Decentralised Wastewater Treatment Effluent Fertigation: Technical assessment

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INTRODUCTION

- Decentralised Wastewater Treatment System (DEWATS) provides onsite sanitation to residents living in informal settlements (Pillay et al., 2008).
- Treated wastewater must be disposed in an environmentally safe manner (Mateo-Sagasta et al., 2013).
- Reuse in agriculture reduces pressure on scarce fresh water resources and allow recycling of nutrients (Pedrero et al., 2010).
- Irrigation with treated wastewater must follow standard guidelines which consider technical aspects such as its management in different seasons, land and storage requirements.

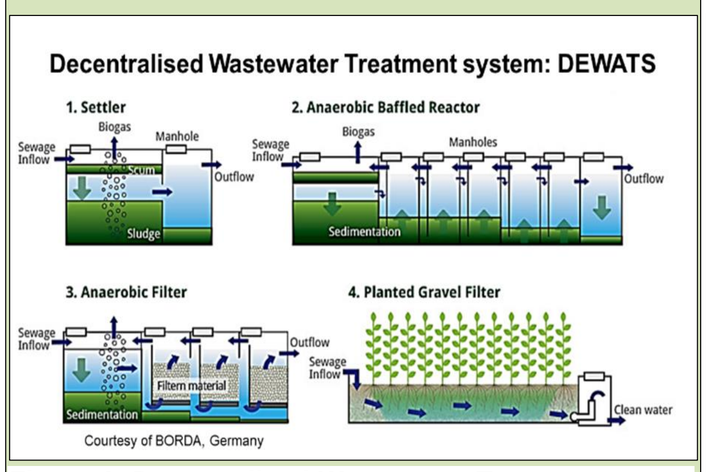

Figure 1: Decentralised Wastewater Treatment System process.

AIM

- To conduct a preliminary technical assessment of using DEWATS effluent to irrigate banana and taro.

MATERIALS AND METHODS

- Research done at Newlands Mashu Research Centre, Durban.
- Banana and taro used as test crops.
- Randomized complete block design (RCBD).
- 2 treatments: (DEWATS effluent vs tap water + fertiliser) and 3 blocks.
- Experiment conducted over 33 months.
- Drip irrigation was used.
- Data was collected on crop growth, yield and weather conditions.

Figure 2: Banana and taro in an intercrop system.

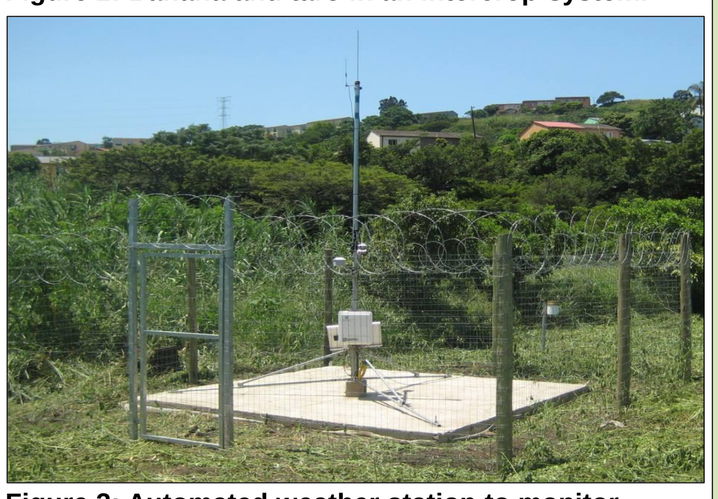

Figure 3: Automated weather station to monitor weather conditions at Newlands Mashu.

Figure 4: Campbell scientific soil reflectometers used to monitor soil moisture content.

RESULTS

- DEWATS effluent banana yield was significantly lower than tap water + fertiliser treatment ($P < 0.05$) during second year.
- Banana leaf area index growth was comparable ($P > 0.05$) between the two treatments.
- Taro yield was significantly lower ($P < 0.05$) in DEWATS effluent treatment during the second year.
- Taro leaf area index was significantly higher ($P < 0.05$) in DEWATS effluent.

