



Participatory research with Namibian farmers to improve ecological functioning.

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Farmers are well aware of the products of biodiversity ...

- Food
- Fibre
- Medicine
- Fuel
- Tools
- Building materials



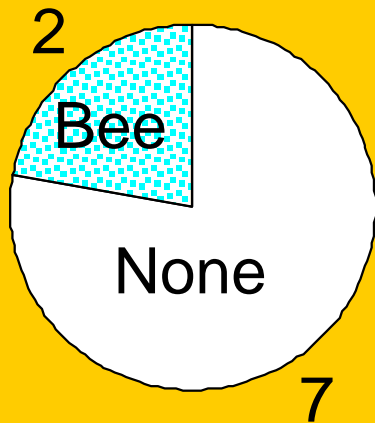
.. but less aware of biodiversity's ecosystem services, such as:

- Predators helping to control pests
- Grasses protecting soil and slowing down water to better penetrate the soil
- Soil microbes converting minerals for uptake by plants and providing glue to hold soil particles together
- Dung beetles cycle minerals from animal to soil and prevent flies and parasites from breeding in dung

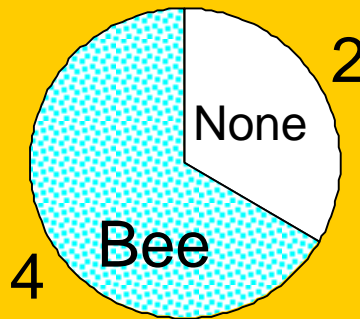


Perceptions of farmers to beneficial insects (Q=Which insect is most beneficial to you? A=Frequencies of different answers from 31 farmers appear below)

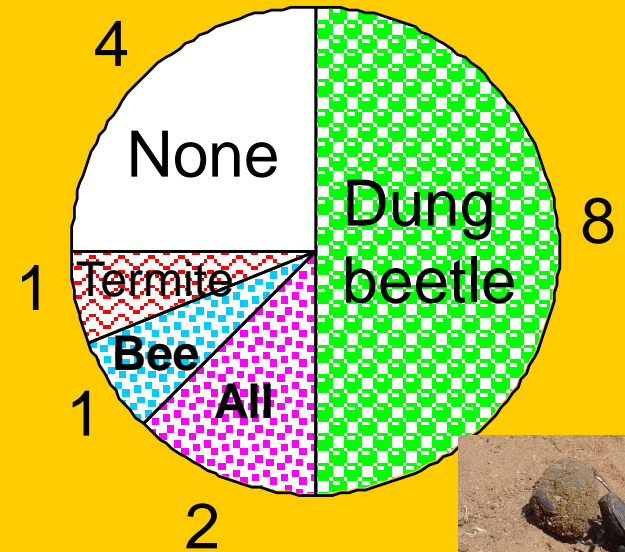
Communal



Baster



Commercial



Problems occur if lots of dung remains unprocessed aboveground



**Decline in
soil fertility**

**More flies
and
diseases**

Farmers have better access to inputs and increasingly use chemicals to control parasites



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Threats to ecosystem services are not sufficiently recognised



**Dung
beetle
beware!**



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Ignore smile and count stars



Product's use should be limited, for example to stock feedlots, and shouldn't be used in pastures because the effect on dung beetles would be severe

Minimal impact on dung beetles



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Rangeland problems are often symptoms of imbalance

- Gullies
- Pedestals
- Dunes
- Bush encroachment
- Bare patches joined together
- Reduced productivity of animals
- Outbreak of weeds, pests or parasites



Root causes identified by farmers



- Increased human population
- Easier access to loans
- El Niño weather phenomenon

In the case of tick problems

- Suspension of free dipping services
- Prohibition on burning the rangeland.

