The influence of high stocking density followed by rest on grass density and soil moisture in the Camelthorn Savanna

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This study made use of the opportunity
provided by three innovative farmers w
apply short duration grazing

Strategic trampling
(followed by rest)

Converts standing dry grass to mulch, which cools and feeds soil microbes

Strategic trampling
(followed by rest)

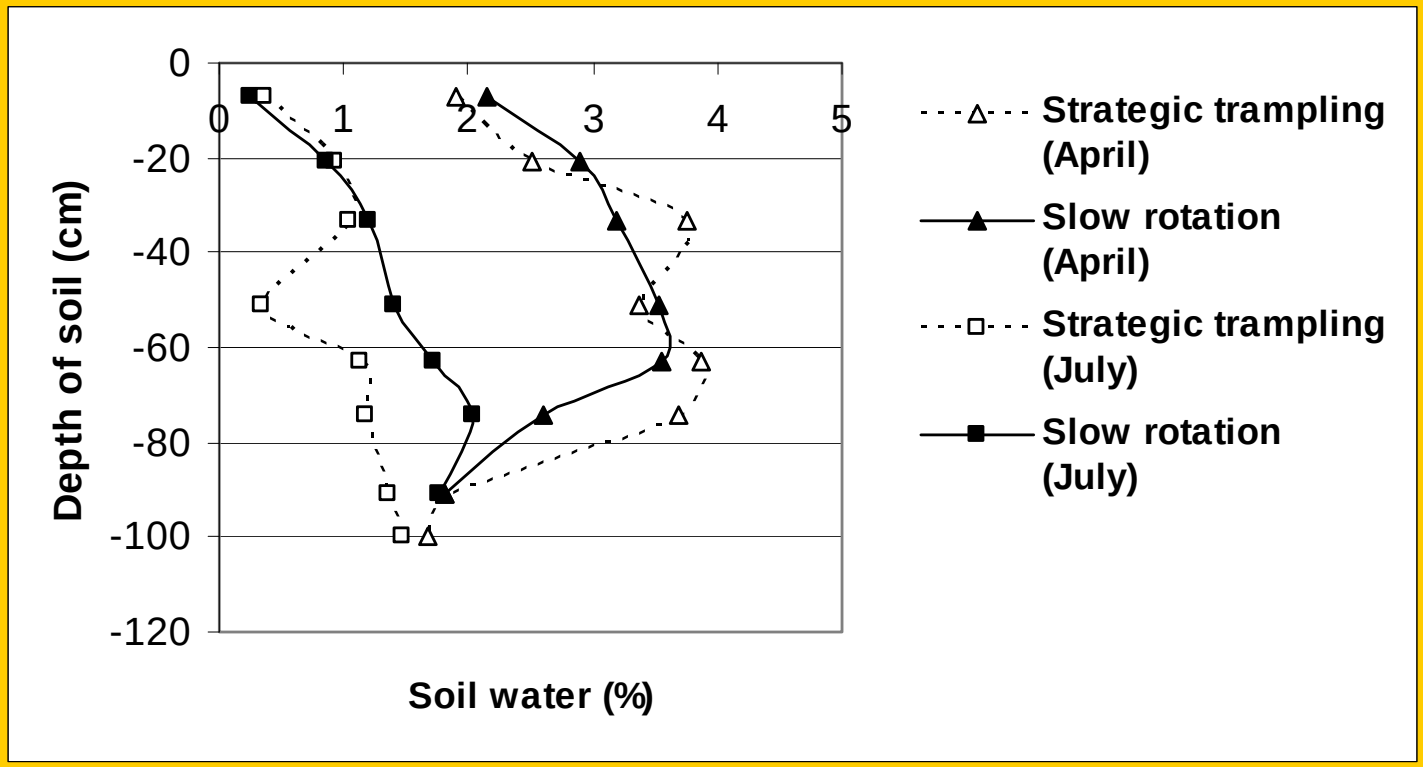
Captures leaves and seeds, and later rain water, in hoof marks

… facilitating emergence of seedlings

Strategic trampling
(followed by rest)

Burying of seeds may increase grass density

Strategic trampling
(followed by rest)



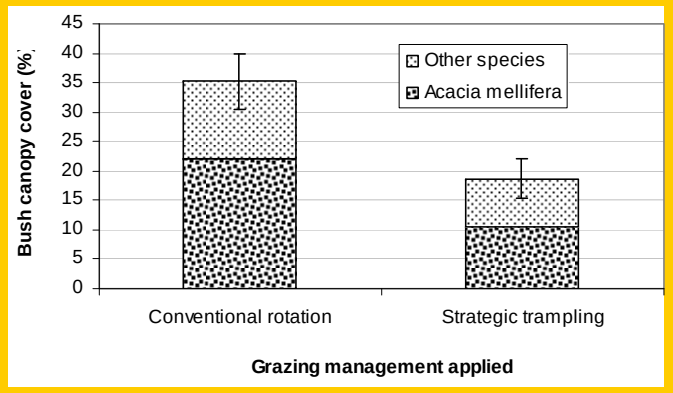
May improve infiltration and reduce evaporation

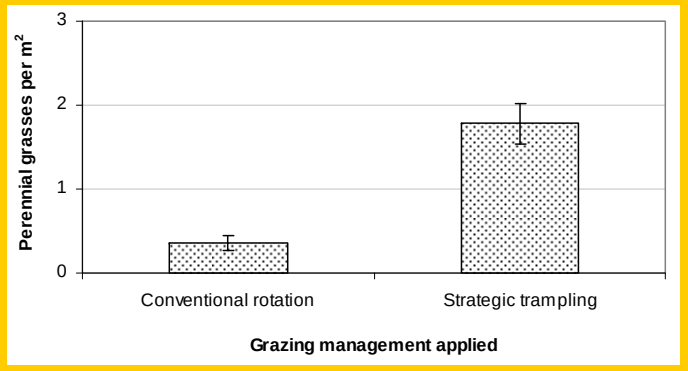
Contrast between two farms

Cattle stocked at 33 kg ha^{-1} a^{-1} and following slow rotation with four paddocks per herd

