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A New Method of Planting Sugarcane

by

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Introduction: In the south Madras, the monsoon is active from July to November with occasional showers upto mid January, the heaviest rain fall being in October and November months. In lighter sandy soils, preparatory operations like deep ploughing could be carried on with some difficulty by the end of January and February. In heavy soils, particularly in the eastern Tanjore delta, the soil is too wet and it is not ready for any ploughing operations till late in February or March. The delay is greater, particularly when the fields are surrounded by swamp paddy crop varieties like late 'samba', which come for harvest by February–March. Planting of sugarcane under such soil conditions is generally not possible till March or April.

This late planting has many disadvantages. The age of crop at next harvest by January–February is barely 10 or 11 months. The young sprouts have to face severe summer temperature and drought from March to May before the sprouts are well established on the ground. The early stem borer (*Chilotroea infuscatellus*) is severe in late planted crops of sugarcane. Due to irregular water supply, particularly due to closure of canals for annual repairs, the sprouting of planted setts is poor and the plots become gappy with thin population. Germination percentages as low as 25 have been recorded even in research stations (1).

In the Arooran Sugar Factory's own farm, various trials were in progress to plant sugarcane early in the season. Mechanical handling of soil, by tractors to liberally aerate the soil by the use of special types of implements, has been developed. A technique to start the crop early is the new planting method described here.

Earlier Work: Germination of normally planted buds varies from 25 to 75 percent depending upon variety and soil conditions. Buds planted deep into soil fail to sprout up and germination percentage in such cases is generally poor, being only 25 to 45 percent. Apart from the physiological condition of bud and the physical condition of soil, the soil pathogens to a large extent affect the

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planted setts and cause failure of germination. Hence, under all conditions of planting, the soil is thoroughly prepared to fine tilth and the setts pretreated with fungicides.

Usually, cane stalks are cut into two or three budded bits and used as planting material. In Java, a technique was evolved for sprouting the buds on standing cane stalks and the seedling bit was planted at one seedling per hole (5). This method is called 'Rayungan' (i. e. sprouted bud) planting. In Kolhapur sugar factory farm, the shoot-setts were developed in a special nursery and the seed bits with two shoots attached were transplanted in a well prepared field (3).

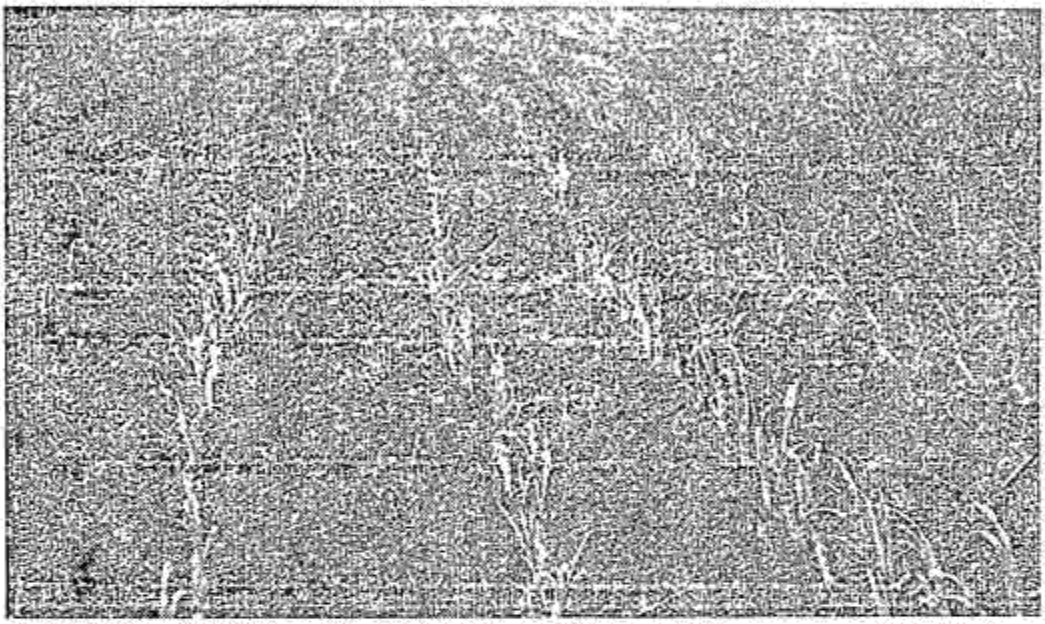
The normal seed rate is 15,000 three budded setts in Madras State and it is sometimes as low as 8,000 to 10,000 three budded setts in Bombay – Deccan. It is as high as 40,000 two budded setts in the Punjab (2). The higher seed rate is generally adopted under soil conditions that lead to poor germination. Studies at Anakapalle Sugarcane Research Station have indicated that 8,000 single buds per acre can yield as much as the high seed rate usually adopted.