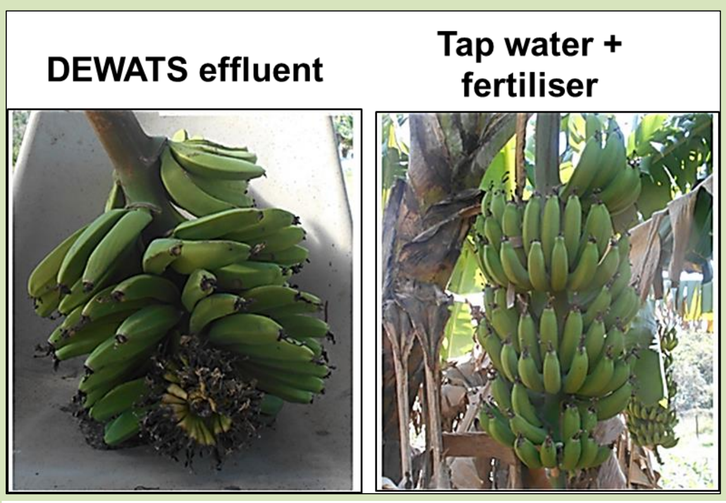

Figure 5: Banana quality between the two treatments.

- Irrigation requirements for both crops over 33 months were 3 514 mm (Figure 3).
- Surplus crop water was received in July 2015 and 2016.
- Each DEWATS requires 0.97 ha of land for banana and taro production.

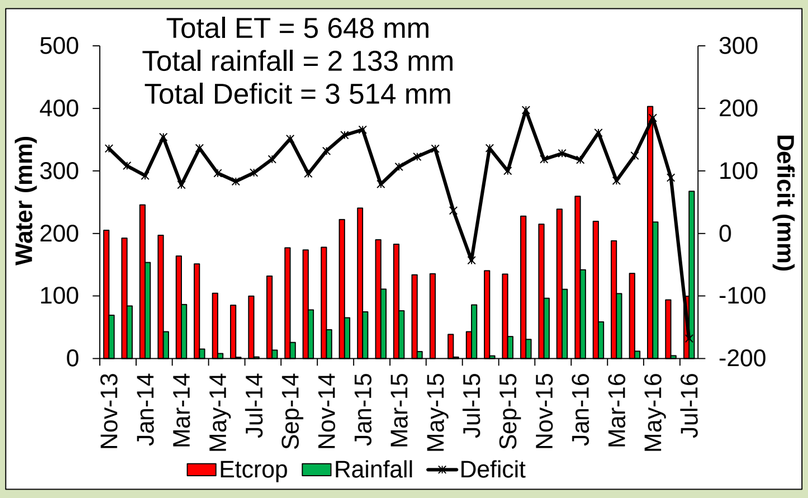

Figure 6: Water balance for banana and taro intercrop over 33 months period.

Table 1: Agricultural area requirements per each household based on annual effluent production.

ETcrop (mm)	Effluent production (m^3)	Area required (ha)	Area required (ha)	Households
Per annum		Per each DEWATS plant	Per household	
1 278	1 250	0.97	0.012	83