Problem tree for worms

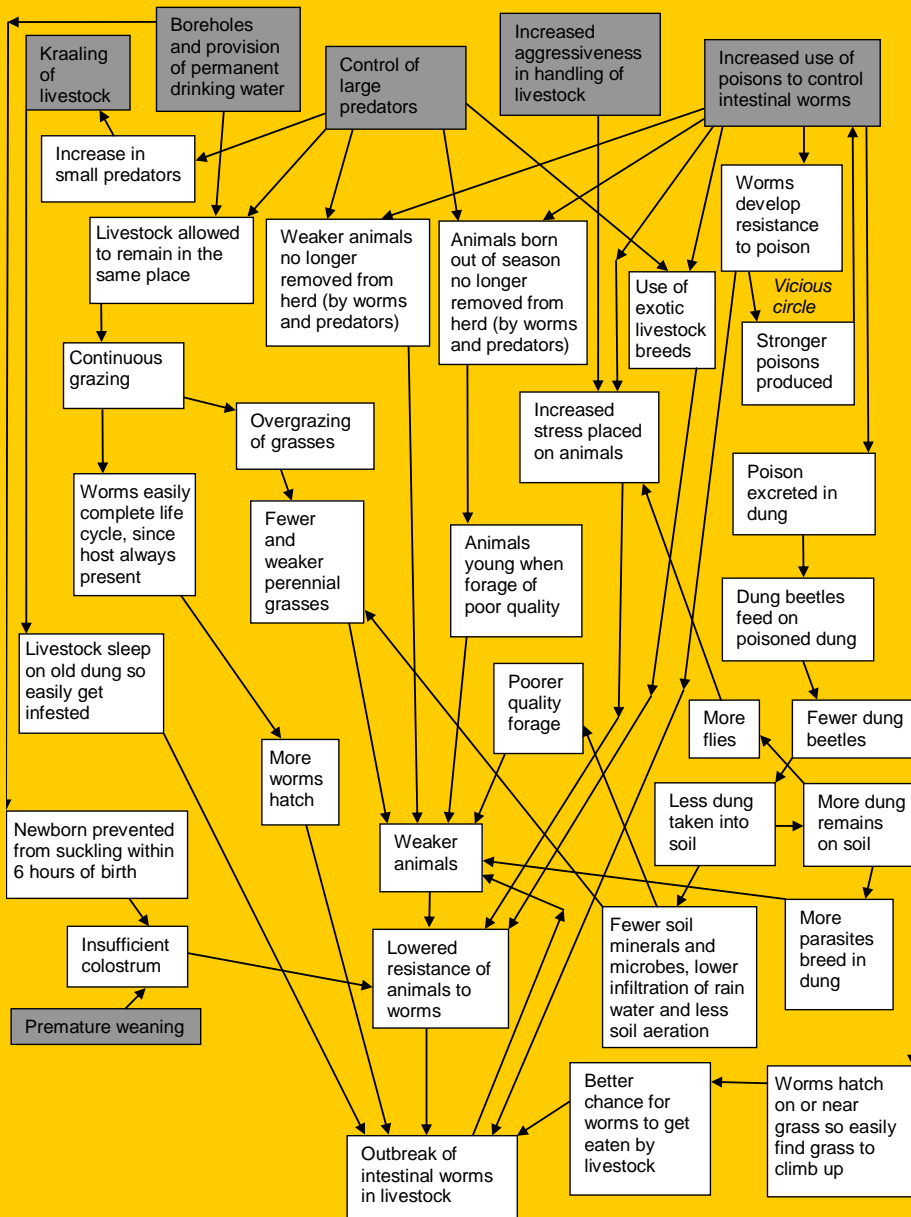
Root causes

Treating the problem at or near the root causes is likely to be more effective in the long term, preventing new symptoms from appearing and possibly allowing old symptoms to eventually healing themselves, with the help of biodiversity.

Intermediate causes

Treating the problem at or near the symptoms is likely to result in new symptoms soon re-appearing, so the management will need to be repeated often.

Symptoms



Options applied by eco-friendly commercial farmers

- Select for better resistance to parasites
- Rotate grazing to disrupt worm life cycle
- Avoid kraaling animals for long
- Rotate use of nematicides, to slow rate of resistance to nematicides
- Only apply nematicide when dung beetles are inactive
- Only treat individuals with high worm load, if unable to slaughter them

Problem tree for worms

Root causes

Treating the problem at or near the root causes is likely to be more effective in the long term, preventing new symptoms from appearing and possibly allowing old symptoms to eventually healing themselves, with the help of biodiversity.