Germination and subsequent tillering are important factors deciding final population of millable canes at harvest and the latter is a major factor for yield per acre. In achieving good yields, earlier planting is ideal (2). Generally in Madras State and more so in the wet land area, the harvest of rice crop and the too-moist soil conditions do not permit of early planting. Non-availability of assured and adequate water for irrigation in summer is another major obstacle for starting an early crop.

The problem: The Arooran Sugar factory farm is over 6,200 acres in extent and is located in heavy clay soil of eastern cauvery delta in Tanjore district of Madras State. This region is subject to prolonged north east monsoon till mid January. The overflowing cauvery canals and the vast surrounding areas of swamp paddy generally cause the surface and subsoil to be too wet and unfit for agricultural operations like ploughing or digging till mid summer months. From early February, the canals are closed and there is great scarcity for irrigation water till mid summer months. From early February, the canals are closed and there is great scarcity for irrigation water till mid June and this period is marked by severe drought. In the past five seasons, planting of sugarcane was delayed upto April – May and the irregular water supply caused great

damages to planted setts by large scale failure of sprouting. The problem was enhanced in saline soils where higher soil moisture is required to sustain the sprouts.

Earlier trials here with 'rayungan' planting proved a failure due to lack of trained and skilled staff in handling the same and also due to irregular and uncertain supply of irrigation water which later is most essential in establishing the seedlings in the planted field.



'Partha' Planting method. Note the setts in vertical position.

The new method: A new technique was developed to meet the local adverse conditions of soil. The new method was tried in one acre in 1959—'60 season and it is now extended to 400 acres with great success in November–December planting in 1960—'61 season.

The land is prepared by August–September and laid into ridges and furrows. Field drains are opened at frequent intervals of 15 to 20 feet to facilitate quick draining. The fields are efficiently connected to the drainage pumping station, which latter is a new technique developed here for mechanically draining the fields under locally fabricated low lift wooden pumps. During heavy monsoon rains, the fields remain under water.

When the beating heavy showers are over by November, planting is taken up. Three budded setts are cut in the usual manner and pre-treated with organic mercurial fungicides. The setts are thrust with the bottom one node only into the soil. The planting is done half way down the slope of ridge, in order to avoid any direct contact with the possible stagnant water in the furrow. The setts

are slanted with 40° to the ground and the two upper buds are kept lateral and out of contact with the ground. The soil round the base of planted sett is compacted well by pressing with hand.

The seed rate adopted is only 10,000 setts per acre and this is now found to be too much and may be reduced to 8,000 setts per acre. In the new method the top two buds sprout and grow up vigorously. This sprouting and early growth is irrespective of the adverse soil condition immediately below. The first lower bud in the soil is sacrificed under these conditions. Even with slushy overmoist condition of soil below, or even with light showers continuing, the top two buds sprout up normally. The aerial location of the top two sprouts keeps off any possible attack from soil pathogens and insects. There is adequate aeration and moisture for sprouting. For such reasons, initial sprouting, growth and survival of seedlings is great. This earlier growth is irrespective of the immensely adverse soil condition below and to some extent even irrespective of atmospheric condition like heavy rain or bright sun. By normal method of planting the seed rate is 15,000 setts per acre and some farmers here have been adopting 20,000 setts, to ensure good population. Many fields still remain gappy due to failure of germination.

When the seedlings are sufficiently grown up and are about 9" tall, water is let into the furrow if required and the setts are pressed horizontally down into the soil *in situ*. Ammonium sulphate is applied by pocketing near the sprouts to supply 45 lbs Nitrogen per acre. The pressing down is carried out preferably under wet conditions and the water is drained immediately. The pressing down can be done even under dry conditions, in which case the soil is opened in front of the sett with a hand hoe, the setts pressed horizontally down, covered and compacted with moist soil. It is preferable to irrigate the crop again after 4 or 5 days or usually there will be light showers or rain during this period. The seedlings also take a slanting position at pressing down, but usually attain erect position within a week. They root from the base and start growing up normally. This new method of planting ia called "*Partha*" method.

