

Research Application Summary

**Effects of tied ridges for rainwater harvesting on maize yields in Swaziland**

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**Abstract**

This study assessed options for use of tied-ridges for on-farm water harvesting in Swaziland. Results showed that farmers in sandy and loamy soils need different sizes of ridges, 4 m and 2 m, respectively.

Key words: Harvesting, rain water, ridges, Swaziland

**Résumé**

Cette étude a évalué des options pour l'usage des crêtes de labour attachées pour la production de l'eau à la ferme au Swaziland. Les résultats ont montré que les agriculteurs dans les sols arénacés et glaiseux ont besoin de différentes tailles des crêtes, 4 m et 2 m, respectivement.

Mots clés: Production, eau de pluie, crêtes, Swaziland

**Background**

African economies have been declining since the 1960s. Africa is the only continent where food production per capita is less than the rate of population growth. Hunger has continued to plague the continent resulting in massive cases of acute and chronic food insecurity. Factors contributing to food insecurity have included delayed and erratic rains, and high costs of commercial fertilisers.

Attempts to address the problems of delayed and erratic rains have included the construction of huge dams, which invariably ended up being used mainly for the production of non-food crops such as sugarcane. One possible means of mitigating the adverse effects of drought on food insecurity is on-farm rainwater harvesting.

**Literature Summary**

The concept and the practice of on-farm rainwater harvesting, which is the method of inducing, collecting, storing and conserving water is not new. It has been used traditionally for several years (Boers and Ben-Asher, 1982). Some of the earliest agricultural civilizations were based on rainwater harvesting.

## Study Description

Rainwater harvesting techniques such as tied-ridges, also known as cross bars, micro-basin tillage, boxed ridges, furrow diking, damming, infiltration pits or *fanya juus* and other techniques including rainwater from roof tops, have been used successfully in the Sahel and other regions (Mutekwa and Kusangaya, 2006; Semu-Banda, 2008). Higher water infiltration rates, less soil loss and higher crop yields have been reported for sorghum, maize and other crops with tied-ridges (Edje, 2006). However, information on the use of tied-ridges for on-farm rainwater harvesting for crop production is scarce, hence the rationale for this study.

Two field trials were established at Malkerns Research Station in Swaziland, and at a farmer's field at Ntondozi in Swaziland during the 2008/2009 cropping season. There were three basic treatments: (1) maize grown on the flat; (2) maize grown on ridges, and (3) maize grown on tied-ridges with cross bars at different intervals. Rows/ridges were 8m long. Details are shown in Table 1.

All plots received 300 kg/ha of a compound fertiliser [N-P-K'2-3-2(22)] at planting and additional 200 kg/ha of limestone ammonium nitrate (28%N). Both were applied using localized spot application method. Data collected included yield components, yield and farmer's assessment of rainwater harvesting technology using coins to quantify their preferences.

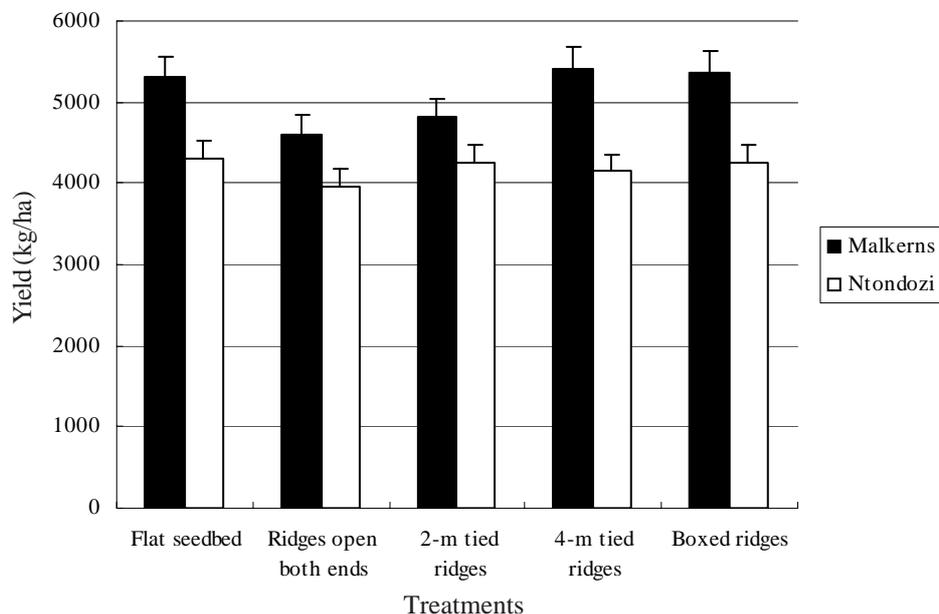
**Table 1. Treatment code and description for both sites.**

Treatment code	Treatment description
1	Maize grown on flat; no ridges
2	Maize grown on ridges, which have no cross bars at both ends of the ridge
3	Maize grown on tied-ridges, with cross bars at 2-m intervals to capture rainwater
4	Maize grown on tied-ridges, with cross bars at 4-m intervals to capture rainwater
5	Maize grown on ridges, with cross bars at the end of 8-m ridge to capture rainwater

## Research Application

The highest seed at Malkerns Research Station (MRS) and Ntondozi were 5405 kg/ha from 4-m tied ridges, and 3694 kg/ha from 2-m ridges, respectively. (Fig. 1). Seed yields differed significantly ( $P < 0.01$ ) between sites. Mean seed yields for Malkerns Research Station and Ntondozi were 5096 and 3283, kg/ha, respectively. Loamy soils at MRS required cross bars at longer intervals than the sandy loam soil at Ntondozi.

Following a light refreshment after the assessment, farmers had an opportunity to discuss their preferences (Fig. 2). Majority of



**Figure 1. Maize seed yield (kg/ha) of five rainwater harvesting treatments at Malkerns Research Station and at Ntondozi on a farmer’s field in Swaziland.**



ng rainwater



**Figure 3. Farmer’s quantification of their preferences for rainwater harvesting technology using coins.**

the farmers preferred boxed ridges to the other types of rainwater harvesting techniques that were evaluated ( Fig. 3). Choice was based on several factors including labour and the availability of “soft” maize seed for frying produced from treatments on boxed ridges.

### Recommendation

Farmers who use loamy and sandy loam soils and with similar circumstances as were on MRS and Ntondozi should use 4-m and 2-m ridges, respectively.

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