Apply stress-free handling

Avoid kraaling for long

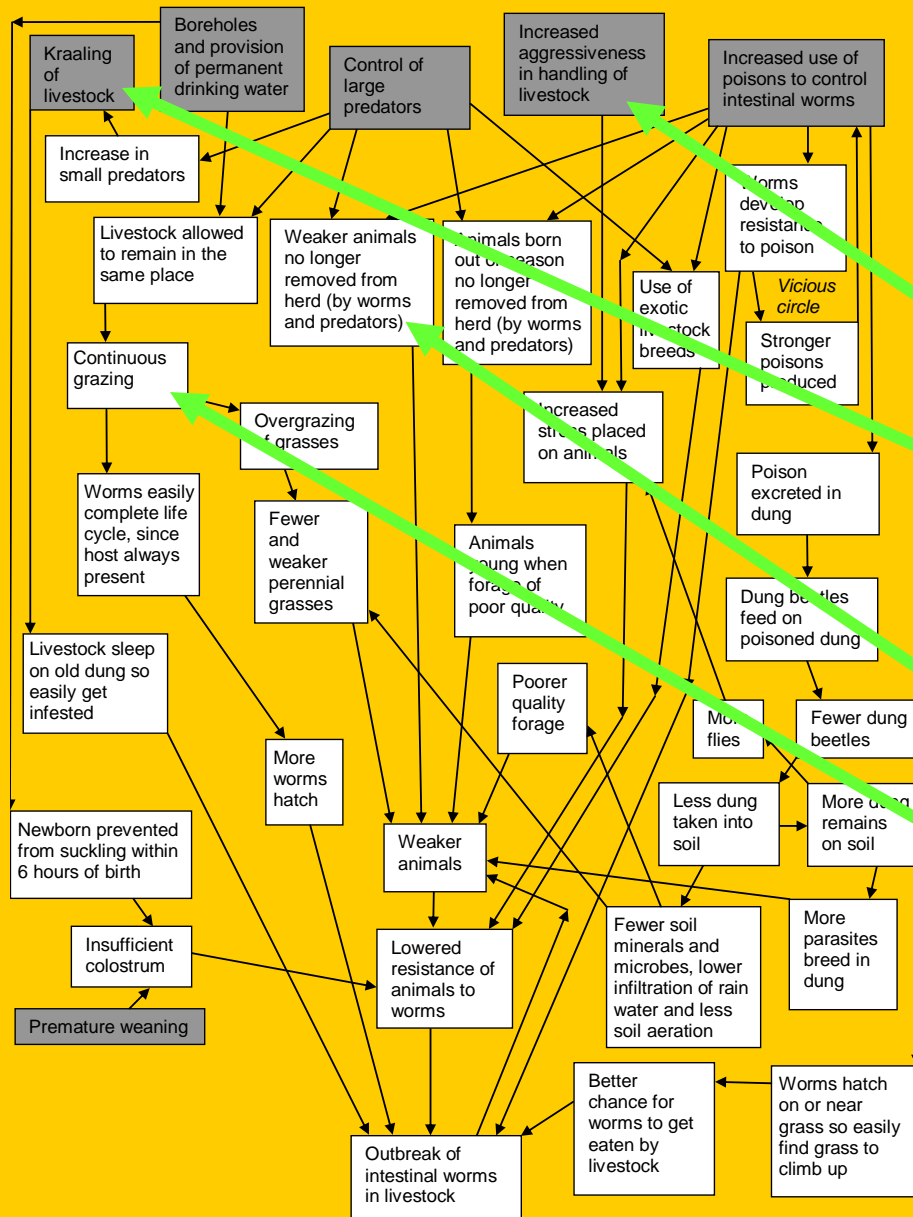
Intermediate causes

Select for resistance

Rotate to disrupt cycle

Treating the problem at or near the symptoms is likely to result in new symptoms soon re-appearing, so the management will need to be repeated often.

Symptoms



Limitations faced by emerging farmers

- **Insufficient fencing for rotational grazing to disrupt parasite life cycle**
- **Lack of means to adequately control predators**
- **Therefore livestock tends to be kraaled every night, favouring parasite build up**

Problem tree for worms

Root causes

Treating the problem at or near the root causes is likely to be more effective in the long term, preventing new symptoms from appearing and possibly allowing old symptoms to eventually healing themselves, with the help of biodiversity.

Avoids this vicious circle

Avoids these effects

Intermediate causes

Eco-friendly products

Treating the problem at or near the symptoms is likely to result in new symptoms soon re-appearing, so the management will need to be repeated often.

Symptoms



Participatory trial with farmers on eco-friendly nematode control



under kraal conditions by applications of
Effective Microorganisms (EM)

Treatments applied by 5 farmers on 400 sheep

- Control group, receiving no treatment
- Conventional group, receiving the nematicide normally applied by the farmer, twice or three times per year
- EM fermented malt dust, known as Bokashi (100g/sheep/day)
- Bokashi daily, plus EM twice per year

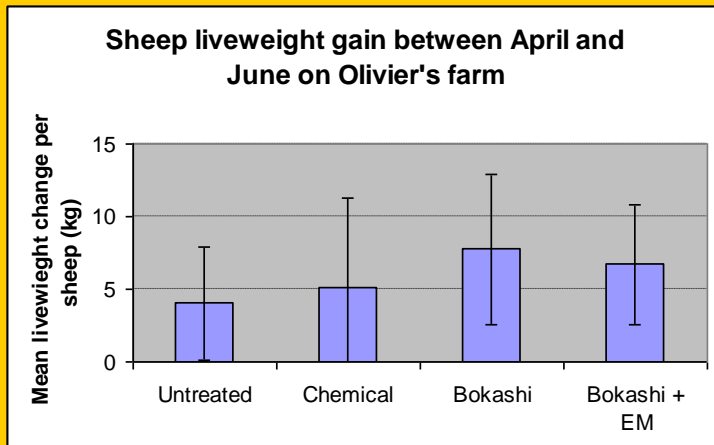
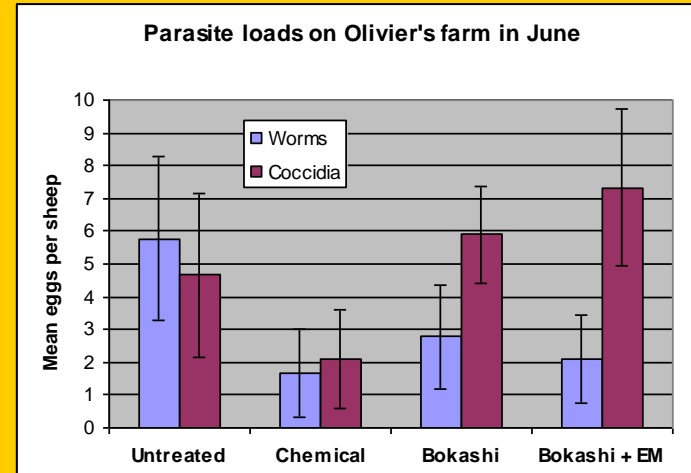
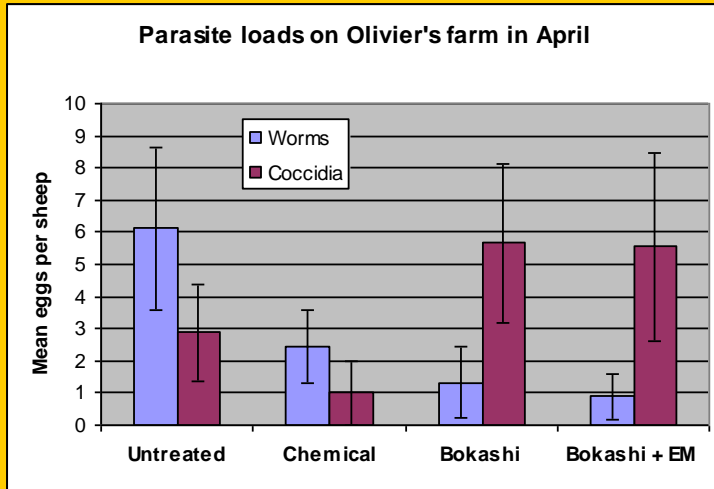
Each sheep gets a numbered eartag, colour coded according to treatment, and every two months weighed and sampled for dung



3g of dung gets weighed out and processed so that worm eggs and Coccidia may be counted



Example of results



EM seems to lower worm eggs but increase Coccidia, though not to pathogenic levels. No significant differences in weight gain, but most farmers interrupt the routine.



