

A NOTE ON CLAY PANS IN THE BAKHARGANJ DISTRICT OF BENGAL.

By J. N. MUKHERJEE, *D.Sc.*, and M. CARBERY, *M.C.*, *M.A.*

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Layers of soil impervious in various degrees to root growth and to free movements of water are often met with in the soil profile. These are generally known as pans. Several types are known. Pans of hard concretionary materials, rich in sesquioxides, humus, calcium carbonate and gypsum as also pans consisting of compact layers free from the above, such as the clay pan or the plough pan, have been met with. Ramann¹ emphasised the interrelationships between podsolisation and pan formation thus bringing it in relation to the pedogenic processes. In the *ortstein* formations studied by Ramann a cementing process is recognised. A number of subsequent investigators have supported this point of view. The plough pan, however, is observed below the soil mulch and Ramann and Ehrenberg² define it as the uppermost layer of the subsoil whose compactness is mainly attributed to the downward translocation of the finely dispersed material of the cultivated layer. Schlacht³ quotes Ehrenberg as stating that plough pans are disappearing with the introduction of modern methods of cultivation but in a recent survey in Germany he finds it to be extensive. He has considered in detail the relation between pan formation and soil structure. He comments that the extensive occurrence of pans, other than those of hard concretionary materials, is not generally recognised. He finds very little dependence on the lime and humus contents, the more important factors being the clay content, the manner of mixture with the clay and the moisture content and its variations. According to him the cultivation of lucerne and potato helps the formation of such pans immediately below the cultivated layer. If destroyed, they are reported by him to be reformed within three months to two years. Hilgard⁴ observed plough pans mostly in clay soils, Ramann⁵ in low and sandy soils and Mayer⁶ in humus sandy soils. Among the factors which promote the formation of such pans are processes which give rise to a fluid dispersed layer of the soil particles.

¹ Ramann, The evolution and classification of soils, p. 69. (English translation by C. L. Whittles.)

² Ramann and Ehrenberg, Die Bodenkolloide, 1915.

³ Schlacht, *Ztschr. Pflanz. Dung.*, vol. 27A, p. 303, (1933).

⁴ Hilgard, Soils, p. 186, (New York, 1916).

⁵ Ramann, *Bodenkunde*, 1911.

⁶ Mayer, *Landw. Versuchs-Stat.*, vol. 58, p. 161, (1903).

The tendency to correlate pan formation with the type and structure of the soil and the soil forming processes appears to be gaining ground. Aarnio¹ has investigated plough pan formation in relation to soil genesis. Jenny and Smith² postulate a sieve action principle in pan formation according to which in a soil profile the colloidal particles can migrate only in the pore channels of the soil skeleton. If the diameter of the smallest pore exceeds the greatest diameter of the clay particle, no tendency to pan formation will exist. In any other case, partial or total accumulation of colloids will take place.

In the Barisal farm it was noticed that a rich soil, which should bear a good crop of cane, failed to do so. A pan was located about 7 to 10 inches below the surface. Such pans have since been observed under water-logged or flooded conditions, under cultivated and uncultivated soils, as also under those not subject to floods or water-logging. The pan has also been observed at similar depths even where soil consists of raised earth. As paddy was mainly grown in the area the pans escaped notice. The roots of the cane grow horizontally and are unable to penetrate the pan. It is quite easy to locate the pans suitably with the help of an iron probe. It appears that these pans are extensive in the area examined. The soil is yellowish grey in colour and appears to be uniform on visual examination throughout the profile up to a depth of about 3 feet. It is free from concretionary material. A bluish layer, deeper down, has been observed in one instance. As most of the area was water-logged when the site was visited, only a preliminary examination was possible. A detailed investigation of these pans and their occurrence which, to the knowledge of the authors, have not been observed so far in Indian soils, has been undertaken.

Regarding ameliorative measures the cultivation of deep rooted plants and deep trenches facilitating drainage suggest themselves and it is intended to try them but a detailed investigation of the soil profile should precede the adoption of such measures. From such evidence and observation as have been made it would seem that if such pans were broken up, they would readily reform; ordinary methods do not seem to be applicable.

¹ Aarnio, Om Alvtyper Geotekniss Meddelanden No. 30, (1921). Quoted from Schlacht.

² Jenny and Smith, *Soil Sci.*, vol. 39, No. 5, (1935).