

**Gender roles in soil fertility and water management for maize (*Zea mays* L.) production in urban agriculture: A case for Harare, Zimbabwe**

Nyamasoka, B.<sup>1</sup>, Nyamugafata, P.<sup>1</sup>, Madyiwa, S.<sup>1</sup> & Nyamangara, J.<sup>2</sup>

<sup>1</sup>Department of Soil Science and Agricultural Engineering, University of Zimbabwe,  
P. O. Box MP167, Mt Pleasant, Harare, Zimbabwe

<sup>2</sup>International Crops Research Institute for the Semi-Arid Tropics, Matopos Research Station,  
P. O. Box 776, Bulawayo, Zimbabwe

**Corresponding author:** bnyamasoka@agric.uz.ac.zw; beemadhuv@gmail.com

**Abstract**

A survey of 205 farmers in Harare and Chitungwiza, Zimbabwe was conducted to characterise soil fertility and water management practices used by urban farmers to produce maize and to determine the influence of gender on their use. Results showed that women (62.4%) dominated men (37.6%) in urban farming activities. Farmers used a combination of either poultry manure, sewage sludge or cattle manure with mineral fertilisers and attained an average maize grain yield of 1.5 t/ha, or sole application of mineral fertilisers that achieved an average maize grain yield of 1.1 t/ha. More women used organic fertilisers than men, but they applied lower rates leading to lower yields. More women than men used ridges and furrows, raised beds and mulching as water management practices but only use of ridges and furrows was significantly correlated with gender ( $p < 0.05$ ,  $r = -0.16$ ). Farming activities in Harare and Chitungwiza are influenced by gender hence training and financial support should be targeted to women.

**Key words:** Gender, Harare soil fertility practices, urban agriculture

**Résumé**

Une enquête sur 205 agriculteurs de Harare et Chitungwiza, au Zimbabwe, a été réalisée pour caractériser la fertilité des sols et les pratiques de gestion de l'eau utilisées par les agriculteurs urbains pour produire du maïs et déterminer l'influence du genre sur leur utilisation. Les résultats ont montré que les femmes (62,4%) ont dominé les hommes (37,6%) dans les activités agricoles urbaines. Les agriculteurs ont utilisé une combinaison soit de fumier de volaille, les vidanges d'épuration ou le fumier de bétail avec des engrais minéraux et ont atteint un rendement moyen en grain du maïs de 1,5 t / ha, soit seule l'application des engrais minéraux qui a réalisé un rendement moyen en grain du maïs de 1,1 t / ha. Plus de femmes ont utilisé des engrais organiques que les hommes, mais elles ont appliqué

des taux plus bas menant aux rendements plus bas. Plus de femmes que d'hommes ont utilisé des crêtes et des sillons, des lits surélevés et le paillage comme pratiques de gestion de l'eau, mais seulement l'utilisation de crêtes et de sillons était significativement corrélée avec le genre ( $p < 0,05$ ,  $r = -0,16$ ). Les activités agricoles à Harare et Chitungwiza sont influencées par le genre; ainsi, la formation et le soutien financier devraient être orientés vers les femmes.

Mots clés: Genre, pratiques de fertilité du sol d'Harare, agriculture urbaine

## Background

Urban crop and livestock production are part of the food security system in most countries in sub-Saharan Africa (Mudimu *et al.*, 1998). In Harare and Chitungwiza, however, poor soil fertility due to the soils' inherent deficiency in nutrients (Nyamangara *et al.*, 2000) and rainfall unreliability and mid-season droughts have resulted in crop failure especially on sandy soils. These conditions have prompted urban farmers in Harare and Chitungwiza to use practices that are suitable to the changing bio-physical and socio-economic environment. Such practices include use of organic fertilisers to compliment use of inorganic fertilisers which are expensive. Water management techniques such as ridges and furrows, pot holing and mulching have been used to manage water. Although many qualitative studies have been carried out on urban agriculture in Zimbabwe, there has been no research done to identify the effects of the agronomic practices commonly used in soil fertility and water management on maize yield and the influence of gender.