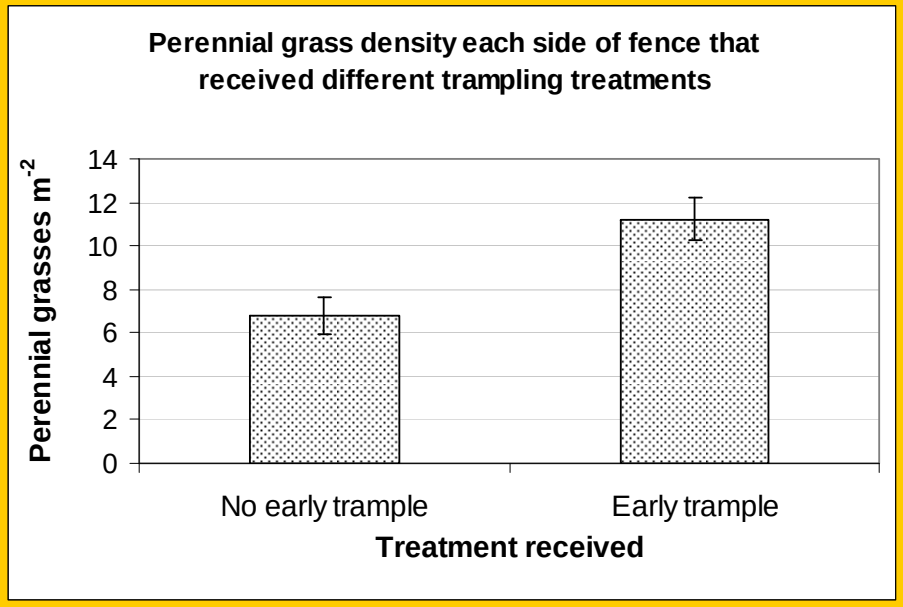
Cattle and small stock at 67 kg ha^{-1} a^{-1} strategically concentrated to provide quick trampling after rain

