by Kouyaté *et al*. (2012) who found that sorghum grown under *zai* pits (planting pits) increased sorghum growth. Higher grain and stover yields may also be as a result of amendments which improved soil fertility status of the soil. Planting pits increased water availability in the root zone (Fatondji *et al*., 2006) and amendments had positive significant effect on soil fertility (Patel *et al*., 2013). The use of planting pits was found to increase sorghum yields (Fatondji *et al*., 2000), increase cowpeas yields in South Africa (Ncube *et al*., 2008) and increase maize yields in Rwanda (Mudatenguha *et al*., 2014). Wedum *et al*. (1996) in Mali found that planting pits with cattle manure increased sorghum yields and these results concurred with results obtained from this experiment. Tied ridges increased sorghum grain yields with amendments and these results concurred with results by Kouyaté *et al*. (2012) who found that tied ridges increased sorghum grain yields. Miriti *et al.* (2007) in Kenya also reported that tied ridges integrated with nutrient management increased crop production compared to conventional tillage with amendments. In another study by Magombeyi and Taigbenu (2008) planting pits (chololo pits) results in higher yields compared to the use of conventional tillage as a technique. According to Kathuli and Itabari (2015) planting pits with no amendments increased sorghum grain yields than conventional tillage with no amendments and this coincides with the results of this experiment.

An increase in grain and stover yield was recorded where sorghum was grown in treatments with cattle manure and mineral fertiliser combination showed an increase in sorghum yields. These results coincides with report done by Patel *et al*. (2013) who highlighted that this combination showed high stover and grain yields compared to treatments without amendments. This finding was consistent with the report of Fatondji (2002) that total grain and stover yield increased with the use of planting pits and tied ridges compared to the use of conventional tillage. Increased grain and stover yield increased in treatments were cattle manure and mineral fertiliser were added due to reduced surface runoff, increased infiltration and soil nutrient availability (Nyamadzawo *et al*., 2013), improved soil structure and soil moisture storage (Mudatenguha *et al*., 2014). This increased crop growth leading to increased grain and stover yields.

Conclusion

Planting pits with cattle manure had the highest grain yield followed by tied ridges with cattle manure. Stover yield was highest in planting pits treated with 60mkg N ha^{-1} and was least from conventional tillage with no amendment. Rainwater harvesting of planting pits integrated with soil fertility management of cattle manure was the best techniques and it can be easily adopted by poor resources farmers so that they increase their yields. If managed well planting pits treatments are the best soil and water conservation option to increase grain yield as compared to tied ridges and conventional tillage. Planting pits can be done even if the soil is dry so as to allow limited labour costs to smallholder farmers. Conventional tillage treatments had the least grain yield compared to planting pits and tied ridges.

Recommendations

Cattle manure and mineral fertiliser are reliable to enhance soil fertility and increase sorghum grain and stover yields. Planting pits are the best way of conserving soil moisture in semi-arid and arid environments where water is a priority compared to conventional tillage and tied ridges. To enhance sorghum grain yields both planting pits and tied ridges can be used as well as conventional tillage when the farmer have limited labour to dig planting pits and construct tied ridges.

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