

Soil Surveys in Madras

By

M. SANYASI RAJU, M. SC., (WISCONSIN)
Government Agricultural Chemist

AND

P. KUNHIRAMA MENON, B. A.,
Assistant Agricultural Chemist, Coimbatore

Soil surveys are essential to study the condition of the soil so that it can be classified on the basis of its productive capacity to, determine ways and means of improving its usefulness. Realising the importance of soil surveys many of the advanced countries in the world, particularly the U. S. A., have surveyed the soils classified and codified them and then prepared soil maps to give guidance to farmers in the proper management of their soils. Unfortunately such information is not available on an extensive scale in India. It is, therefore, essential to undertake soil surveys in India on a systematic basis.

The Madras Agricultural Department has been in the forefront with regard to soil survey work in India, and has carried out soil surveys for various purposes. For instance, it has surveyed the soils of the Godavari, Krishna and the Cauvery deltas, of the Periyar tract and of Malabar. On the basis of the results obtained in these surveys manurial programmes have been worked out for the different tracts.

In some States in India irrigation projects were sometimes started without proper soil surveys. In areas such as the Nira Valley in Bombay, the Irwin canal area in Mysore, it has been found that with the advent of irrigation the fertility of the soil decreased and within a few years the soil became unfit for cultivation on account of alkalinity. So, before an irrigation project is taken on hand the Madras Government (Agricultural Department) have been carrying out soil surveys of project areas with a view to find out the suitability of the soil and water for irrigation. Such surveys were undertaken in the Tungabhadra project, the Cauvery-Mettur project, the Lower Bhavani project, the Gundalakamma Project, the Todular project, the Gandikota project and the Bhairavanitippa project. In addition, the Madras Agricultural Department has carried out soil surveys of some tracts in the Ceded districts to find out their suitability for fruit culture. The North-East coast of Madras which was badly affected by a cyclone in 1945 has also been surveyed to ascertain the extent of damage caused to the soil by the tidal wave from the sea and to suggest measures to reclaim them.

In a soil survey, the data to be collected in the region under investigation are; (1) the surface features of the land such as flat, undulating, broken etc., (2) the soil water conditions including drainage; (3) the texture of the soils such as clayey, loamy, sandy etc.; (4) the colour of the soils; (5) the depth and succession of soil horizons down to the parent rock; (6) the character of the parent rock; (7) the nature of cropping and the natural vegetation in the tract. After making these observations in the field, representative samples of the horizons of typical soil profiles are sent to the laboratory for detailed study. In irrigation soil surveys, waters are also examined, both in the field and in the laboratory.

In the earlier soil surveys undertaken by the Agricultural Department the object was to ascertain the manurial requirements of particular tracts with special reference to cereal crops. The soil samples were collected to a depth of 18 inches, the first 9 inches to represent the surface soil and the second 9 inches to represent the subsoil. Later, it was realized that the soil from the surface down to the parent rock, i. e. the soil profile as a whole, should also be taken into consideration. To get the profile of a soil the simplest method is to dig a pit down to the parent rock. The vertical sides of the pit can then be examined. It will ordinarily be found that there are layers in the soil differing in colour, texture etc. These different layers are called the horizons of the profile. The top soil usually is darker than the lower layers on account of the humus or organic matter content. If a profile is examined by the practical agriculturist he can see the nature of the subsoil, its drainage possibilities, bands of sand and other layers, kankar, gypsum and salt concentration etc. It is not necessary to dig a pit solely for profile examination. Pits are dug in the field for many purposes and whenever a pit is excavated for any purpose the practical agriculturist should be interested to examine his soil profile to know the depth of soil, its drainage possibilities and other characteristics. Sometimes when the soil is very deep it may not be possible to study the soil down to the parent rock. Then the soil is examined to a certain depth depending on the purpose for which it is intended. Thus in the Tungabhadra project soil survey some of the black soils were found to be very deep. So they were sampled to a depth of 8 feet. In cereal crops such as paddy, cholam, ragi etc. the roots are abundant in the first two feet and so in the case of these crops it is sufficient to study the soil only to this depth. In cotton and other deep-rooted crops the soil must be examined to a depth of three feet. For fruit trees the depth of the soil is important and must be studied to at least six feet.

Soil surveys to assess soil fertility: These were undertaken between 1912 and 1928 and had for their object the determination of the fertility status and the manurial requirement of the soils of certain tracts. As is well known, three most important nutrients which plants require from soils are nitrogen, phosphoric acid and potash. Hence the soil samples collected during the surveys were analysed for these constituents, for lime and for mechanical composition so that a complete picture of the soil with reference to crop production was obtained. The limits of plant nutrients for the climatic and soil conditions of our State are 0.05% of nitrogen, 0.01% of available phosphoric acid (P_2O_5) and 0.005% of available Potash (K_2O) and 0.5% of lime (CaO). The soils of all the regions surveyed for fertility status were measured with this yardstick. In addition to the plant nutrients organic matter or humus also must be present in adequate amounts in the soil for good crop production. Organic matter has several important functions in improving the mechanical composition and the fertility status of soil. In our State organic matter is lost from the soil not only by microbiological (bacterial) activity but also by oxidative decomposition. Consequently the loss is considerable and the loss must be made good by the incorporation of green manure and other bulky organic manures into the soil. The results of the soil surveys are given below:

Tanjore Delta: The soils are deficient in available phosphoric acid and nitrogen. Patches in the delta are deficient in lime. The soils contain adequate amounts of potash.

