

Rainwater harvesting and conservation practices: Challenges and opportunities for sustainable land and water use of “The Green Village” in arid to semi-arid climate zones

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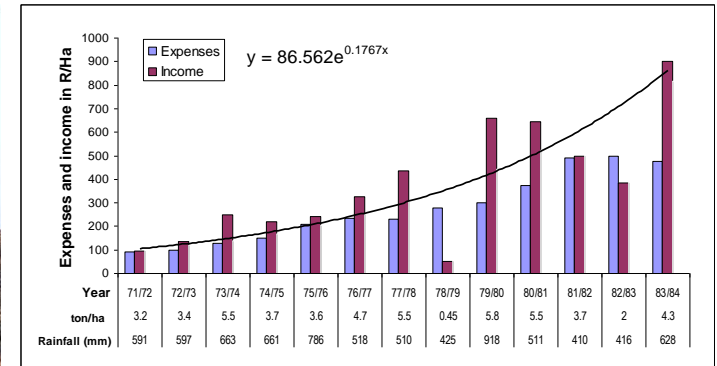
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LOCAL SOLUTIONS - GLOBAL IMPACT

Tillage practices

Tillage practices

❑ Conventional



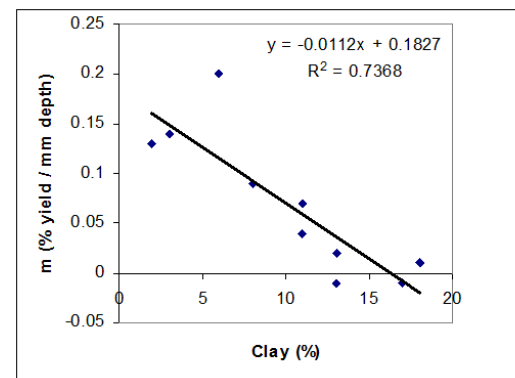
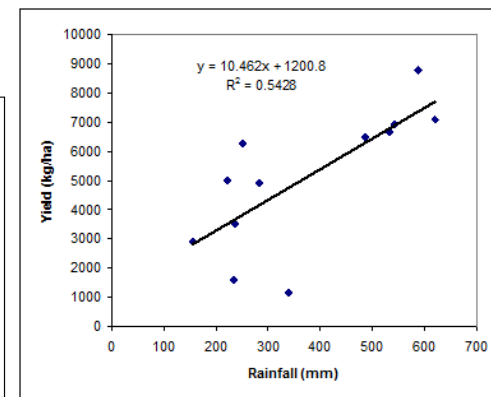
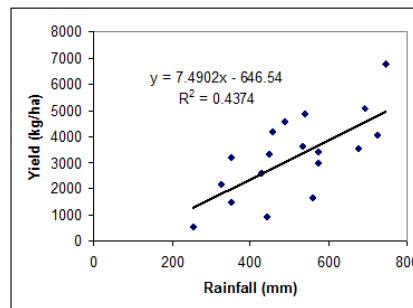
❑ Conservation

- Minimum Tillage
- Stubble mulch
- Zero tillage



Tillage practices: 1980-2000

Author	Locality	Ym (kg ha ⁻¹)	Number of Seasons
Snyman (1985)	Viljoenskroon	6933-8775	2
	Sannieshof	4063-5160	3
	Delareyville + Coligny	3680-4557	2
Van der Merwe (1993)	Sandvet	2595-4948	3
Du Plessis (1991)	Bloemfontein	1580-1770	4
	Bloemfontein	1190-3690	4
	Bloemfontein	320-3640	4
Burger (1982)	Wesselsbron	6273-7082	4
Snyman (1988)	Lichtenburg	690-6756	6



McPhee and Smithen (1985)

% Runoff = 47.9 – 0.44 (% mulch cover)

