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## Fertiliser Optimisation Approach to Integrate Co-Compost into Fertilisation Strategies on Large Scale Plantations

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### Abstract

The predominant commercial plantation sector in Sri Lanka seeks to reduce production costs by applying low cost fertiliser. An available and valuable source of nutrients and organic matter is dewatered compost made of faecal sludge (FS) and organic fractions of municipal solid waste (MSW). Although, recent research confirms that this bio-waste-based compost in Sri Lanka is a valuable fertiliser, its economic value remains uncertain. Therefore, a fertiliser optimisation approach has been developed and applied to optimise fertiliser requirements for a least cost combination using FS-MSW and most dominant mineral fertilisers e.g. urea, triple super phosphate (TSP), Muriate of Potash (MOP) and Dolomite, typically used as fertiliser on large-scale plantations in Sri Lanka.

The model structure shall entail (i) maximising plant nutrient supply by FS-MSW co-compost, (ii) calculating necessary mineral fertiliser additives for a least cost combination, and (iii) calculating price schemes to increase FS-MSW quantities. Further Side constraints which are incorporated in the model equations will be chemical and physical soil properties and labor costs. Calibration and validation as well as incorporating factors like effect on yields, soil structure, and economical value of waste recovery are still subject of ongoing research.

The developed optimisation approach estimated cost of fertiliser use per ha for the most dominant plantation crops (e.g. tea [*Camellia sinensis*], rubber [*Hevea brasiliensis*], coconut [*Cocos nucifera*]) cultivated in Sri Lanka. Preliminary results indicate cost differences of our FS-MSW co-compost combined with mineral nutrient additions compared to a solely mineral fertilisation, but so far it is not accounted how yields would change over several years.

In addition, the beneficial factors of increased soil organic matter, potential mitigation of soil degradation and increased resource recovery from urban waste streams have not been incorporated in the equations yet. Further development of this tool will require field tests, generation of a dataset for validation and software development to enable open access for compost plants and plantations.

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