Participatory trial with farmers on biodiversity-friendly tick control





Oxpeckers and dung beetles may be killed by some tick poisons

Labeling seems independent



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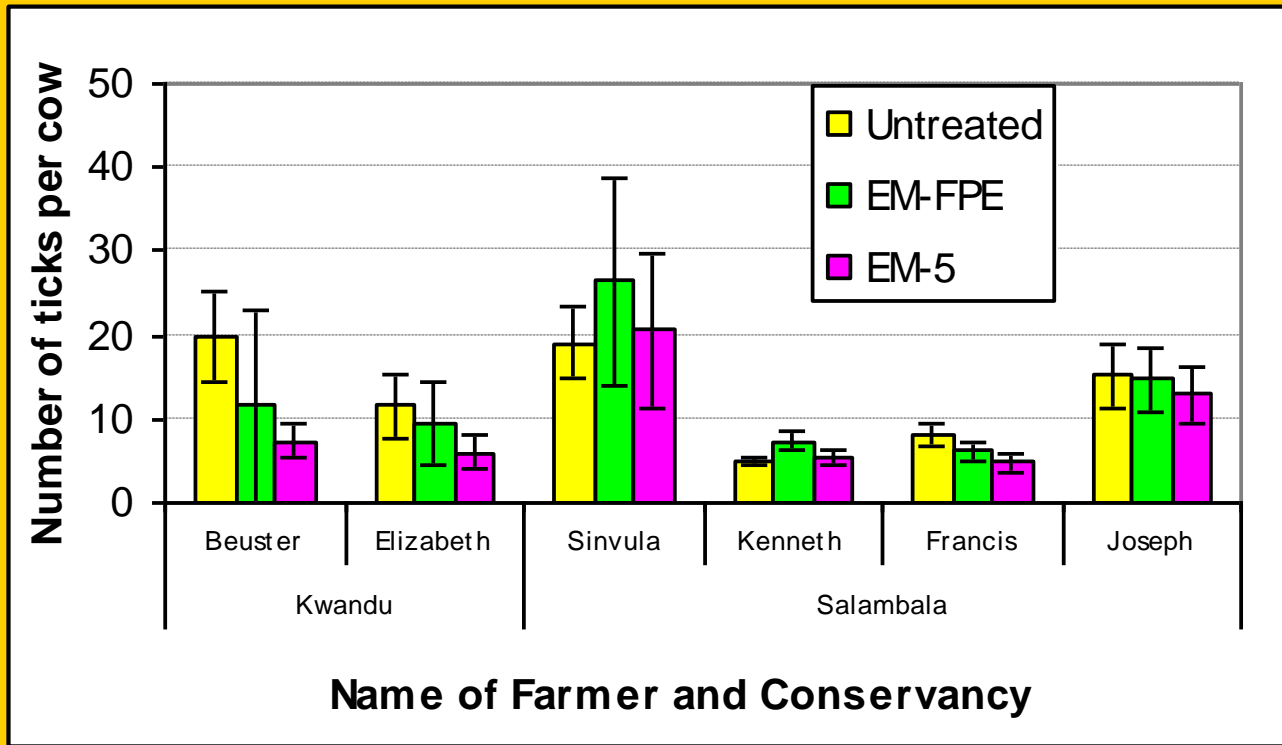
Eco-friendly sprays

EM-5
fermented
with grape
vinegar
and
alcohol,
which
makes it
expensive

Cheaper
EM-FPE
fermented
with plants
that repel
ticks



Results from March



Only three farmers got significant improvement from EM-5, but most interrupt the routine



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Patch burning of rangeland



Applied by some farmers



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Fire as management tool

- Natural fires used to burn occasionally
- Such as after exceptionally good rains
- Human interference mostly suppresses fire
- The option exists to apply the occasional fire in a controlled way
- Such as to control excessive bushes
- Or to enhance biodiversity and productivity, if only patches are burnt

Plants closest to sample points were marked, measured & re-measured

- Perennial grass of >5cm basal diameter (Greatest basal diameter & at right angles)
- Woody plant of >0.5m height (Height, greatest canopy diameter & at right angles)
- Woody plant of <0.5m height (")
- Seedling of woody plant (")



Treatments measured

Control

**Grazed firebreak,
on 1 of 3 farms**

Burnt



Measurements repeated

- Before the fire (where possible)
- Shortly after the fire, in growing season
- Next year's growing season