Tillage practices: 1980-2000



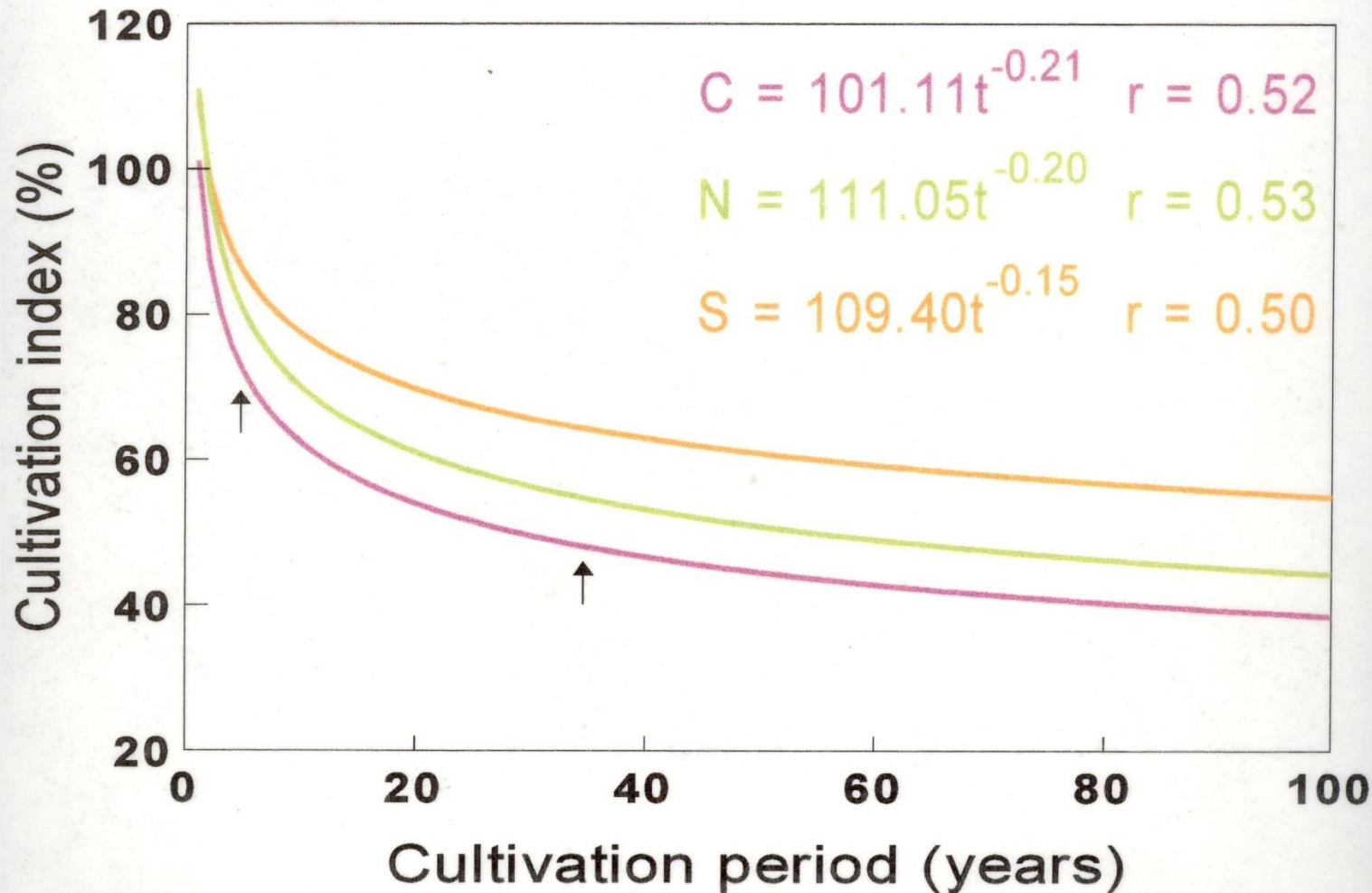
❑ Scientific contributions

- Bennie, A.T.P., Hoffman, J.E., Coetzee, M.J. & Vrey, H.S., 1994. Storage and utilization of rain water in soils for stabilizing crop production in semi-arid areas [Afr]. [Report No 227/1/94. Water Research Commission](#), Pretoria, South Africa.
- Bennie, A.T.P., Strydom, M.G. & Vrey, H.S., 1998. The application of computer models for agricultural water management on ecotope level [Afr]. [Report No. 625/1/98. Water Research Commission](#), Pretoria, South Africa.
- Bennie, A.T.P. & Hensley, M., 2001. Maximizing precipitation utilization in dryland agriculture in South Africa – a review. [Journal of Hydrology 241, 124-139.](#)