## Literature Summary

According to Wilbers (2004), if food poverty is to be reduced, then it is important to ask who produces the food, who has access to the technology and knowledge to produce it, and who has the purchasing power to acquire it. This makes it important to study gender roles as men and women have a diversity of reasons for engaging in agricultural activities. The fact that women are less likely to benefit from research or extension services that fail to consider gender-specific differences regarding methods of plant production, crop species and use of compost, manure and fertiliser also plays a role (Wilbers, 2004). Animal manure (poultry, pig and cattle manure in particular) is commonly applied to fertilise maize and vegetables and it is an important source of N,P, and potassium (K) needs of most crops because greater than 25% of the manures' N,P and K contents are in forms readily available for crop uptake (Copperland, 2002).

Water management practices are critical to manage water since most of the crop production is rain fed. One such practice is mulching with straw or stover which are important for soil water retention and maintaining soil temperature regimes (Sarkar *et al.*, 2007). Ridges and furrows are also used to retain water in the field hence sustaining crop growth when mid-season droughts occur (Critchley, 1991).

### **Study Description**

A survey was conducted where structured questionnaires were administered to 205 farmers (137 in Chitungwiza and 68 in Harare to account for differences in soil type). Key questions covered aspects on crop production systems and gender responsibilities in soil fertility and water management activities. The responses from the questionnaires were post coded and analysed using the Statistical Package for Social Sciences (SPSS version 16). Descriptive statistics and correlation analysis were also done.

### **Research Application**

Most farming activities such as land preparation, planting and fertiliser application were done mostly by women who dominated urban agriculture in Harare and Chitungwiza (62,4%) over men (37,6%). Over 90% of female farmers were not formally employed as compared to 25% of their male counterparts and hence women carried out most of the farming activities while male farmers were at work.

At the two study sites, farmers used a combination of poultry manure, domestic sewage sludge, cattle manure and mineral fertilisers. Mineral fertilisers were however used below the recommended 120 kg N /ha application rate for intensive maize production. Use of mineral fertilisers and animal manures was not significantly correlated with gender, but the application rate of mineral fertiliser and domestic sewage sludge used was significantly correlated with gender ( $p < 0.05$ ,  $r = 0.14$ ) and ( $p < 0.05$ ,  $r = -0.14$ ) respectively. More men than women applied mineral fertiliser. Although more women than men used animal manure as organic amendments in Chitungwiza, women were associated with lower application rates (Fig. 1a). However the application rates for the organic resources was too low (Fig. 1b) to significantly increase crop productivity. Only a fraction of the nutrients contained in organic matter are mineralised in the first year, the balance is released in the second and third years. Therefore combined application of organic and inorganic nutrient sources, in adequate amounts, is a viable strategy to

