

## A Quantitative Study on Plant Nutrients Naturally Supplied to Agricultural Land from Seawater

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### Summary

In island countries or areas, it seems salts from seawater frequently fly into land and the amount in typhoon or monsoon season become larger sometimes to cause serious damages to agricultural crops, which is called *engai* in Japanese, especially in subtropical small islands such as in Ryukyu Archipelago, Japan. However, such a transfer of sea salts means a natural supply of plant nutrients contained in seawater as Mg, S, Ca, K, B to agricultural lands. In contrast with *engai*, the nutritious effect to crops by sea salts should be called *enenki*, sea salt services, in Japanese. So, this study was focused to evaluate the amount of salts transferred from seawater to land, and to try to develop a model to estimate the amount of salts under different geological and climatic conditions. This is the abstract of the final report for the three-year research in 2009 - 2011.

The measurements were carried out in the following 4 areas of Japan; Tsu area (at latitude around 34°N), the southern part of Okinawa Is (26°N), Miyako Is. and Ishigaki Is (24°N both). In each area, 5 spatially open points (on a roof of a building, mainly) were selected to set up the aerosol gauge developed for this study, made mainly of polypropylene. With using a Marriott tank, the gauge always had a settled height and area of surface (the internal diameter is 276 mm) of deionized distilled water, in which wet and dry aerosols with sea salts can be trapped.

In the period from Aug. in 2009 to Dec. in 2011, the amounts of Na<sup>+</sup> trapped in the gauge were in the range of 1.8~2.6, 13.9~30.7, 10.8~22.4 and 10.6~16.4 gm<sup>2</sup>year<sup>-1</sup> in Tsu, Okinawa, Miyako and Ishigaki, respectively. The ratios of Cl<sup>-</sup>/Na<sup>+</sup> in each area were 1.766, 1.774, 1.762 and 1.793, comparing to that of seawater, 1.798. The amounts of trapped K<sup>+</sup> were 0.16~0.66, 0.48~1.16, 0.59~1.36 and 0.45~1.77 gm<sup>2</sup>year<sup>-1</sup>. The maximum amount of K<sup>+</sup>, 1.77 gm<sup>2</sup>year<sup>-1</sup>, correspond to almost the half amount of K<sup>+</sup> required for annual sugarcane cultivation in Okinawa area. The amounts of trapped NO<sub>3</sub><sup>-</sup>-N and total inorganic nitrogen were 0.21~0.67 and 0.39~1.05; 0.22~0.36 and 0.34~0.80; 0.13~0.33 and 0.32~0.51; 0.16~0.37 and 0.23~0.60 gm<sup>2</sup>year<sup>-1</sup>, respectively. The amount of Na<sup>+</sup> trapped in typhoon events had high positive correlation with the maximum spontaneous wind speed at some survey points on Miyako and Ishigaki islands.