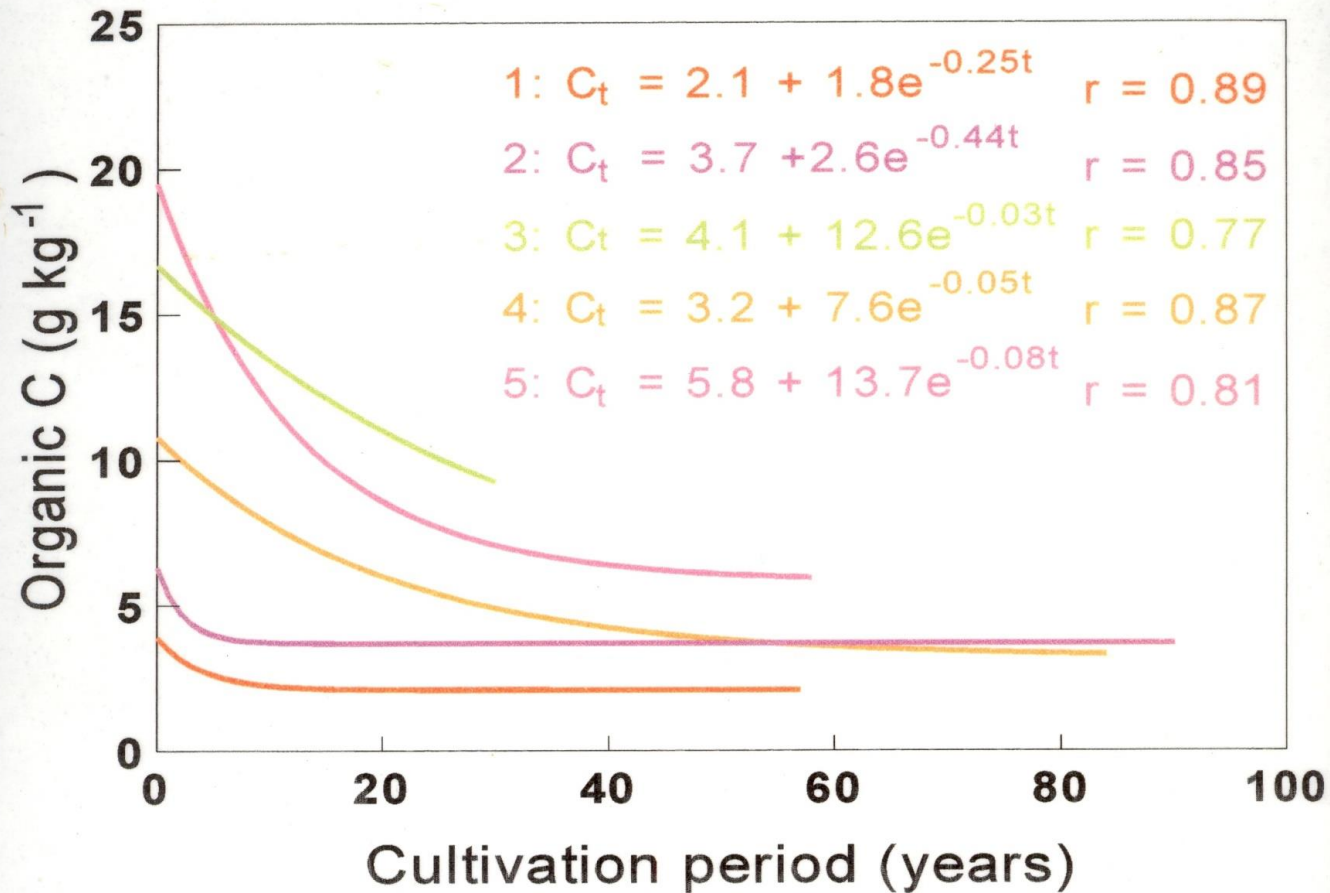
❑ Output: [SWAMP model \(UFS-WRC\)](#)

❑ Impact: [Sustainable decisions on selection of best tillage practices based on soil physical and agronomical principles](#)

