

Lecture 3

Soils with Physical problems cont...

Heavy clay soils

Clay soils are referred as heavy soils. To be classified as clay soil, it should be made up of about 40% clay particles, the finest particles found in soil. This is also slowly permeable soils.

Main production constraints

Heavy have very hard consistence when dry and very plastic and sticky ("heavy") when wet. Therefore the workability of the soil is often limited to very short periods of medium (optimal) water status. However, tillage operations can be performed in the dry season with heavy machinery. Mechanical tillage in the wet season causes serious soil compaction.

They are imperfectly to poorly drained, leaching of soluble weathering products is limited. This is due to the very low hydraulic conductivity. Once the soil has reached its field capacity, practically no water movement occurs. Flooding can be a major problem in areas with higher rainfall. Surface water may be drained by open drains.

Most of the heavy clay soils belonging to Vertisols are chemically rich and are capable of sustaining continuous cropping. They do not necessarily require a rest period for recovery; because the pedoturbation continuously brings subsoil to the surface. However, the overall productivity normally remains low, especially where no irrigation water is available. Nitrogen is normally deficient as well as phosphorus. Potassium contents are variable. Secondary elements and micronutrients are often deficient. In semi-arid areas free carbonate and gypsum accumulations are common.

There are two broad groups of vertisols

Self-mulching Vertisols. These have a fine (granular or crumb) surface soil structure during the dry season. When such soils are ploughed, the clods, after being subjected to repeat wetting and drying, disintegrate. Crusty Vertisols. These have a thin, hard crust in the dry season. When ploughed, crusty Vertisols produce large, hard clods that may persist for 2 to 3 years before they have crumbled enough to permit the preparation of a good seedbed. Such soils require mechanical tillage if they are to be cultivated.

The structural stability of high clay soils remains low. They are

therefore very susceptible to water erosion. Slopes above 5 per cent should not be used for arable cropping, and on gentler slopes contour cultivation with a groundcover crop is advisable. When terracing, sufficient surface drainage must be provided. The strategies suggested for slowly permeable soils also hold good for clay soil.

Fluffy paddy soils

Occurrence and Causes

It is formed due to the continuous rice-rice cropping sequence. The traditional method of preparing the soil for transplanting rice consists of puddling which results in substantial break down of soil aggregates into a uniform structure less mass. The solid and liquid phases of the soil are thus changed. Under continuous flooding and submergence of the soil for rice cultivation in a cropping sequence of rice-rice-rice the soil particles are always in a state of flux and the mechanical strength is lost leading to the fluffiness of the soils. This is further aggravated by in situ incorporation of rice stubbles and weeds during puddling.

Impact of fluffiness

Sinking of draught animals and labourers is one of the problems during puddling in rice fields which is an invisible drain of finance for the farmers due to high pulling power needed for the bullocks and slow movement of labourers during the puddling operations. Further, it leads to low bulk density and very rapid hydraulic conductivity which in turn affects anchorage to the roots and the potential yield of crops is adversely affected.

Management Methodology

- Irrigation should be stopped 10 days before the harvest of rice crop
 - After the harvest of rice, when the soil is under semi-dry condition proctor moisture level, compact the field by passing 400 kg stone roller or an empty tar drum filled with 400 kg sand 8 times.
2. Usual preparatory cultivation is carried out after compaction.