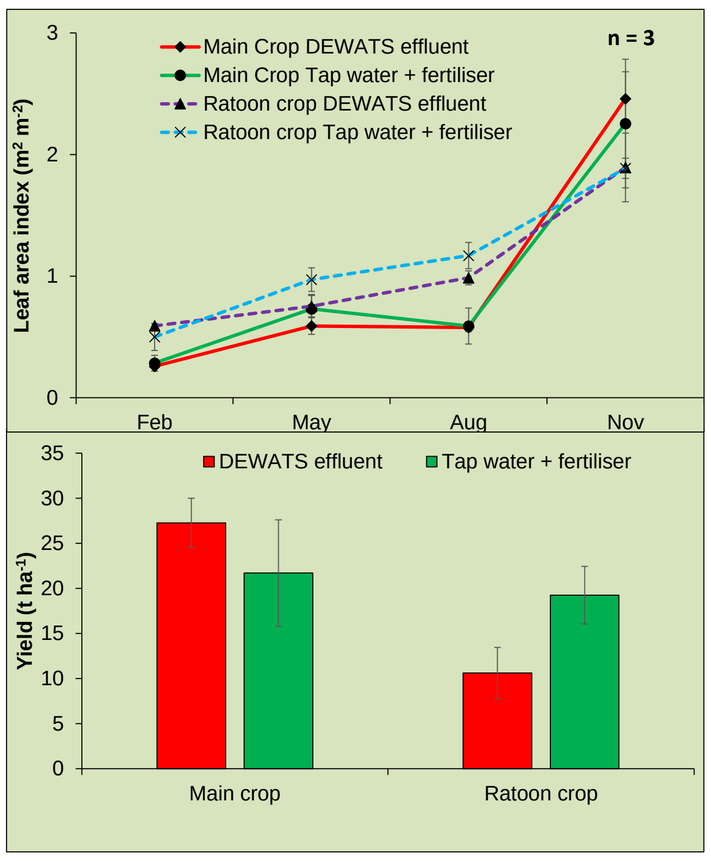

Figure 7: Banana leaf area index and yield results (mean ± SED) during the two growing seasons.

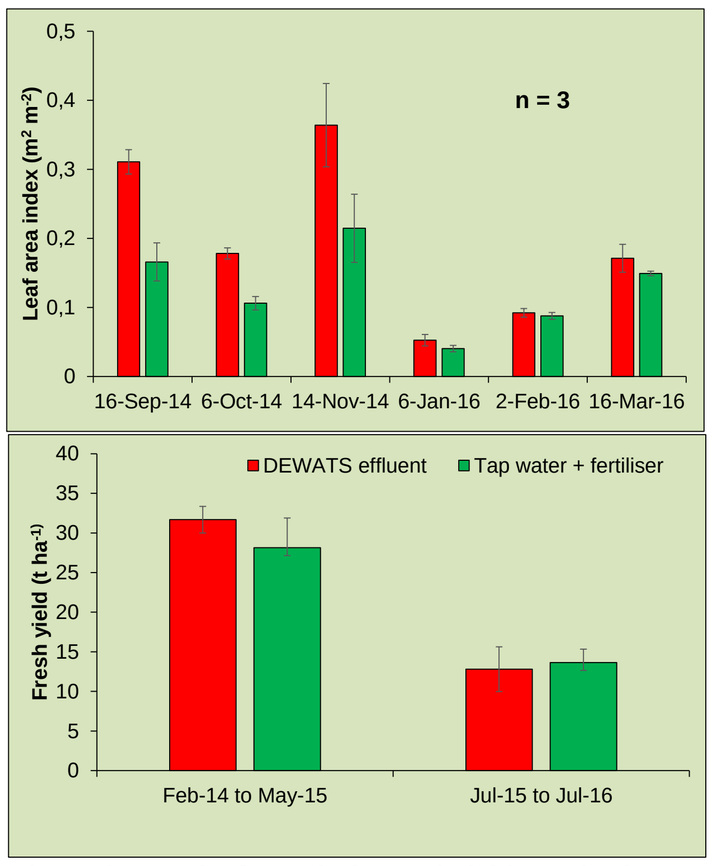

Figure 8: Taro leaf area index and yield results (mean ± SED) during the two growing seasons.

CONCLUSIONS

- DEWATS effluent is a source of water although some nutrients need to be supplemented.
- 0.012 ha per household can be reserved for growing banana and taro with DEWATS effluent at Newlands Mashu.
- Storage is required during low crop water demand period.

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