When the seedlings are established, and when the soil comes to condition, the field is ploughed up between rows and the soil opened up and weathered. The absence of mechanical handling of soil immediately preceding planting, by way of preparatory operations is made good by way of deep and frequent interculture. Further top dressings of nitrogenous and phosphatic fertilisers are carried out at the right stage of growth of the cane crop.

called "chelated compounds" (Ghani 1943, Leaver & Russell 1957, Olsen & Fried 1957). These complex ions have but slight tendency to combine with phosphorus.

3. **Blocking Action of Organic Compounds:** Other decomposition products not well defined, may be adsorbed on the same sites on the clay micelle that could hold the phosphate ion and thereby prevent the phosphorus form being adsorbed. Leaver and Russell (1957) found that when soils that have been treated to remove free iron oxides are further treated with 'blocking agents' like fulvic acid (extracted from farm yard manure) the phosphate fixing power of such soils gets considerably reduced.

4. **Carbon Dioxide Production:** In calcareous and other well aerated soils, decomposition organic matter and production of carbon dioxide aid in the solubilisation of insoluble phosphates. (Jensen 1917; Miller & Turk 1951; Gustafson 1941; Russell 1951).

5. **Protective Action:** Protective action of organic colloid or gross organic matter helps to prevent the soluble phosphate from coming into contact with active iron and aluminium in the soil. (Midgley *et al* 1945, Pierre 1948, Swenson *et al* 1949).

Lessening of Phosphate Fixation by Liming: Fixation of phosphate is especially troblesome under acidic conditions, when liming can be resorted to for producing beneficial effects. One effect of lime is to reduce the solubility of iron and aluminium in the soil with the result that phosphate gets precipitated as the more soluble dicalcium or tricalcium phosphate or compounds closely related thereto. Another effect is to increase the number of hydroxyl ions which tend to compete with the phosphoric acid ions for a position on the adsorption complex.

On tropical and sub tropical acid soils, heavy liming is not always feasible, nor is it desirable in certain cases, due to the consequent alteration of the ionic balance in soils. In these soils placement of fertiliser and use of organic matter must be resorted to, for getting increased yields from the application of super phosphate and other soluble forms of phosphate fertilisers. (Russell 1951)

Crop Rotation: Species of plants differ markedly in their capacity to absorb phosphorus. Phosphorus from phosphate rock was found to be most available to buck wheat. Legumes extracted more phosphorus from phosphate rock than grasses (Olsen & Fried 1957). The change in the exchange capacities of the plant roots and

alteration in carbon dioxide production by the roots of different plants, have been put forward as plausible reasons for this (Russell 1951; Olsen & Fried 1957). Thus crop with a low capacity to absorb phosphorus should benefit if it follows a crop with a high capacity, due to the greater phosphate availability in the soil brought about by the previous crop.

Before concluding this paper, I would like to stress on a point which is of particular importance in the study of phosphorus availability in Indian soils. Several of the agronomic experiments conducted in different parts of the country show no significant results by application of phosphorus fertilisers; but this does not justify the conclusion that our soils are well supplied with phosphorus. According to Stewart (1947) the view that Indian soils do not require phosphate appears to be held to a 'surprisingly and indeed dangerously large' extent. He attributes the failure to respond to phosphates to other factors, such as unbalanced nutrition, and not to a sufficiency of of phosphorus in Indian soils and believes that when soil is adequately fertilised with nigrogen and potash, the need for corresponding high fertilisation with phosphorus also would become evident.

Summary: A short review of the work that has been done on the problem of phosphate fixation and availabilty is attempted. The problem is complex, as several factors are involved. Among the factors that are known, fixation by soil colloid, sesquioxides and calcium are the most important and pH, time, organic matter and other environmental factors also affect fixation. The reaction of organic matter on clay is such that phosphorus fixation gets lessened and availability to plant roots gets increased. If the availability of phosphorus to plants is dealt with on an energy basis as in the case of 'phosphate potential' advocated by Schofield, a better yardstick, for measuring phosphorus availability to plants can be got.

Though some of the experiments conducted in India do not suggest any need for phosphorus fertilisatson it is suggested that, when optimum ionic balance is maintained in the soil, phosphorus fertilisation is certain to show response, provided there are no adverse soil conditions in the soil.

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