Strategic trampling





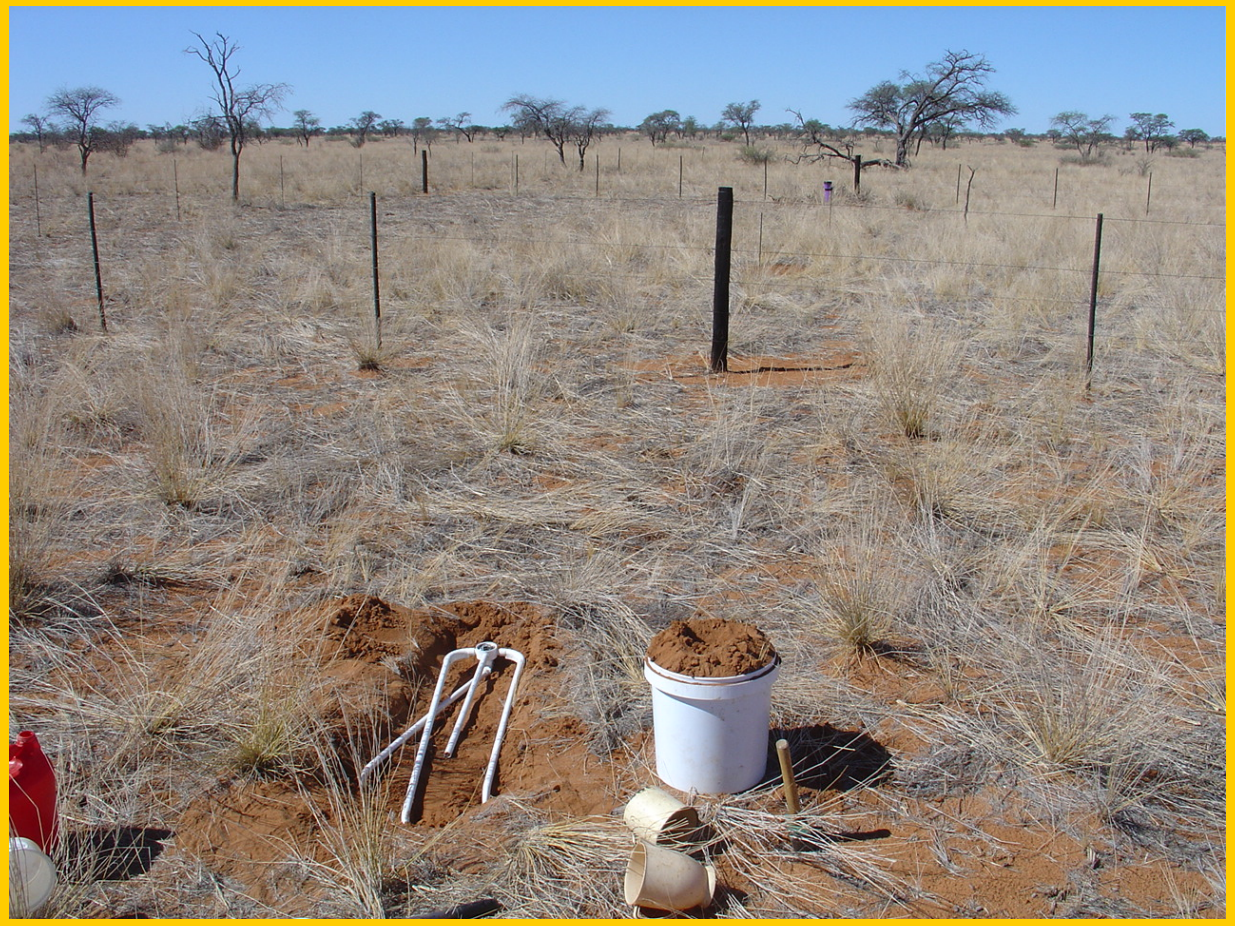
Short trampling in early growing season



High density of young *Stipagrostis uniplumis*

… at another fenceline contrast

Five exclosures on each of 3 farms

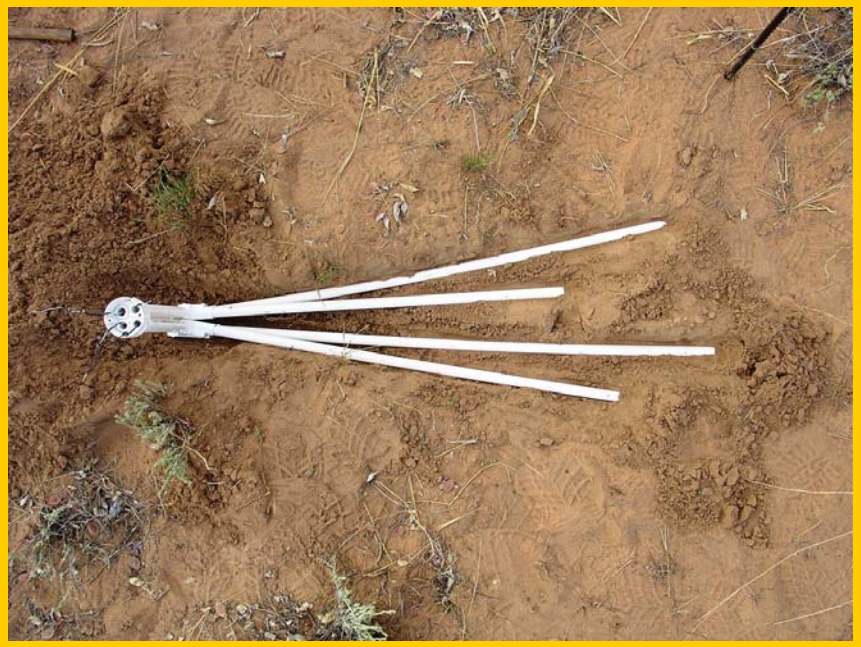


Farmer measures soil moisture both in and outside the exclosures, and records animals stocked

Gypsum blocks to determine available soil moisture

Holes were augured at 10, 25, 50 & 80cm

Gypsum blocks were lowered in each hole and soil was replaced

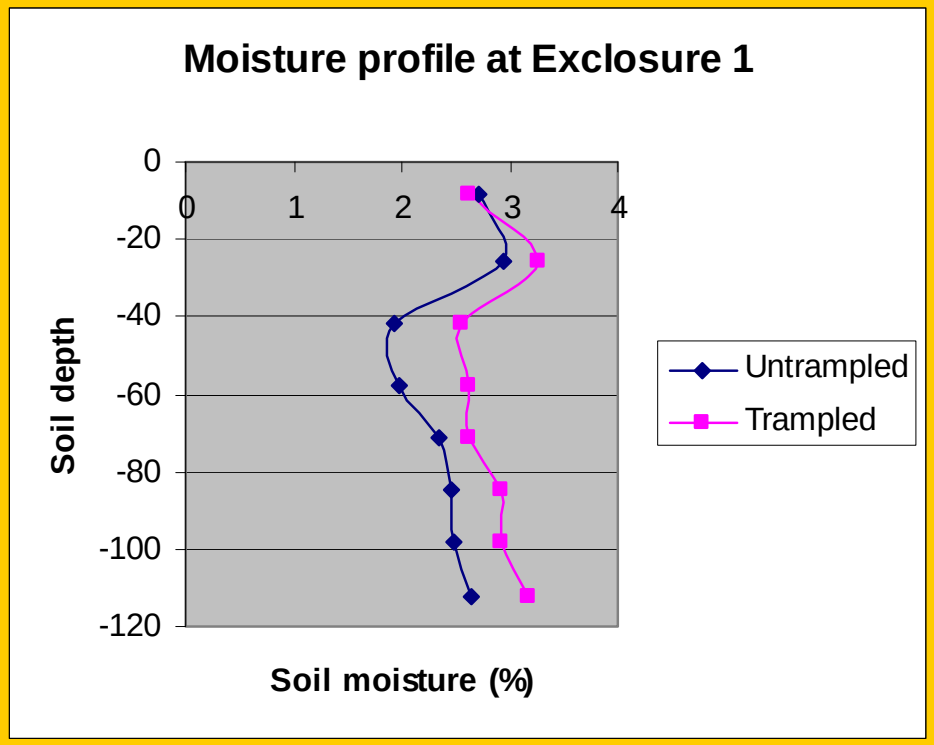


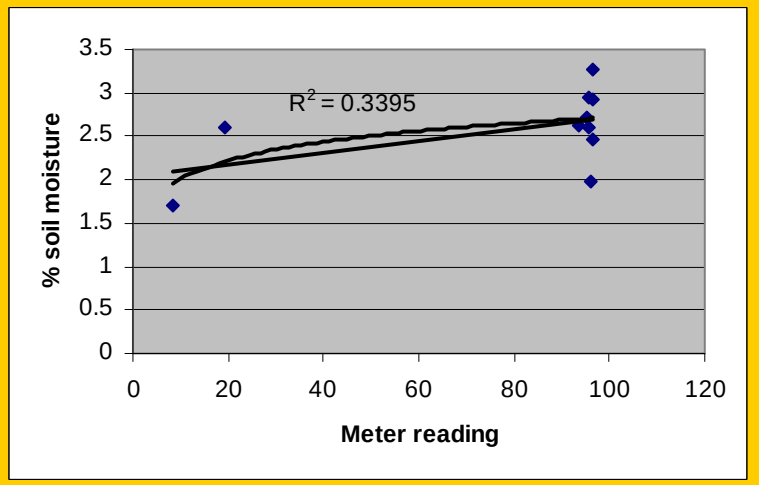
Wires connected to gypsum blocks were protected by conduit piping