Guntur Delta: The soils of this region contain adequate amounts of phosphoric acid, potash and lime. But nitrogen is deficient over the whole area.

Krishna and Godavari Deltas are deficient in nitrogen but rich in potash and lime. Phosphoric acid, is in short supply in half of both the regions.

Periyar Tract: The soils of the area are rich in potash and deficient in phosphoric acid and lime. Nitrogen is just on the border line.

Malabar: Some of the lateritic soils of the region contain adequate amounts of nitrogen but are poor in all other plant nutrients and lime.

Soil Survey of Tanjore District: A soil survey is in progress in Tanjore District to determine the fertility status of the soil and to evaluate the response to manurial treatments since the current year.

Manurial Programme Suggested: (1) When nitrogen is deficient agriculturists are advised to grow green manure legume crops with

the application of phosphate (30 lb. of P_2O_5 in the form of superphosphate) and to plough in the legume crop. The seeds of the legume crop should be inoculated with the specific bacteria before sowing. It is claimed that under optimum conditions one pound of phosphate supplied to the legume brings about the fixation of 3 lb. of atmospheric nitrogen. So by this means nitrogen, organic matter and phosphorus are staked in the soil for the growth of the succeeding crop. Nitrogen may also be applied to soil as nitrogenous manures.

(2) Potash is present in most of the soils in Madras State in adequate amounts, except in the coastal regions and on the hills.

(3) Phosphate may be directly added to the crop or to the green manure legume crop. It is better to apply phosphate to the legume than to the main crop.

Irrigation Soil Surveys: In an irrigation soil survey the most important points to be studied are the quality of the water to be used for irrigation and the texture and salt content of the soil. Sweet water which is good for drinking and cooking purposes may contain sodium bicarbonate (baking soda) and is not good for irrigation purposes. If the water contains sodium salts such as carbonate (washing soda), bicarbonate (baking soda) and chloride (common salt) in appreciable amounts without much of calcium salts, the water is unfit for irrigation. These salts will gradually render the soil alkaline and unproductive. If the water is of good quality irrigation can be undertaken but the nature of the irrigation, light, medium or heavy which is to be adopted will depend on the soil. A soil with low salt content and good capacity for drainage is ideal for irrigation. If there is salt concentration in any depth and if these consist of sodium salts irrigation must ensure that the soil is not wetted to this depth especially if the water table is high or the drainage from the soil is not adequate. Salt concentration existing in any depth of the soil is a potential danger, leading to the alkalisation of the soil by the rise of salts to the surface. Drainage is therefore one of the most important factors in all irrigation projects.

Of the important irrigation projects undertaken by the Madras Government the soils commanded by the following projects were surveyed: The Tungabhadra project, the Cauvery-Mettur project and the Lower Bhavani Project. The water in all the three projects were found to be of excellent quality and the soils were considered to be suitable for irrigation. But in the Tungabhadra project area patches of black soils were found to contain salt concentration in the lower depths. It was feared that alkalinity might develop in these soils in due course. So an Agricultural Research Station was started at Siruguppa in Bellary district to find out

what happens with different kinds of irrigation on such soils. The findings so far obtained indicate that there is no danger of the soils going bad, as the drainage is satisfactory. But the experimental station is situated in the midst of a vast area of drylands and the drainage is now adequate. What will happen to the drainage when the whole land mass comes under irrigation is to be investigated. The need for constant vigilance is therefore indicated.

Soils commanded by several minor irrigation projects of the Madras Government have been surveyed by the Government Agricultural Chemist and recommendations have been made in each case regarding the suitability or otherwise of the soils for irrigation with the available water.

Soil Survey of the cyclone-affected areas in North Madras Coast: In 1945 there was a cyclone in North Madras Coast and heavy seas invaded the land 150 miles long from Yellamanchili in the Visakapatnam district to Repalle in Guntur district. It was feared that salinity would have developed in the soil on account of the inundation by sea water. The area was surveyed and the soils were analysed. There was accumulation of salt (sodium chloride) in the soil and flooding with good water and drainage were recommended to correct the evil.

Soil Survey for Fruit Development: Fruit trees require a deep soil (6 feet and more) with good drainage and low salt content for best growth and performance. Some areas in the Ceded districts were surveyed to find out their suitability for fruit culture. Extension of this survey to a larger area in the Ceded districts is in progress.

Soil surveys are thus useful in finding out soil fertility and in deciding what manures are necessary for good crop production in various tracts. It is necessary to find out the irrigability or otherwise of the soils commanded by an irrigation project and a soil survey must be carried out before an irrigation project is taken up. Soil surveys are important for locating areas where fruit culture can be successfully and profitably be carried out. It is also essential for many other purposes such as suggesting suitable crops for particular types of soil.