August

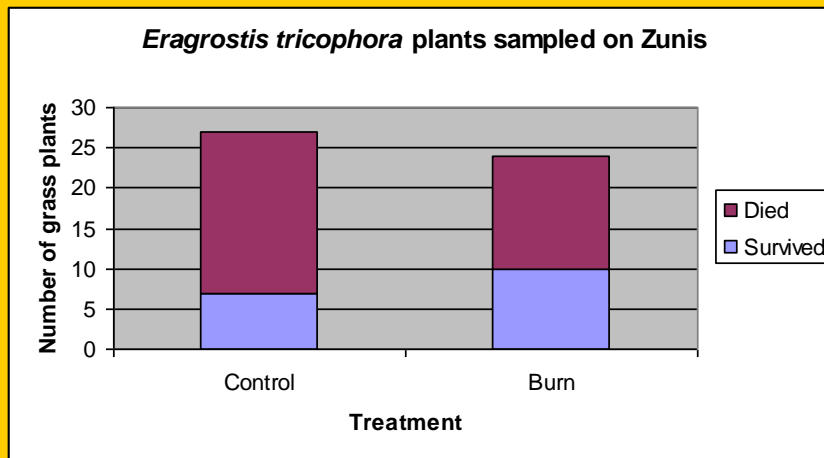
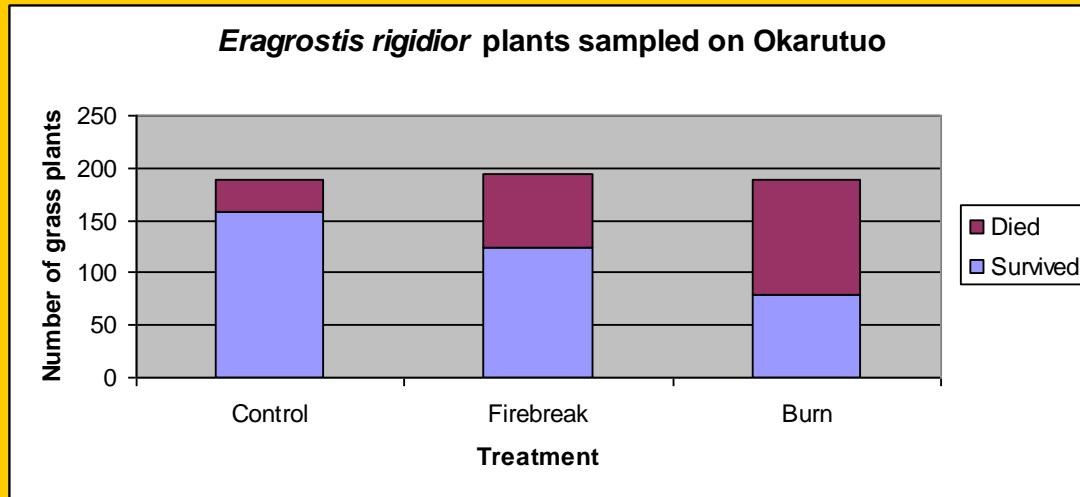


October



February

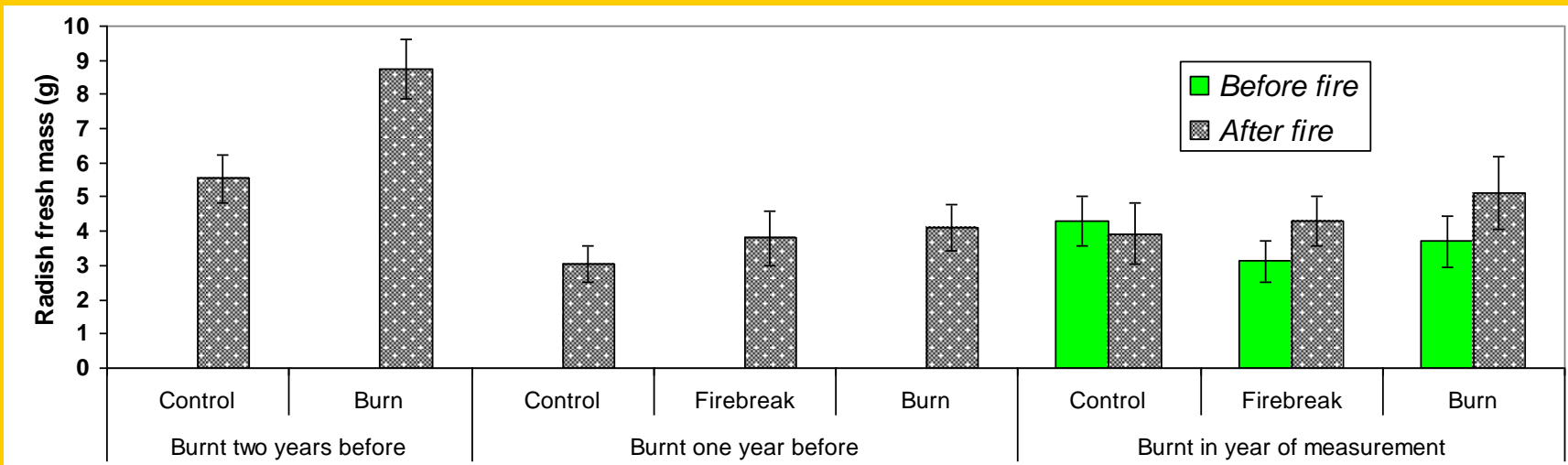
Effects on perennial grasses



Nutrient hotspots from burns



Radish bioassay



Strategic trampling



Applied as management tool by innovative farmers



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Strategic trampling (followed by rest)



**Converts standing
dry grass into mulch**



**Captures leaves and
seeds in hoof marks**

Improves infiltration and reduces evaporation

Contrast between two farms



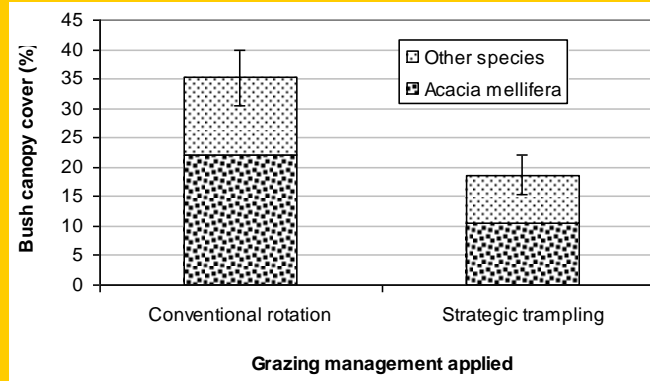
Cattle stocked at 14ha/LSU and following conventional rotation with four camps per herd