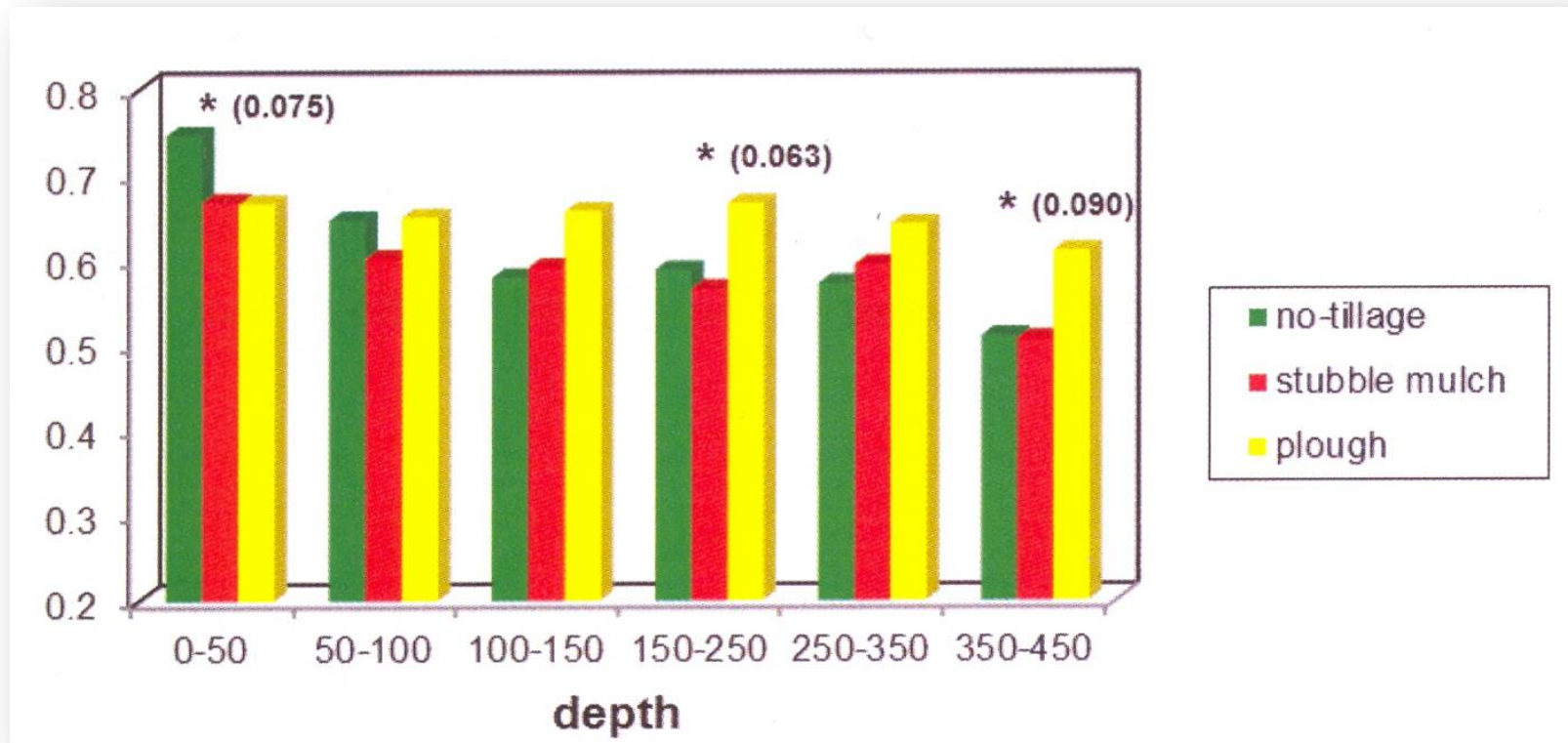
Relative soil C loss (du Preez et al., 2011)



Soil C loss from agro-ecosystems (du Preez et al., 2011)



Soil C (%) vs tillage practices (32 yrs) [Loke et al., 2012]



Wheat yield (Mg ha⁻¹)) [Loke et al., 2012]



Period	No-till	Mulch	Plough
1979-2010	2.11	2.19	2.28
1979-1990	2.04	2.07	2.16
1991-2000	1.85	1.90	2.02
2001-2010	2.33	2.29	2.46

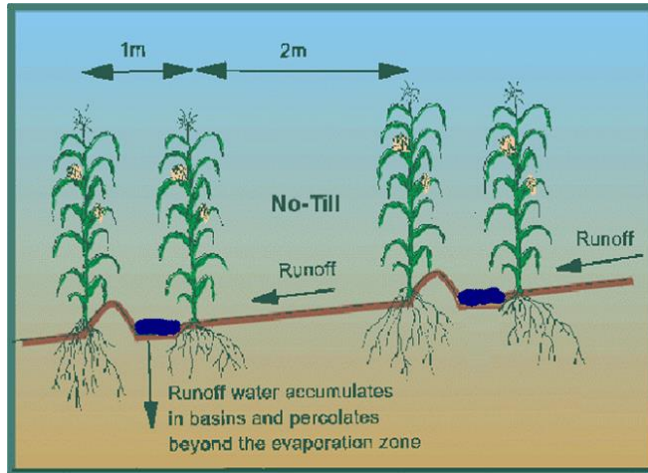
Tillage practices: After 2000

- ❑ Conventional
- ❑ Conservation
 - Minimum Tillage
 - Stubble
 - Zero tillage
 - **Rainwater harvesting**



