Studies on the Soil Physicochemical Properties of Sago-Palm (Metroxylon sagu Rottb.)-Growing Areas and Its Growth and Starch Productivity in Southeast Sulawesi, Indonesia

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Sago palm has been utilized more than two hundred years as the second staple food after upland rice for the indigenous people in the Southeast Sulawesi, Indonesia. However, the growing areas decreased appreciably from about 13,000 ha in 1986 to 4,988 in 2007, mainly due to the conversion to the rice field. On the other hand, in recent years sago palm has been paid much attention as the raw materials for industrial use such as bio-fuel (alcohol), biodegradable plastic production, etc., due to its great starch productivity. This study was carried out to obtain the basic information on the soil environment under sago growing areas and the growth and starch productivity of sago palm in the Southeast Sulawesi to predict and evaluate the possibility of sago palm cultivation in this region.

Physicochemical properties of soils under sago-palm-growing areas (SF) were compared with those of the surrounding cashew fields (CsF), cacao fields (CoF), and paddy fields (PF) around Kendari. The soil texture under the SF varied from sandy loam to silty clay and the soil bulk densities in the SF were mostly lower than those in the CsF and CoF, due to the differences in water regimes. The soil pHs in

Photo was taken shortly after my final exam defence, February 6, 2010. From the left : Prof. Tetsushi YOSHIDA (Co-supervisor and Examiner, Kochi University), Associate Prof. Dr. Akira MIYAZAKI (Co-Supervisor and Examiner, Kochi University), Prof. Hideki SUGIMOTO (Examiner, Ehime University), myself, and my Supervisor and Japanese Advisor Prof. Yoshinori YAMAMOTO (Supervisor and Examiner, Kochi University).
the SF were dominantly acid, particularly for the organic soils in Watulondo. The total-N contents varied from low to very high in the SF and these were higher than those in the CsF, CoF and PF. In the SF, the available-P contents were dominantly very low to medium, whereas the exchangeable-K contents were mostly low. The soil CECs in the mineral soils widely varied from low to high, except in the peat soil in Watulondo where the CECs were very high. The total-C contents were widely ranged from very low to very high in the mineral soils, while it was extraordinarily high in the peat soil of Watulondo.

The comparison of the physicochemical properties of mineral soils around Kendari with those in the major sago palm growing areas of eastern Indonesia, Seram and Jayapura, revealed that nutrient contents of sago-palm-growing areas around Kendari showed higher in the CEC, total-N and total-C than those in Seram and Jayapura. On the other hand, the exchangeable-Ks, available-Ps and pH values showed lower around Kendari than in Jayapura and Seram. Around Kendari soil acidity is not so good for nutrients availability.

The growth and starch productivity of the three types of sago palm (folk variety; Molat, Tuní and Rotan) found around Kendari were compared along their growth stages after trunk formation (ATF). The increase in trunk weight per year ATF, the average trunk weight and starch yield at harvesting stage were higher in the order of Molat > Tuní > Rotan. The differences in starch yield were caused by the differences in trunk (pith) weight, but not by the starch percentage. The average starch yield per ha of Molat sago was predicted around 9 ton during the consecutive years from 2006-2015. However, the starch yield showed a downward trend from 13.5 t/ha in 2006 to 4.3 t/ha in 2015. This trend is caused by the decreasing numbers of harvestable trunks in each subsequent year due to the less management of sago palm garden.

Sago palm is one of the rare crops which can grow on the marginal lands such as deep peat and water-logged soils. In Southeast Sulawesi there are huge deep peat land at Tinondo swamps, district of Kolaka, and waterlogged land at Rawa Aopa surrounded by districts of Kolaka, Konawe and South
Konawe. These lands are possible to be converted into the large scale plantations of sago palm aiming at the industrial use of the starch. The total area of the lands is around 58,000 ha. If the sago palms are planted at a density of 10m x 10m in the whole land and harvestable one palm from each clump in each two years after attaining harvesting stage, the starch yield would be 1.16 million ton per year from the average starch yield of Molat sago (ca. 400kg). This is expected to result in the agricultural and rural economic developments in the districts. For developing the huge sago palm plantation, the use of seedlings as planting materials were examined, and the possibility was approved.