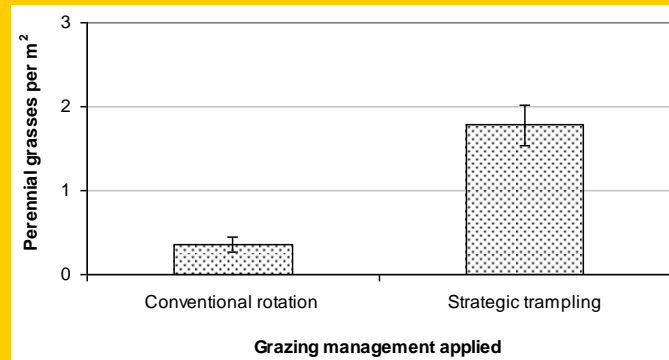
Cattle and small stock at 7ha/LSU strategically concentrated to provide quick trampling after rain



Conventional management



Strategic trampling



Five exclosures on each of 3 famrs



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

Gypsum blocks to determine available soil moisture



Gypsum blocks placed at depths of 10, 25, 50 & 80cm



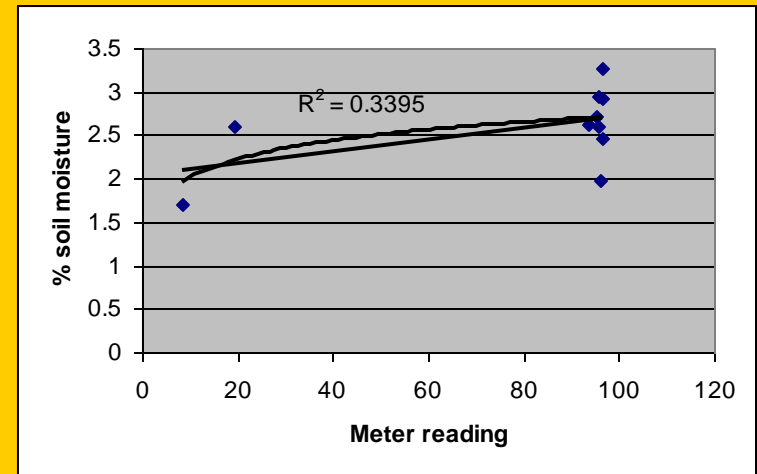
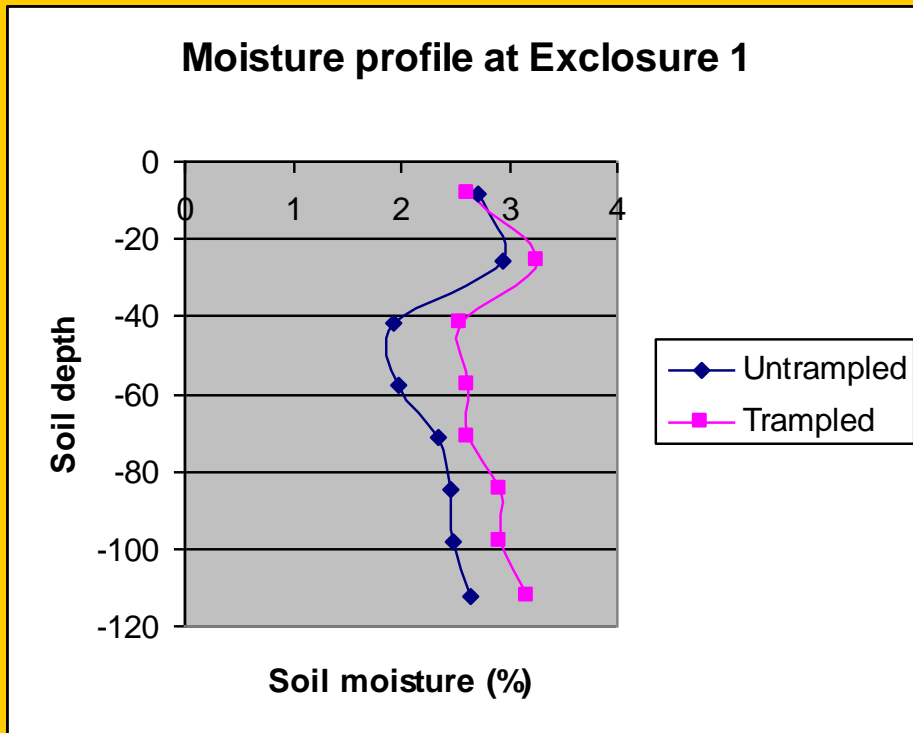
Wires protected by conduit piping. An electronic meter is used to measure soil moisture.



Soil moisture

Gravimetrically determined

Poor relationship between gypsum block meter readings and gravimetric



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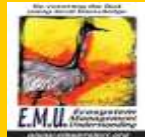
Restoration of degraded rangeland, in partnership with farmers of the Auas-Oanob Conservancy and Hugh Pringle of the EMU programme



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Farmers identified key features for priority management in their landscapes. In particular, grassy valleys now mostly eroded and getting encroached by bushes.



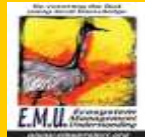
An intact grassy valley acts as a benchmark, providing a vision for restoration of eroded valleys.



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Problem tree for gully

Root causes

Treating the problem at or near the root causes is likely to be more effective in the long term, preventing new symptoms from appearing and possibly allowing old symptoms to eventually healing themselves, with the help of biodiversity.

