CHAPTER III

OBJECT OF STUDY AND STUDY AREA
Of all the natural resources, soil is indispensable and of fundamental importance to mankind, because it is the basis of plant life which supplies food to man and animals, either directly or indirectly. Soil is an inexhaustible resource and if proper methods of management practices are adopted, its productivity can be maintained for centuries. As all human beings are dependent on soil and as soils are the cause of much trouble to farmers and gardeners for their complexity in relation to the supply of nutrients, it is necessary to classify lands according to their capability for land use planning. So the land capability classification should be the immediate programme of any planning agency.

The present treatise is an appraisal of the study of soil potentiality and classification of land of the Khargram - Indrani Plain based on physico-chemical properties of soil and their responses to plant growth under current management practices. In it, an agronomic evaluation of land types has been made by proper assessment of physical and chemical characteristics of soil influencing plant growth. Besides, other external physical factors such as, relief, geology, hydrology, climate etc. have also been taken into account in assessing the land types. Since the land types have been invented on consideration of index values of all the physico-chemical attributes of soils, it is no doubt an ideal and modern classification of land for purposes of use and planning.

On the basis of the land groups or classes thus obtained, areas can be mapped which will serve as a directory to the suitability or otherwise for the
cultivation of a particular crop or crops. Thus the land classification map would show crop adaptation, and the yield of each adapted crop under a given system of management. Such a map would be relatively permanent. That is, the improvement of road, a change of ownership or fluctuation of price of products would not affect it, it would show the capability of the land for use, but not the use to which the land has been currently put. More specifically, the object of the study involves the classification of the land on the basis of physico-chemical properties and crop response, and finally to produce a soil rating map according to the capability of the region.

THE STUDY AREA

The region under study lies between the R. Dwarka and Mayurakshi in the administrative Sub-division of Kandi in the district of Murshidabad. This may be called the Khargram-Indrani Plain. It comprises an area of 400 sq. kilometers and supports more than 160,000 souls. There are 186 villages with only one small urban centre having a population of 20,000. This region thus provides an example of excellent rural base for agriculture. More than 90% of the total area is under cultivation. A striking feature in this region as with other parts of the district is tillage of small holding, average farm comprising less than 0.5 hectare. The small size of the farm is inimical to the application of modern agricultural machines.

Rice is the most distinctive and most important crop which grows well during the period of summer monsoon, and is harvested in the post monsoon period i.e. in autumn (October- November). Other secondary crops that are cultivated in the dry season by the farmer with the help of irrigation wherever possible,
include some high yielding varieties of rice, wheat, pulses, potatoes and vegetable. Sugar cane is a whole year crop. It is cultivated in this region, but its area is restricted in favour of rice which is the main food stuff of the district. Although ecological factors for jute and rice cultivation are almost synonymous, the cultivation of jute is almost nil due to economic reasons and also for lack of storage water for retting the crop and washing the fibre.

Physiography and drainage:

Physiographically, the region comprises a part of the alluvium tract lying west of the R. Bhagirathi, a distributary of the R. Ganges in the district of Murshidabad. As a whole, the area is a plain but slight undulations due to differential erosion, and river bluffs characterise the landscape. The entire region is lying between 30 and 15- metre contour lines. The S.W. part of the police station of Khargram and the adjoining parts of Burwan Police Station are higher than the rest of the region. Streams flow from West to East indicating that the gradient is towards the east. (Map No. 1).

The region is drained by the rivers Dwarka, Goai Nadi (known as Kandar, higher up), Mayurakshi and Daoki, a tributary of the latter. Goai Nadi is a small rivulet which almost dries up during the summer but in the rainy season it takes a destructive appearance. It originates in the undulating terrain in the west in the district of Birbhum and loses itself in the Patan bil, a natural depression in the eastern part of the region. This bil linked up with Balun and Sankro bil seems to be the remnant of a former river channel. During the rainy season these saucer shaped depressions are converted into a continuous lake of considerable size inundating marginal areas and damaging standing crops of considerable worth. Several right bank tributaries of the R. Dwarka partially drain out water of these
bils. For the greater part of the year these shallow and ill-drained depressions, largely covered by water hyacinth, are the breeding grounds of mosquitoes.