An electronic meter is used to measure soil moisture at each depth

Gravametrical soil moisture

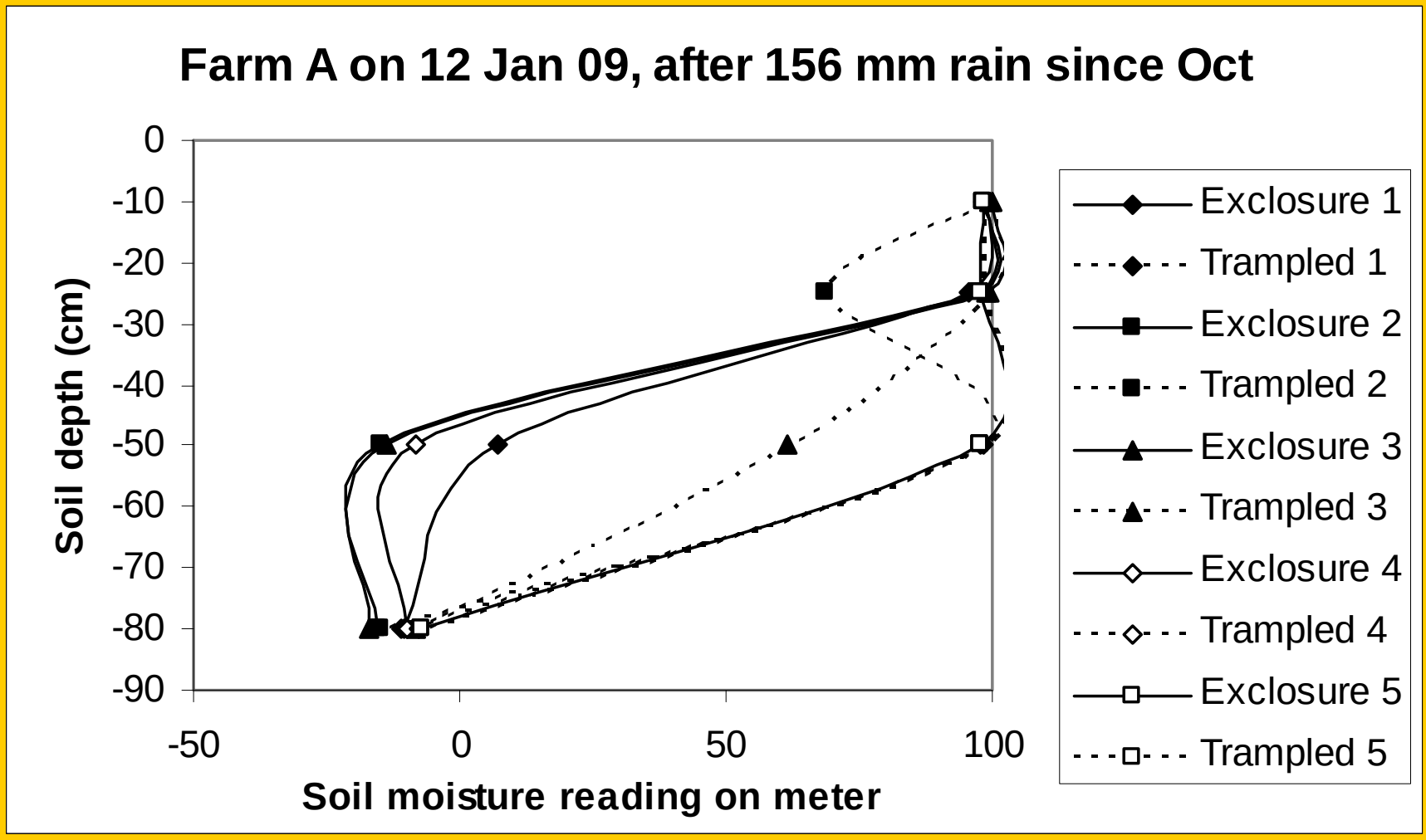
…. related to electronic meter readings



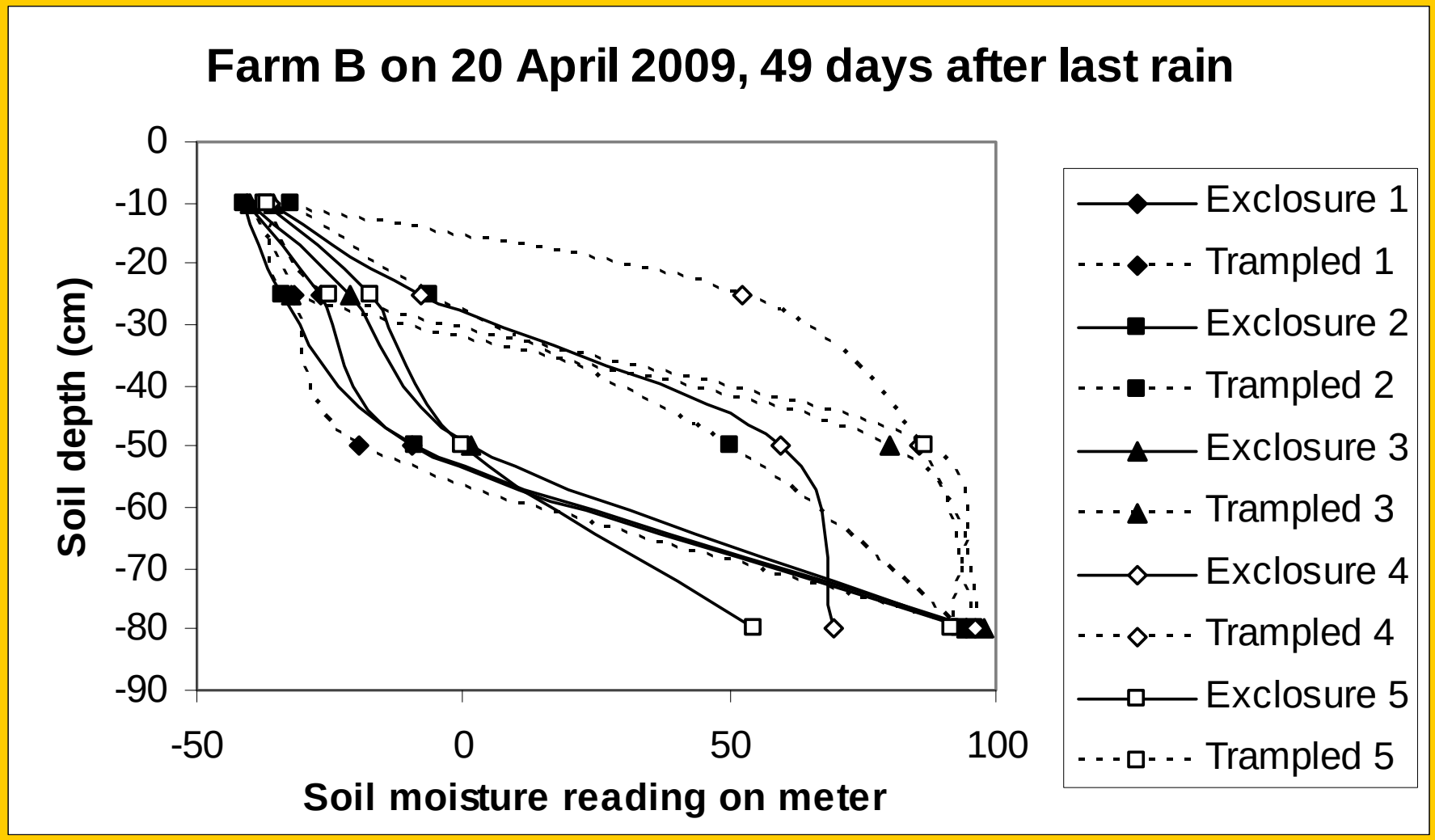


Some characteristics of the three farms where the trampling study was undertaken

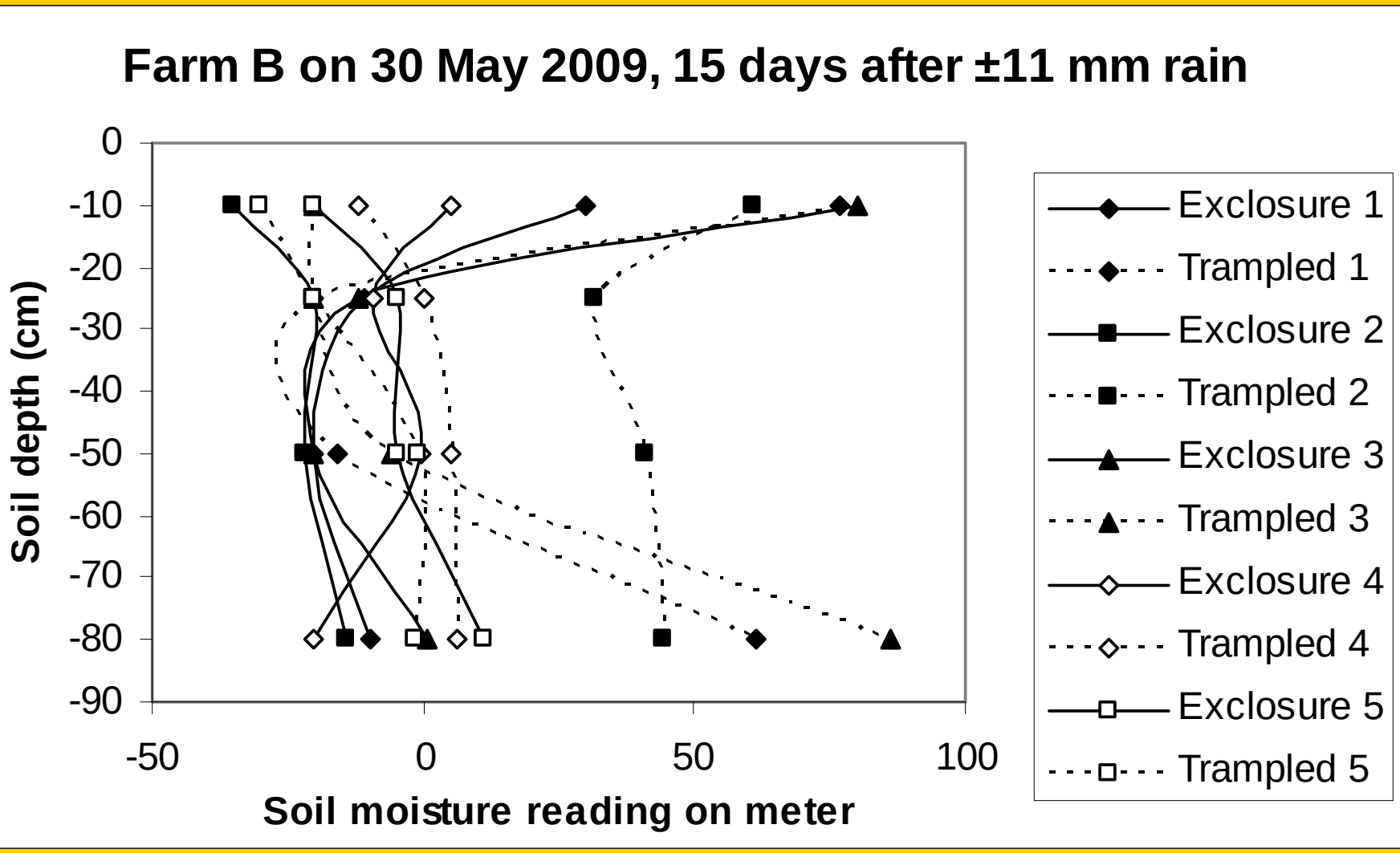
Characteristic ↓	Farm A	Farm B	Farm C
Mean annual rainfall (mm)	380	280	250
Median % clay in soil	2	4	6
Dominant species of bush or tree	*Terminalia sericea*	*Acacia erioloba*	*Acacia mellifera*
Median stocking density (kg liveweight ha^{-1})	3 300	480	330
Median length of grazing period (days)	2	6	14
Median grazing periods per year	2	3	4
Overall stocking rate (kg liveweight ha^{-1} a^{-1})	30	24	24