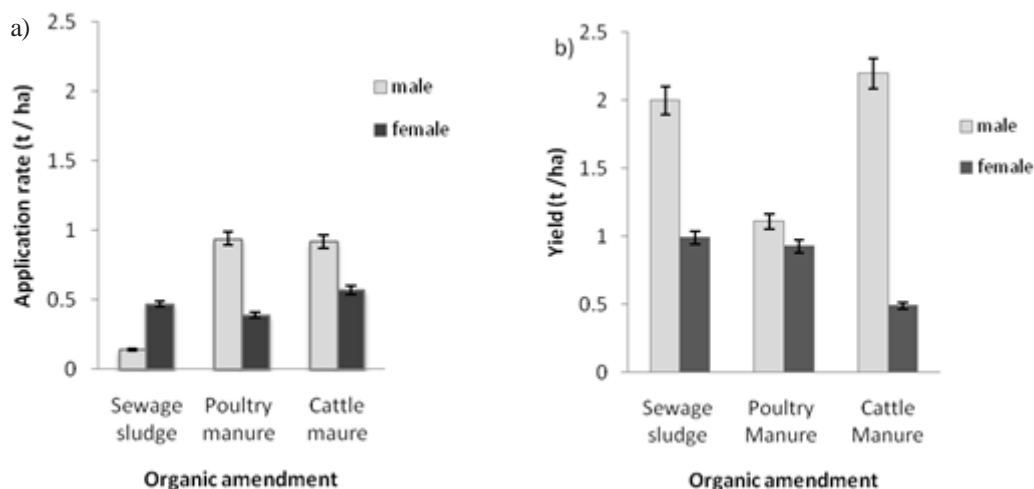


Figure 1. Manure application rates (a) by gender and (b) and maize grain yield attained in Harare and Chitungwiza (Error bars represent standard error of means).

enable high productivity on the small pieces of land cultivated by the majority of the farmers.

Farmers in the two study sites used at least one practice for managing soil water. The most common practices were pre-plant ridges and furrows which are constructed in such a manner that maize is planted on the ridge, and then the stover is ploughed into the furrow after harvest and covered up to make a ridge thus shifting the position of the ridge in the following season. Ridges and furrows can result in increased yields by not only conserving soil moisture but also by reducing nutrient loss due to erosion and increasing plant rooting depth (Critchely, 1991). Even though more women than men used these water management technologies only the use of ridges and furrows was significantly correlated with gender ( $p < 0.05$ ,  $r = -0.16$ )

In sandy soils, use of water management practices significantly improved maize yield and was much higher for men than women farmers. Maize yield was significantly higher where water management practices were used because rainwater collects in the furrows and can be available in times of low rainfall (Ibraimo and Munguambe, 2007). In clay soils, however, use of water management practices depressed maize yield for both male and female farmers.

## Conclusions and Recommendations

Farmers in Harare and Chitungwiza applied sub-optimal fertiliser application rates and this resulted in low yields. The use of fertility

inputs was gendered with more women than men using the organic manures and men using the relatively more expensive but more effective mineral fertiliser. The use of water management practices was also gendered and were practiced by more women than men, but positive yield responses were only recorded on sandy soils. There is need to train the urban farmers on efficient use of nutrient inputs (organic and inorganic) and water management technologies, with a special focus on female farmers.

## References

- Critchley, W. 1991. Looking after our land. New approaches for soil and water conservation in dryland Africa. Oxfam Publication, 274 Banbury Road, Oxford, UK, 1991. 8-17.
- Ibraimo, N and Munguambe, P. 2007. 'Rainwater Harvesting Technologies for Small Scale Rainfed Agriculture in Arid and Semi-arid Areas'. Report on the Limpopo Basin (Project CP 17). Waternet.
- Nyamangara, J., Mugwira, L.M. and Mpfu, S.E. 2000. Soil Fertility Status in the Communal Areas of Zimbabwe in relation to sustainable crop production. *Journal of Sustainable Agriculture* 16 (2):24.
- Mudimu, G.D. 1998. Urban agriculture activities and women's strategies in sustaining family livelihoods in Harare, Zimbabwe. *Singapore Journal of Tropical Geography* 17(2):179-194.
- Wilbers, J. 2004. Urban agriculture and gender: Some key issues. Unpublished Discussion Paper 1, RUAF: Leusden, Netherlands.
- Sarkar, S., Paramanick, M. and Goswami, S.B. 2007. Soil temperature, water use and yield of yellow sarson (*Brassica napus* L. var. *glauca*) in relation to tillage intensity and mulch management under rainfed lowland ecosystem in eastern India. *Soil. Till. Res.*, 93:94-101.
- Yi. Liu., Yufang, Shen. , Shenjiao, Yang., Shiqing, Li. and Fang, Chen. 2011. Effect of mulch and irrigation practices on soil water, soil temperature and the grain yield of maize (*Zea mays* L.) in Loess Plateau, China. *African Journal of Agricultural Research* 6:2175-2182,