

Integrated small-scale water harvesting for food security in Niger, preliminary results

Wildemeersch J.¹, Cornelis W.M.¹, Sabiou M.² and Garba M.²

¹*Dept. Soil Management, UNESCO Chair on Eremology, Ghent University, Belgium*

²*Dep. Natural Resource Management, Institut National de Recherche Agronomique du Niger*

ABSTRACT:

As a result of a growing population pressure and limited fertile land availability, Nigerien farmers increasingly rely on marginal lands for their food production. These severely degraded lands, however, generally provide a poor millet yield due to their low soil nutrient content and imbalanced partitioning of water in the rootzone. This study compares several small-scale water harvesting techniques (i.e. zaï, demi-lunes, no-till with scarification, manure and control treatment) which tackle these two major crop growth limitations by integrating water, nutrient and farm management. Preliminary results from the first cropping season from June to October 2011 show overall low yields. The 2011 season was characterised by erratic rainfall with a severe dry spell during flowering stage. Rainfall during the growing season was moreover 490 mm, which is below the long-term average of 550 mm. Both the control and manure treatment did not result in any grain yield, but simply applying manure did increase dry matter production with a factor of 20. The highest grain yield was produced by the zaï, 134 kg/ha, which was 3 and 9 times better than respectively the grain yield of demi-lunes and no-till with scarification treatments. The zaï treatment moreover reduced cumulative evaporation as measured using mini-lysimeters during a 10 day drying cycle from 6.6 mm and 7.3 mm to 8 mm in case of respectively demi-lunes and the other treatments. Evaporation was reduced in the furrow of the no-till with scarification treatment, whereas evaporation inside the demi-lunes and the zaï-pits was greater than outside the catchment, which can be explained by the self mulching behaviour of the crusted soil. In conclusion, up until now the synergistic effect of the water-harvesting practices and the supply of manure show promising potential to rehabilitate and to increase the agronomic efficiency of marginal land in Niger. Future work will focus on the impact of the treatments on yield, physical, chemical and biological soil quality properties and on the rootzone water balance considering the partitioning of rainfall into surface runoff, evaporation, transpiration, drainage and storage of water in the rootzone.