Optimizing rainwater-use in Cape Verde through alternative land management technologies: Preliminary research results from "Ribeira Seca" watershed, Cape Verde

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Introduction

Food production in Cape Verde dryland areas is severely hampered by erratic rainfall patterns, high intensity storm events, water losses through rapid runoff, deep percolation and low soil fertility, resulting in poor rainwater use efficiencies (RWUE) and low crop yields. In spite of past investment in soil and water conservation, crop yields remain low. It is, therefore, crucial to explore innovative land management technologies that integrate soil fertility, efficiency of rainwater-use and increase dryland crop productivity. There is a wide range of land management techniques available to improve RWUE in dryland farming systems (Stroosnijder, 2009; WOCAT, 2007), but need to be tested in each specific condition and take into consideration farmers' perception and participation. This research **aims** to evaluate the efficacy of selected land management techniques in Cape Verdean drylands to increase RWUE and crop yield, combining traditional and scientific knowledge in a field based participatory approach.

Figure 2:Aspects of trial sites

Method

- Literature review to select potential land management techniques
- Stakeholders workshop to discuss and select techniques
- Experimental design: Completely Randomized Design; 3 replications; 4 collaborative field trials (1 on-station and 3 on-farms), in Ribeira Seca (Fig.1 and 2)
- Experimental units: 44 m^2 field plots
- **Treatments/scenarios**: **T1** = control (standard farmers practice); **T2** = organic nutrient source (4 t/ha compost or animal manure) + soil surfactant (1mL/m^2); **T3** = organic nutrient source (1t/ha green manure, compost or animal manure) + pigeon pea barrier; **T4** = crop residue mulching at 4 t/ha) + organic nutrient source (4 t/ha)
- Crops: local maize variety and 2 bean types
- Instruments: rain gauges, TDR, data logger with moisture sensor
- Parameters: rainfall amount and intensity, soil moisture, amount of runoff and suspended sediment, maize and bean yield

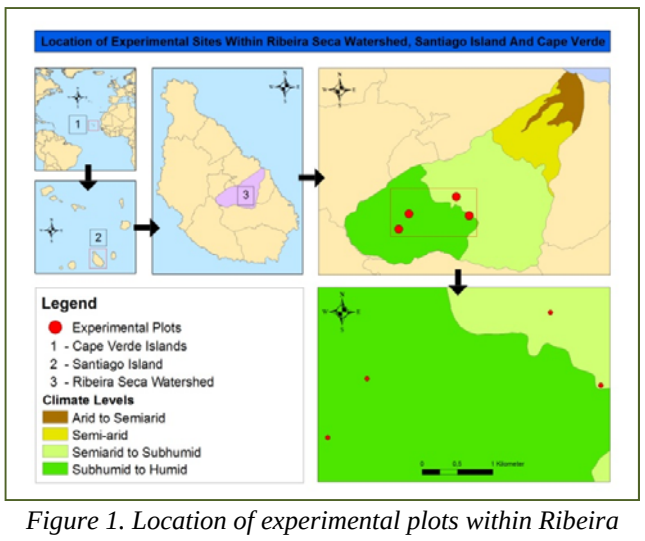

Figure 1. Location of experimental plots within Ribeira Seca, Santiago and Cape Verde

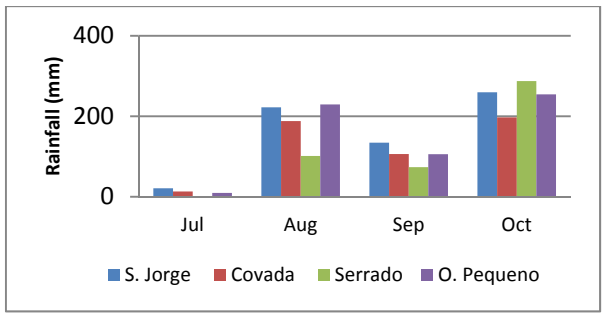

Figure 3: Rainfall distribution during growing season

Table 1: Characteristics of experimental sites

Site	Soil texture	Slope (%)	OM content (%)	K cm/day	Rainfall 2011 (mm)
S. Jorge	loam	8	2.46	7.34	655
Covoada	loam	11	1.63	41.56	504
Serrado	sandy loam	35	1.10	95.04	462
O. Peq.	silt loam	23	1.55	45.79	599

Table 2: Effect of treatments on runoff (l/m^2), suspended sediment (g/m^2), and maize grain yield (kg/ha) in each experimental sites for 2011 rainy season

Treatments*	S. Jorge			Covoada			Serrado			O. Pequenos		
	Runoff	Sediment	Maize yield	Runoff	Sediment	Maize yield	Runoff	Sediment	Maize yield	Runoff	Sediment	Maize yield
T1 (control)	0.79 a	2.04 a	289 a	0.98 a	1.41a	462 a	1.61a	40.13 a	1818 a	2.10 a	235.42 a	856 a
T2	0.42 b	0.58 b	444 b	0.71a	0.42b	1288 b	1.34 a	13.74 b	1469 a	1.78 a	72.21 b	924 a
T3	0.34 b	1.18 c	305 a	0.62 a	1.73a	598 a	1.33 a	22.12 c	1545 a	1.89 a	94.46 b	833 a
T4	0.10 c	0.27 d	542 b	0.15 b	0.03c	955 b	0.35 b	11.41b	2083 a	0.95 b	6.32 c	606 a

*Treatment means followed by same letters are not significantly different at 0.05 level

Conclusion

- ✓ Amounts of runoff and sediment yield were influenced by steepness of slope and rainfall amount per event
- ✓ A combination of residue cover (mulching) with an organic nutrient source (compost, animal manure or green manure) contributes for significant reduction of runoff and soil loss from agricultural dryland fields in the watershed, thus, improving RWUE
- ✓ Application of soil surfactant seems to have positive effect on crop yield depending on specific soil conditions (i.e. texture)
- ✓ Effect of treatments on maize yield is not conclusive for first year results of experiments due to uncontrolled external factors such as poorly distributed rainfall, during growing season and damage by rodents

References

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