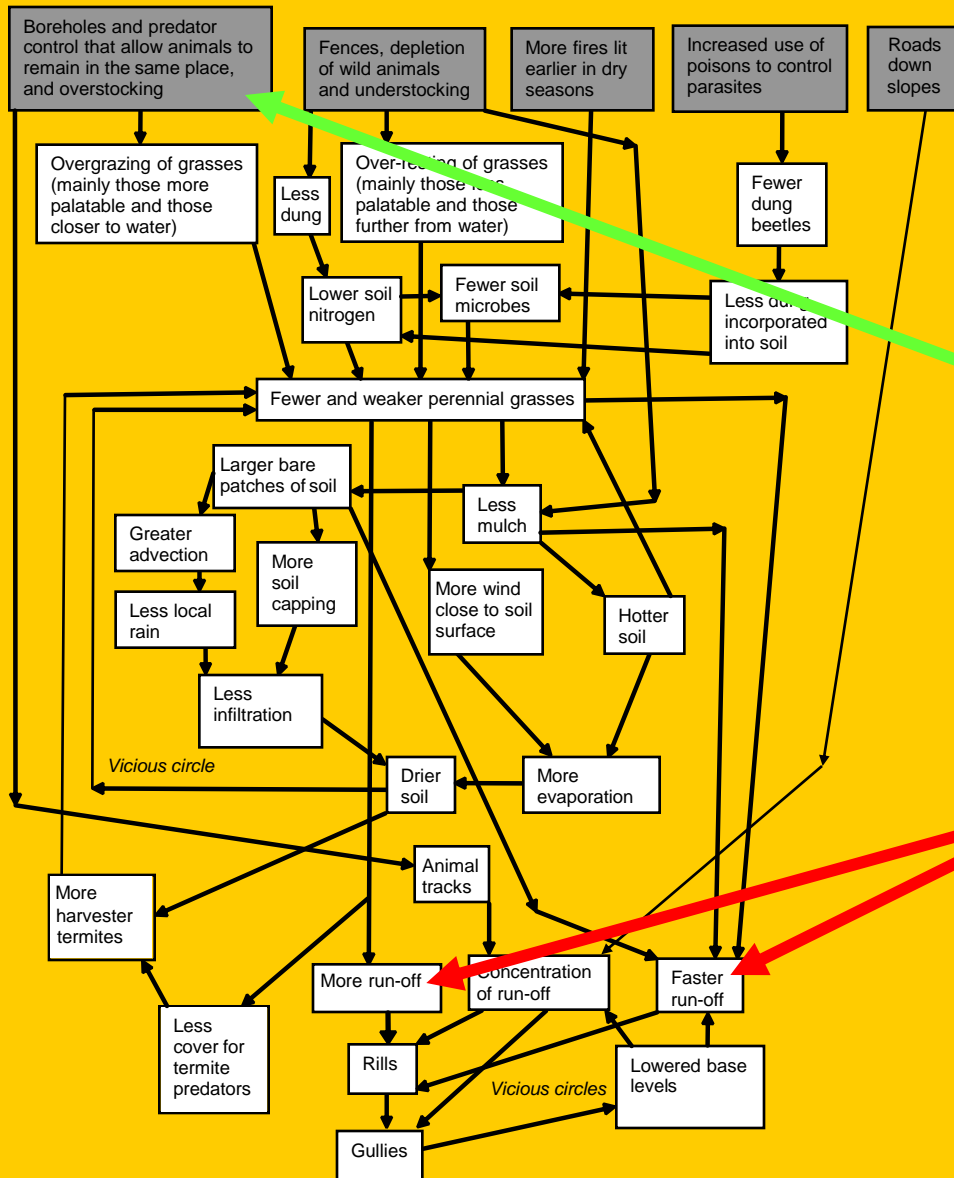
Reduction of game

Intermediate causes

Restoration

Treating the problem at or near the symptoms is likely to result in new symptoms soon re-appearing, so the management will need to be repeated often.

Symptoms



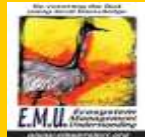
Encroachment by *Acacia mellifera* gets treated, while providing filter material



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Branches of *Acacia mellifera* get placed in both gullies and rills



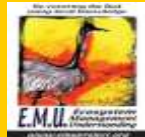
at critical control points in the landscape



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Branches are stacked for water to go through, not around



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Filters must be strong to calm turbulence at a confluence



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Wire gets woven through a filter, to hold branches together



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Filters get tied with wire to nearby trees



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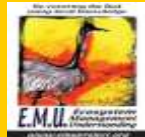


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Where there is no tree nearby, a steel post serves as anchor



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Gully depth was measured at regular intervals along transects



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Landscape Function Analysis across the rills and gullies



Half of the measured sites are fenced to exclude cattle



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**LFA measurements both above
and below each feature at:
Untreated system & Treated system**

**Unfenced
2 confluences
and 3 rills**

**Unfenced
2 confluences
and 3 rills**

**Fenced
2 confluences
and 3 rills**

**Fenced
2 confluences
and 3 rills**

Some results

2007



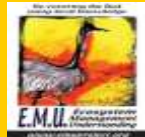
2008



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About 50mm of rain in 30 minutes resulted in sediment being trapped



Mainly soil trapped



Both soil and organic matter trapped

Grasses encouraged to grow



More grasses
under filters



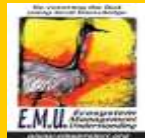
Perennial grasses will hopefully take over the filter function as the branches decompose, as in this rill



