

THE ANDOSOLS IN INDONESIA

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Received for publication August 10, 1964

In the last few years there have been several studies of the andosols. Since this group of black-colored soils is widely distributed in the volcanic areas around the Pacific basin, it is not surprising that they are gradually receiving more attention.

The unusual behavior of these soils is attributed to their amorphous clay fraction. In Japan, according to the literature, andosols are often characterized by the presence of allophane (1, 6). In New Zealand, however, allophane has been reported (3) as also present in a group of soils derived from volcanic andesitic and rhyolitic ash, and in Hawaii (9) as present in considerable amounts in latosols.

Because of the predominant influence of the allophane content in the soils of Japan, Kanno (6) even proposed to designate Japanese volcanic ash soils as humic allophane soil.

In Indonesia this group of soils is widely spread over the archipelago, from Sumatra in the west (4, 8, 12) over Java (10, 13) to the Lesser Sunda Islands in the east (8).

The possibility that these soils might resemble marginalitic soils, as postulated by Gerasimov [see (6), p. 180], is doubtful. The andosols should be clearly separated from marginalitic soils, since the andosols possess different morphological, physical, and analytical characteristics.

PARENT MATERIAL

The andosols in Indonesia are developed from a rather wide variety of parent material, but all of them originated from recent Pleistocene eruptions.

In north Sumatra the andosols are formed primarily on andesito-dacitic tuffs and lahars of the Sibajak volcano [for their mineralogical composition, see Tan and Van Schuylenborgh (12)] and are restricted to the lowest parts of

the region. In west Java they are found successively from west to east on basalto-andesitic lahar of the Salak volcano (Tjiapus/Bogor), on andesitic tuff of the Tangkuban-prabu volcano (Lembang), and on andesito-basaltic tuff of the Pengalengan Highlands. In east Java the kind of parent material is still under investigation but is expected to be of basaltic type.

These facts indicate that the parent material from which the andosols are developed changes from acid to rather basic types in going from west to east along the volcanic rim of the Indian Ocean. This change in parent material may have some influence in the development of certain differing characteristics among the andosols that will be discussed in this paper.

CLIMATE

In general the climate in Indonesia changes with elevation. Rainfall increases with elevation and probably reaches a maximum at about 1500 to 2000 m. above sea level. Temperature decreases with increasing altitude. Differences in temperature can be calculated by the formula [see reference to Braak, 1923/25 in Tan and Van Schuylenborgh (12)]:

$$t = 26.3 - h \times 0.6^{\circ} \text{C.}$$

where h is the elevation in hectometers. Thus the lowlands will have a humid tropical climate, while up in the mountains a warm temperate climate will prevail.

Since the andosols in north Sumatra are restricted to the plains at the foot of the Sibajak volcano, they are formed under the influence of a humid tropical climate (table 1). The andosols in Java are, to the contrary, mostly situated at higher elevations, in what is closer to a warm temperate climate.

Due to these differences in climatic conditions, different humus compositions seemed to be formed in the various andosols of Indonesia. The humus of the Sumatran andosol contains relatively higher amounts of fulvic acids than

¹Bogor, Indonesia. This article was prepared for the F.A.O. working meeting on volcanic ash soils in Tokyo (Japan) June 11-27, 1964.