Between the rivers micro-ridges run from west to east separating the drainage basins. Occasionally, these ridges have a relative height of 3-6 m. Over these ridges most of the human habitations are located. The sloping flood-plains when wide are really the most favourable sites for the rice culture.

The rivers Mayurakshi and Dwarka which unite later and join the Bhagirathi near the border of the district, contribute to the drainage of the area. At the confluence of the Mayurakshi and Dwarka lies a lowland tract known as 'Hijal'. This having an area of about 90 sq. kilo-meters offers a very different aspect. Here the country becomes more open and large stretches of thatching grass, rather than rice, cover an almost tree-less plain. During the rainy-season, the 'hijal' is widely inundated. Reclamation of the 'hijal' along the peripheries has just started for the production of rice.

Climate:

Climate is one of the most important factors which not only influences the soil but is responsible for the growth of plants. Agriculture is, therefore, dependent on the nature and characteristics of the climate that prevail in the region. Soil development and its fertility status are determined by the climatic factors including temperature and rainfall. Kellogg (1936) in stating the factors of genesis emphasises that soil is to be considered in relation to its development as a function of climate, vegetation, relief, age and parent material. The degree of soil development represents the extent to which original rock has made successive
steps in simplification towards true solution or in moving from land towards the sea. It designates the extent to which nutrient holding clay fraction is saturated with essential nutrients. It also indicates the extent to which the soil may be depleted of its basic nutrient store by replacement with $H^+$ ion in preference for acidity. Thus the study of the climate of the area will provide an indication of the character of the soil which is one of the important attributes of evaluating land according to its capability class.

In the Khargram - Indrani Plain the climate is characterised by a rhythm of seasons produced by the south-west and north-east monsoons. When the sun moves to the south of the equator, cool and dry winds of continental origin come from the north-east, while with the approach of the sun to the north of the equator, the wind direction is reversed and warm moist winds of oceanic origin begin to blow from the middle of March each year. But due to excessive insolation, air temperature rises rapidly, so that the mean maximum temperature is about $35^\circ C$. By April and May, the normal air temperature in the mid-day hours is over $40^\circ C$ and absolute maximum approaches $44^\circ C$. The summer heat is so oppressive that it is difficult to go out in the sun in the mid-day. Under such conditions of heat and excessive evaporation, the land gets completely devoid of water, soil is dried up and cracked and tilling appears to be awfully difficult.

The oppressive heat continues till some relief is obtained by Norwester, a tropical thunderstorm, by the end of April. This storm not only brings some rain in the evening but also provides a pleasant weather after the mid-day heating. Such a frequent cyclonic activity in the afternoon ameliorates the weather and takes the most useful contribution to plant growth by supplying moisture. Indeed, the
little amount of cyclonic rainfall is very helpful for the preparation of land for subsequent cultivation.

By the middle of June, the monsoon sets in and widespread rain begins as the monsoon strengthens, but discontinuity, often for weeks together, sometimes extending to a month is the most disturbing phenomena for the farmer. The monsoons may cause disaster to agriculture by its irregular appearance and also because without it, no water even for hand-lifting irrigation can be found anywhere in the western part of the region. These are certainly great hindrances for planned agricultural programmes. However, in the event of timely monsoons, rain first moistens the soil, permits easy tilling, and after two or three weeks of operation still leaves enough moisture for the soils so as to allow transplantation of rice. Records of rainfall as available for Kandi Station show that the average precipitation is about 166 cm. The amount of rain falling during the period between June and September constitutes about 79% of the total annual precipitation. In twenty years period (1950-1970) highest amount of rainfall of over 300 cm. was recorded in the year 1959. This is about 181.5% of the normal precipitation occurring in this region. On an average there are 78 rainy days in a year with a variation of \pm 24%.

Geology and Soil:

Geographically this region forms a part of the Lower Ganga Plain. Geologically it occupies a portion of the gap between Rajmahal and Meghalaya Plateau being composed of Pleistocene and recent deposits, mainly old alluvium to the west and newer alluvium to the east.

