

THE INFLUENCE OF MULTIPLE CROPPING ON THE BULK DENSITY OF UPLAND ALLUVIAL RICE SOILS

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Soil physical properties influence the plant growth in many ways and in particular circumstances they can have a dominating influence. Their effect on plant growth is indirect. Hence a study on the effect of various crops and cropping patterns on the bulk density of the soil was conducted in a multiple cropping experiment at the Central Rice Research Institute, Cuttack, during the years 1967-68 and 1968-69.

The soil of the experimental area was sandy loam and medium in fertility. The cropping patterns tried were potato-rice-rice, maize-rice-rice, groundnut-jute-rice, rice-jute-rice and rice-rice. Undisturbed core samples of soil were collected before starting of the experiment and after every crop and dried at room temperature. These were used in determining the bulk density. The bulk density was determined by finding out the weight of undisturbed core of oven dry soil per unit volume of soil.

Results and Conclusions

The data on bulk density of soil at the beginning of the experiment and after every crop are presented in Table 1 and Fig 1.

The data reveal that the bulk density of the surface of the soil was 1.51 gm per cc at the beginning. There was only a small change in bulk density of soil after certain crops. In the treatment potato-rice-rice, there was a small decrease in bulk density after potato (0.03 gm per cc) during both the years but it increased after the rice crops. This could be explained in the light of the fact that rice was transplanted after puddling the soil. The puddling operation helped in increasing the bulk density. But in case of potato a loose friable soil was desirable which obviously decreased the the bulk density.

In the treatment maize-rice-rice there was a decrease in bulk density by 0.1 gm per cc after maize but there was an increase after both *dalua* (*rabi*) and *khari*rice. During the second year there was no change in bulk density

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of the soil. In the treatment groundnut-jute-rice there was a slight decrease in bulk density (0.01 gm per cc) after groundnut during the second year, but during both years there was increase in bulk density after the rice crops.

In the continuous cropping of rice (rice-rice) treatment there was an increase in bulk density during the first year by 0.05 gm per cc.

Table I

Bulk density of the soil after each crop in gm per cc

Treatment	Initial status	1967-68			1968-69		
		after potato	after <i>dalua</i> rice	after <i>kharif</i> rice	after potato	after <i>dalua</i> rice	after <i>kharif</i> rice
Potato-rice-rice	1.51	1.48	1.50	1.53	1.52	1.53	1.53
Maize-rice-rice	1.51	after maize 1.50	1.53	1.55	after maize 1.55	1.55	1.55
Groundnut-jute-rice	1.51	after groundnut 1.52	after jute 1.54	1.55	after groundnut 1.54	after jute 1.55	1.55
Rice-jute-rice	1.51	after <i>dalua</i> rice 1.54	after jute 1.54	1.55	after <i>dalua</i> rice 1.56	after jute 1.56	1.56
Rice-rice	1.51		after <i>dalua</i> rice 1.55	1.56		after <i>dalua</i> rice 1.56	1.56

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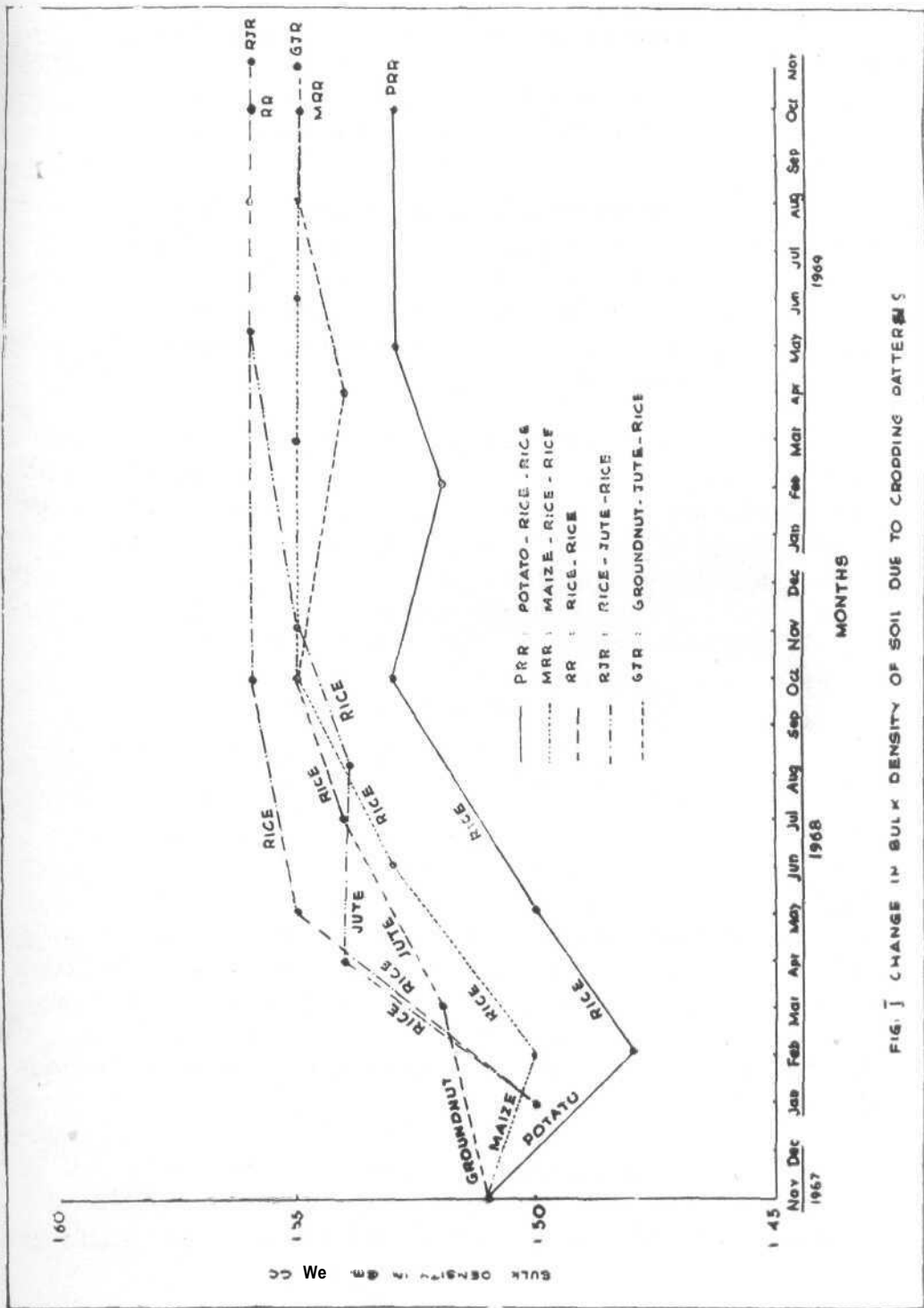


FIG. 1 CHANGE IN BULK DENSITY OF SOIL DUE TO CROPPING PATTERNS

The decrease in bulk density noticed after the potato crop may be due to the large quantity of farmyard manure (20,000 kg per hectare) applied to this crop. The organic manure might have improved the structure and increased the pore space thereby decreasing the bulk density of the soil. Similar observations in the reduction of bulk density by the addition of farmyard manure were reported by Klute and Jacob (1950) Russell *et al.* (1952) and Das *et al.* (1966).

In all the treatments after the *Kharif* rice there was an increase in bulk density. This was due to the rapid oxidation of the organic fraction of the soil during the summer and the consequent loss of water stable aggregates. Moreover during puddling operations, the soil particles got reoriented thereby decreasing porosity and increasing bulk density.

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