

Integrated Nutrient Management for Papyrus (*Cyperus malacensis*. Lam) Production in Nga Son district, Thanh Hoa province, Vietnam

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Papyrus is a major crop and a source of income for farmers in 23 communes of Nga Son, a coastal district in Thanh Hoa province. Farmers in these communes make a living by processing this crop into mats and other traditional products. In recent years, however, the papyrus cultivation area, as well as yield, quality and production efficiency have declined due to increasing salinity levels brought about by climate change. As a result, over 30% of the district's arable land has been affected. Moreover, drought, fresh water shortage, new pests and costly inputs, such as fertiliser and labor have contributed to the decreasing production efficiency of papyrus. Thus this study, first assessed through a survey on the main production constraints in 3 communes (Nga Thai, Nga Tien, Nga Thuy) of Nga Son. Thereafter the team tested fertiliser application rates in two treatments, and compared the soil quality and the papyrus nutrient demand. The 300 farmers represented 3 yield levels (high, average and low yields). The existing constraints in fertiliser application included:

- (1) the very low or zero use of organic fertilisers and lime;
- (2) the type of liming with CaO which is not suitable for saline soils;
- (3) the applied dose of N (400 – 500 kg ha⁻¹) which exceeds the crop demand;
- (4) the N-fertiliser is applied 3 to 4 times and the timing depends on the climate (rainy);
- (5) the soil content of available P and K was insufficient to balance the N application and the crop demand, because farmers did not apply P and K.

The field trial compared the farmer's practice (control) with the application of (1) lime as CaSO₄ and (2) mineral-organic fertiliser (treatment). For the control, 500 kgN/ha was applied 4 times. The quantity of CaSO₄ applied was calculated to raise the soil pH to nearly neutral (pH = 6,5). A total of 2000 kg ha⁻¹ mineral-organic fertilizer composed of 10%N, 5%P₂O₅, 3%K₂O and 9.5%C, was applied at tillering and elongation stages. Compared to farmers' practice, results showed that with application of fertilizer, the yield of papyrus increased by 19%, the ratio of papyrus longer than 1,75m increased by 7%. Without considering a variable interest rate for buying fertilizer on loan, the net profit increased by 32% in comparison with the current farmer's practice. Marginal benefit-cost ratio was more than doubled. This indicates that the treatment is economically viable for farmers producing papyrus.

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