HENSLEY, M., BOTHA, J.J. ANDERSON, J.J., VAN STADEN, P.P. & DU TOIT, A., 2000. Optimizing rainfall use efficiency for developing farmers with limited access to irrigation water. **Report No. 878/1/00. Water Research Commission**, Pretoria, South Africa.

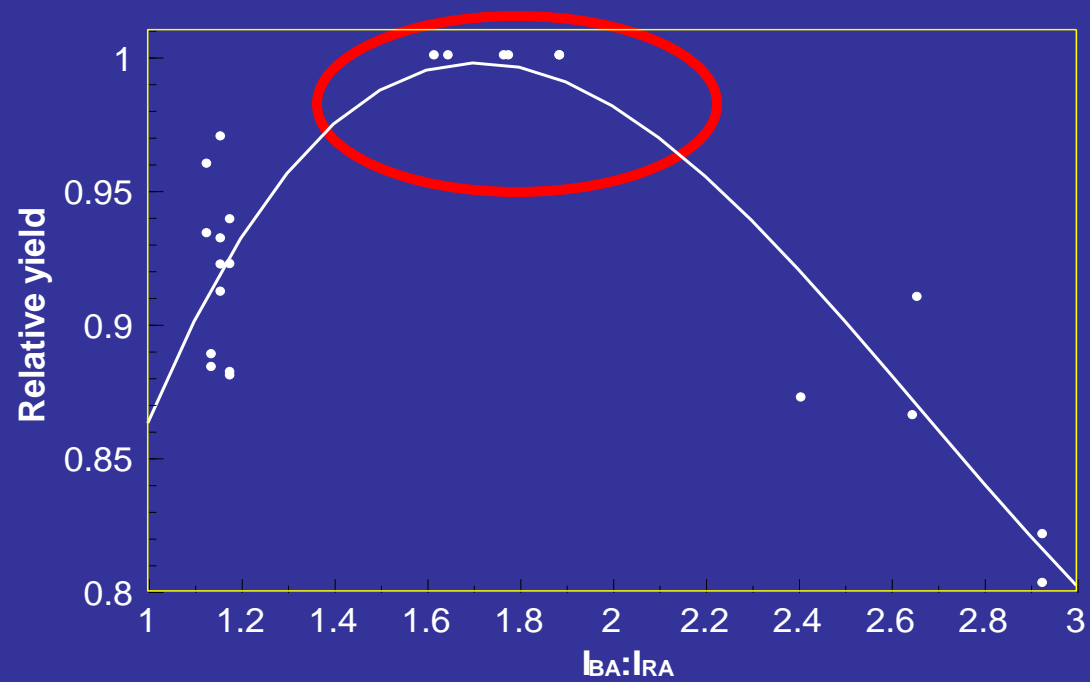
In-field rainwater harvesting: Bio-physical



In-field rainwater harvesting: Mulching

Botha JJ, Van Rensburg LD, Anderson JJ, Hensley M, Macheli MS, Van Staden PP, Kundhlande G, Groenewald DG, Baiphethi MN. 2003. *Water conservation techniques on small plots in semi-arid areas to enhance rainfall use efficiency, food security, and sustainable crop production*. Water Research Commission, Report no 1176/1/03, Pretoria, South Africa.





IRWH: Technology exchange



In-field rainwater harvesting: Socio-economic

Kundhlande G, Groenewald DG, Baiphethi MN, Viljoen MF, Botha JJ, van Rensburg LD, Anderson JJ. 2004. Socio-economic study on water conservation techniques in semi-arid areas. Water Research Commission, Report no 1267/1/04, Pretoria, South Africa.



IRWH-upscaling (van Rensburg et al., 2012)



- ❑ Number of WRC
- ❑ Universities
- ❑ Capacity building
- ❑ Society
- ❑ International



Conclusion: Forgotten green village