The old alluvium soils of this region are derived from the crystalline rocks of the Chota Nagpur Plateau and have been transported by rivers and deposited
in the plains of Birbhum and Murshidabad. Rivers flowing through the laterite section of Birbhum district have washed down silt and clay and deposited them as alluvium of mixed origin. S. K. Mukherjee (1955) classified the soils into Rajmahal riverine lands and Rajmahal flat land types on the basis of their place of origin. Two profiles were dug within the region and the details of the profile characters were studied following Kuibiema (1953) and Bhattacharjee (1968).

**Study of Soil Profiles:**

**A. Rajmahal Riverine Lands**

Profile No. 1. Locality - P.S. Kandi

Site - Jasahari

Relief - Level land

Elevation - About 27 metres above sea level.

Topographic situation and slope - About 3 km. west of Kandi, imperceptable.

Parent material - Alluvium

Vegetation - Rice plant

Weather condition prior to sampling - Dry sunny weather

Profile drainage - Free

**Morphology**

0 - 30 cm - Dark yellowish brown (10 Yr - 4/4); Silty clay loam; no stone; very hard; medium platy structure; sticky; neutral in reaction; roots of paddy plants present - in abundance; changes to -
30 - 60 cm - Yellow brown (10 yr - 5/4), sandy loam; no stone; comparatively
soft than above; single grained; slightly sticky; friable;
mildly alkaline, pH = 7.4; plant roots present.

60 - 90 cm - Light yellowish brown (10 yr - 6/4), clay loam; no stone; single
grained; slightly plastic; soft; friable alkaline; few plant
roots present.

90 - 120 cm - Yellowish brown (10 yr - 5/4), coarse sand; single grained;
non-sticky; non-plastic; alkaline; very few fine roots present.

B. Raja Mahal Flat lands

Profile No. 2. Locality - P. S. Khargram

Site - Sherpur
Relief - Level land
Elevation - About 25 metres above sea level

Topographic situation and slope - About 11 km. north of Khargram,
imperceptable.

Parent material - Alluvium

Vegetation - Rice Plant

Weather Condition prior to sampling - Dry sunny weather

Profile drainage - Free.

Morphology

0 - 30 cm. - Yellowish brown (10 yr - 5/4); clay loam; compact massive
structure; fairly hard; no stones or pebbles; slightly acid
in reaction; roots of plants present in abundance.

30 - 60 cm. - Dark yellowish brown (10 yr - 4/4); clayey; compact structure;
sticky; alkaline in reaction; few plant-roots; few lime
concretions of irregular shape; moist.
60 - 90 cm. - Dark yellowish brown (10 yr - 4/4); clayey; compact structure; sticky; alkaline in reaction; few plant roots; few lime concretions of irregular shape; moist.

90 - 120 cm. - Light yellowish brown (10 yr - 6/4); clayey; compact structure; very sticky; very hard when dry; alkaline reaction; few plant roots; lime concretions present; moist.

The profile character of the soil association which had its origin in the Rajmahal riverine lands is that it contains distinct sand layers which are of coarse nature. Occasional lime concretions in the form of yellowish irregular shaped dolomite sparsely scattered in the profile are met with. From their random occurrence it is believed that they have been carried by riverwash from the adjoining parts of Birbhum which is rich in dolomite. Finally, the rich colour of the soil is due to their iron content, though iron and ferro-manganese concretions are absent indicating the absence of water logging of the area for considerable part of the year. This type of soil is found to occur in the P.S. of Burwan, S.W. Kandi and southern part of Khargram. Elsewhere between the Goal Nadi and the Dwarka in the P.S. of Khargram soils belong to Rajmahal Flat land family. The profiles of this soil association is characterised by moderate accumulation of clay and higher concentration of lime in the sub-soil as a result of leaching from the surface horizons. Besides, there are occurrences of brown concretions and isolated dolomite concretions in the layers below. No free calcium carbonate was detected in the profile.

It seems that the soil is comparatively poor in plant nutrients, specially in N. P. K., but under proper management, the soil becomes much productive and responds well to the cultivation of rice, wheat, gram, potatoes and sugarcane.