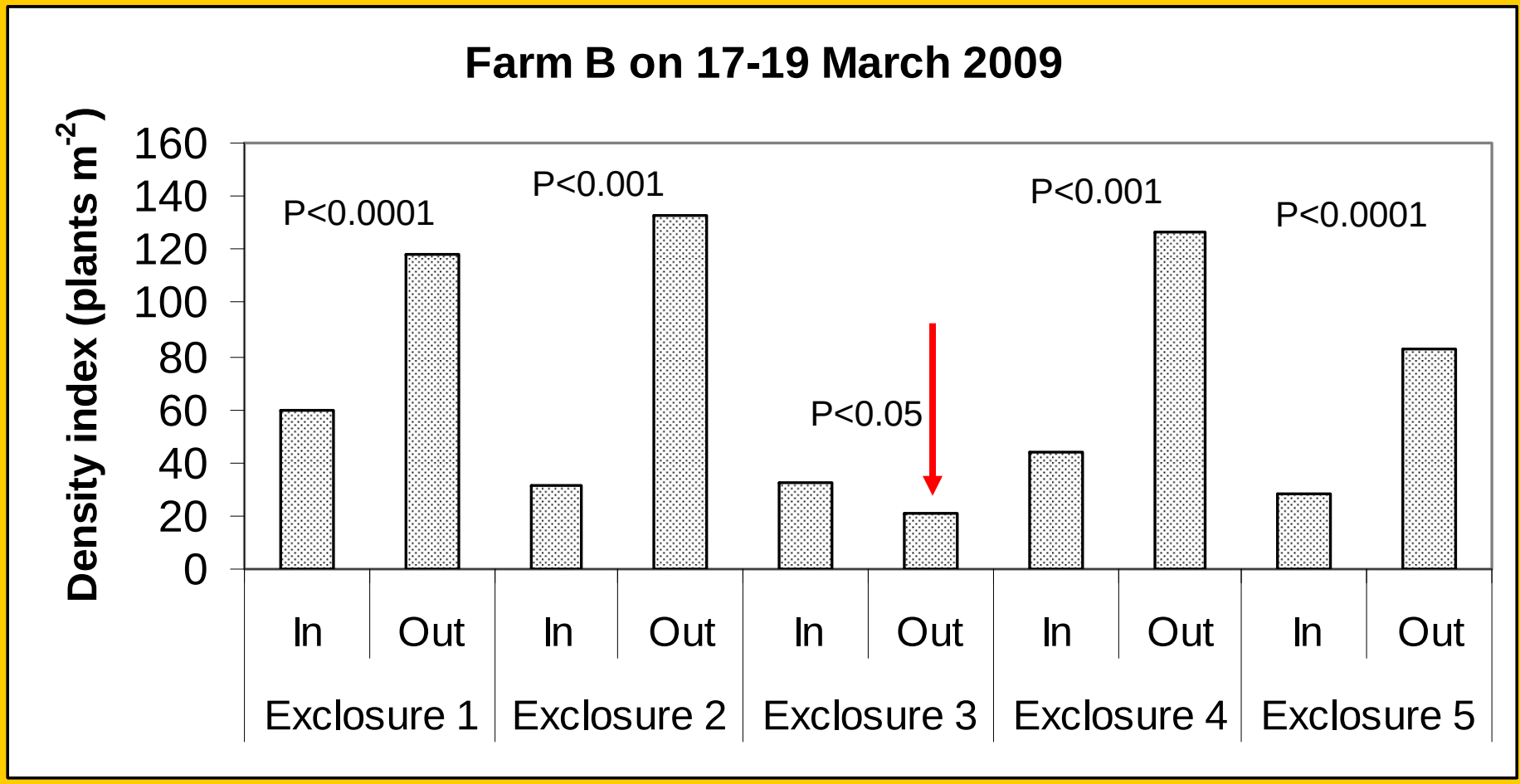
Soil moisture profiles in and outside exclosures. Moisture reached 50 cm at all trampled sites but in only one of the five exclosures.



Soil moisture profiles in and outside exclosures. Moisture at 50 cm depth remained higher at four of the five trampled sites than in the exclosures.

