

Comparative Study on Nutrient Balance and Utilization Efficiency Between Organic and Conventional Rice and Ginger Production

Qiao, Y.H.¹, He, W.T.¹, Halberg, N.², Duan, Y.F.¹, Zhao, J.¹, & Pan, X.H.³

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Abstract

Organic farming is a more environmentally friendly farming style and a promising way to cope with the current problems in agriculture. However, there are few studies on soil nutrient management in organic systems in Asia. Nutrient balance and utilization efficiency of rice and ginger production in organic and conventional systems in Wanzai County P.R. China were studied and evaluated with hope to provide data and scientific support for the efficiency of soil nutrient utilization in organic farming system.

The results show the total N- input in organic rice was lower; the net surplus was higher because of the estimated losses from fertilizer and manure. Ginger production, both organic and conventional, shows very high level of N surplus and losses. Statistical analysis shows no significant difference for nutrient net surplus and system production efficiency in organic rice N and P ($P>0.05$). As to overall sustainability, however, the indicator (percent of input from manure) of organic rice production is significantly higher than that of conventional system ($P<0.05$). Organic and conventional ginger production shows no significant differences in all indicators ($P>0.05$)

Different levels of N surplus were shown in both organic and conventional systems, both rice and ginger production. Generally, taking all pathways of N losses into consideration, N surplus is acceptable, but should be kept under the threshold that environment can endure. A surplus rate over 20% could indicate potential threat to environment (Huan, 2002), so it is important to pay close attention to N input, especially in the case of ginger production, given its remarkably high level of N surplus. Since ginger was the first organic cash crop with good market opportunities, farmers may have given exceptionally high priority in terms of manure application to this crop.

¹ China Agricultural University, Beijing, P. R. China; e-mail: qiaoyh@cau.edu.cn

² Faculty of Agricultural Sciences, Aarhus University, Blichers Allé 20, Postboks 50, 8830 Tjele, Denmark.

³ Jiangxi Wanzai Organic Agricultural Office

However, as the market for more organic cash crops develops, the farmers should be motivated to distribute manure more evenly on the land.

P surplus rates in both systems are also higher than permissible rates (30%). Since the utilization rate of phosphorus is low, in red soil, especially on dry lands, a P surplus rate of 100% to 150% is acceptable. In conventional systems, the P surplus rate is over 200%, which is out of the reasonable range. P inputs in organic production is more reasonable, in that organic farming seeks to utilize soil available P as much as possible, and only introduces extraneous P when soil P is extremely low. While in conventional farming, large amount of P nutrient input could easily lead to P accumulation, which could result in water eutrophication. Even so, people should still be aware of the potential P accumulation in organic soil, as the trend to accumulate begins to emerge during long-term P application.