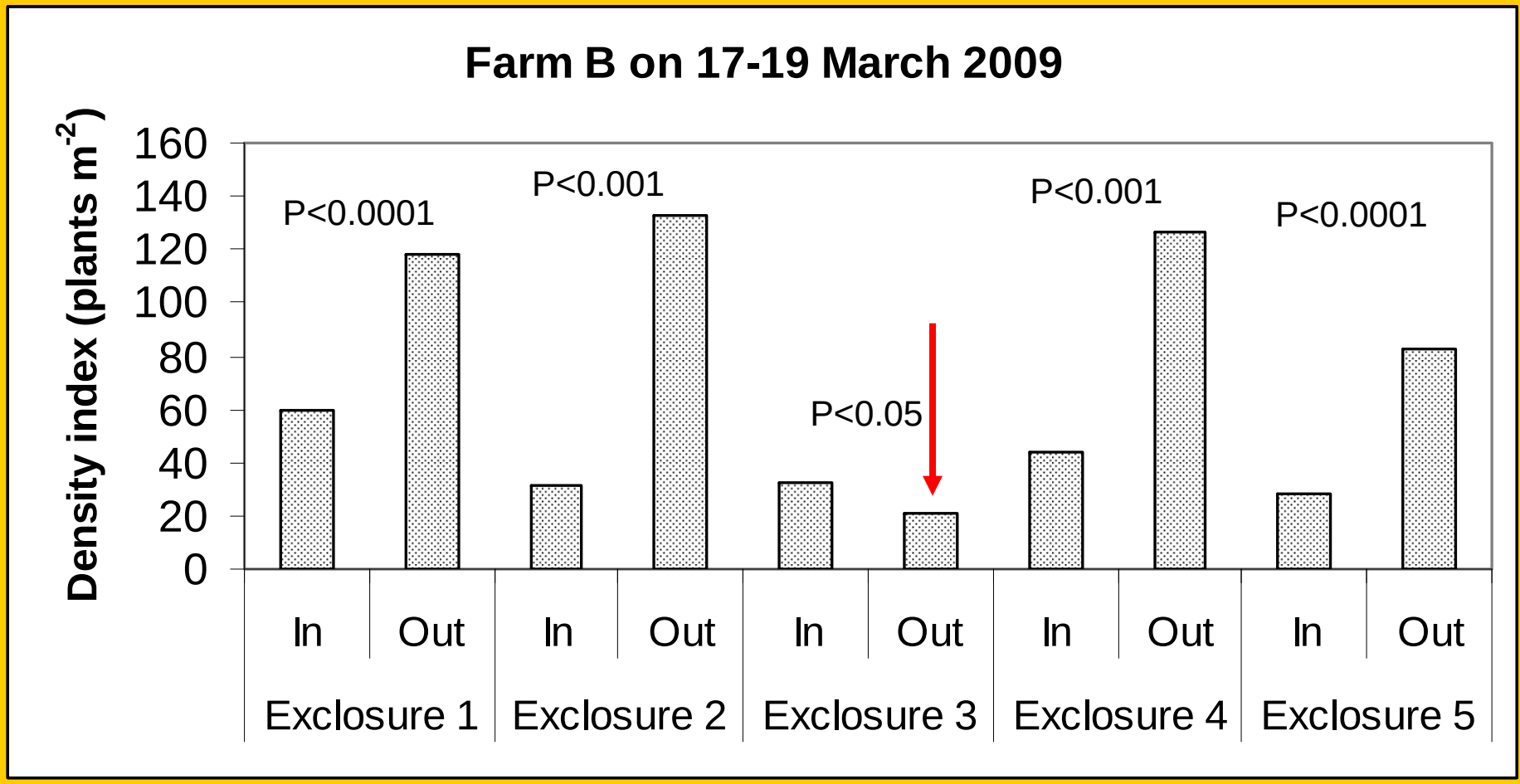


Soil moisture profiles in and outside exclosures. Moisture at 80 cm depth remained higher at four of the five trampled sites than in the exclosures.

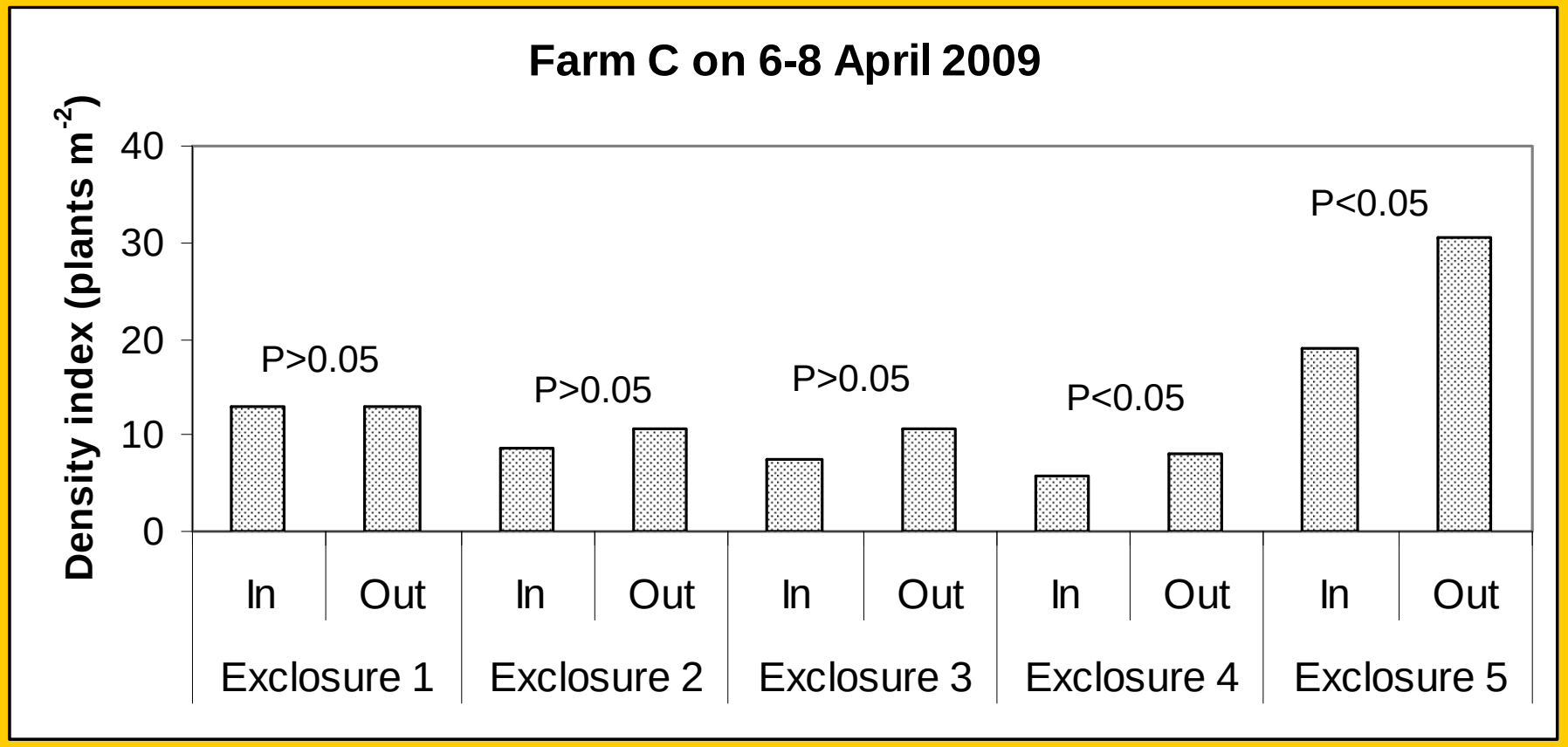


Density indices of plants – mostly annual grasses – recorded near the end of the growing season in and outside exclosures at Farm B

A high density of grass seedlings on the trampled side (left) of Exclosure 3 in Dec 08.



Density indices of plants – mostly annual grasses – recorded near the end of the growing season in and outside exclosures at Farm B



Density indices of plants – mostly annual grasses – recorded near the end of the growing season in and outside exclosures at Farm C

CONCLUSIONS

- Soil moisture measurements only hint at higher infiltration and less evaporation on trampled sites.
- A higher density of annual grasses on trampled sites probably sucks more moisture out of the soil.
- The tool of trampling may achieve rangeland management objectives under certain circumstances and if followed by sufficient rest in the growing season.

Observation of farmer	Farmer's explanation	Management application
Trampling on soil low in organic matter results in abundance of the weed *Tribulus terrestris* and encourages establishment of bush seedlings, while trampling on soil with sufficient organic matter results in abundance of grass after rain.	Soil low in organic matter gets hotter than soil with sufficient organic matter. Grass seed cannot survive or germinate successfully in hot soil, while *Tribulus terrestris* and bush species.	Only apply intensive trampling where the soil organic matter content is high or where there is abundant standing dry grass to trample down into the mulch layer.

Observation of farmer	Farmer's explanation	Management application
Trampling on sandy soil in the dry season does not increase subsequent perennial grass density, while trampling it in the growing season does, if followed by rest.	Trampling in the dry season loosens the soil around grass roots, so that they become desiccated or uprooted. When soil is moist, it is not loosened so easily and hoof marks remain fairly firm.	Only apply trampling to sandy soil in the growing season (if soil organic content is sufficient).

Observation of farmer	Farmer's explanation	Management application
Trampling on loamy soil with low organic matter when it is moist, causes hardening of the soil.	Moist loamy soil cannot resist trampling pressure and becomes compacted. When hard and dry, it resists compaction.	Reduce the stocking rate on loamy soil in the growing season.

Observation of farmer	Farmer's explanation	Management application
Trampling before rain on loamy soil improves water infiltration and establishment of grass seedlings.	Trampling causes hoof marks that encourage seeds and mulch to settle into them before rain and hold water during rain.	Apply brief trampling before rain to capture more rain water, seeds and mulch.

Observation of farmer	Farmer's explanation	Management application
Trampling after rain on soil with sufficient organic matter conserves the water already in the soil. If low in organic matter, the loosened soil dries out fast.	Trampling breaks the capillary connections in the soil surface, thus reducing capillary rise of water after evaporation of soil water from near the surface.	To reduce evaporation loss from the soil, apply brief trampling after good rain, provided there is sufficient organic matter in the soil.

Observation of farmer	Farmer's explanation	Management application
Trampling after good rains on soil where few perennial grasses grow tends to favour bush growth.	Bushes use the soil water conserved by the trampling since there are insufficient grasses to use it.	Rather trample such poor paddocks after the first rain of the season, to encourage perennial grass emergence.

Observation of farmer	Farmer's explanation	Management application
Damara and Van Rooi sheep provide a better trampling service on hard ground than Dorper sheep.	Damara and Van Rooi sheep have sharper hooves than Dorper and have retained their herding and mothering instincts better.	Farm mainly with Damara and Van Rooi sheep, mixed with limited Dorper genes to provide the larger animals demanded by the market.

Observation of farmer	Farmer's explanation	Management application
The presence of a few jackals causes sheep to remain bunched together, which provides a better trampling service.	Sheep feel more secure in the presence of jackals when bunched together. Therefore, they create a higher density of hoof marks.	Control jackals to a limited extent and sacrifice the loss of a few sheep, so that the herd bunches well and mothering instincts continue to be selected for.

ACKNOWLEDGEMENTS

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