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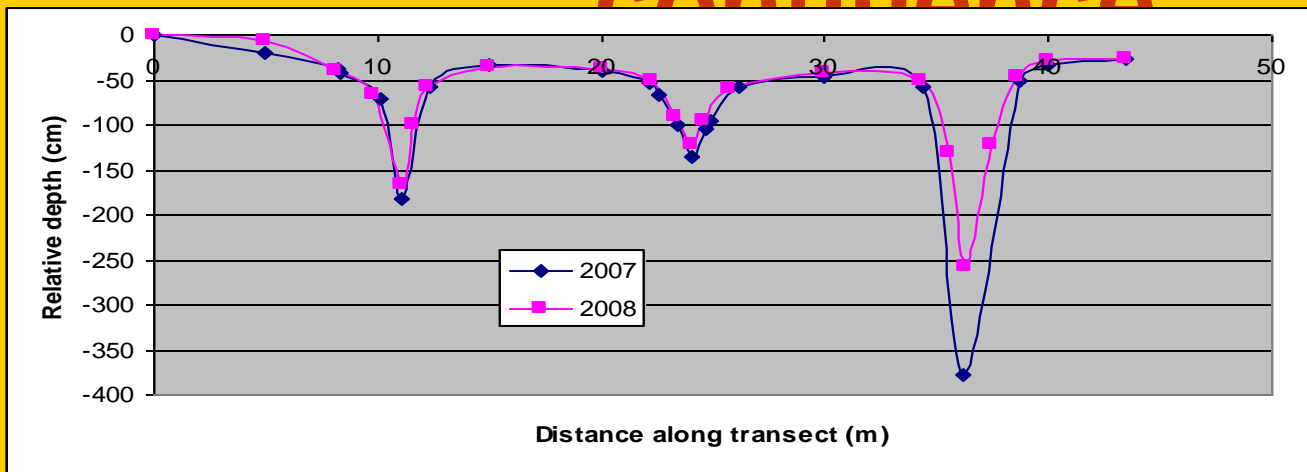


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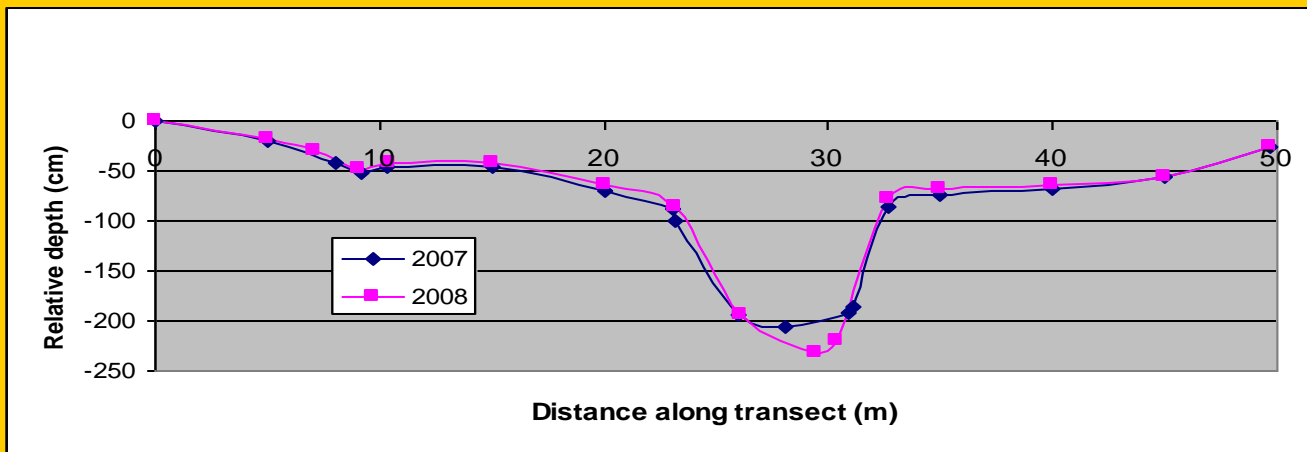


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Change in cross section over a year above and below confluence



Above the filter of confluence



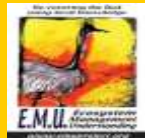
Below the filter of confluence



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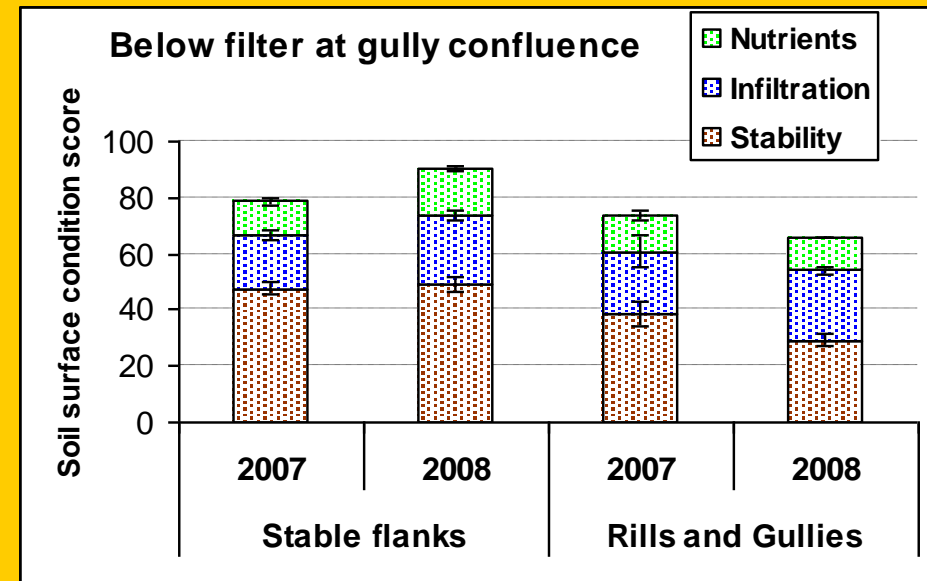
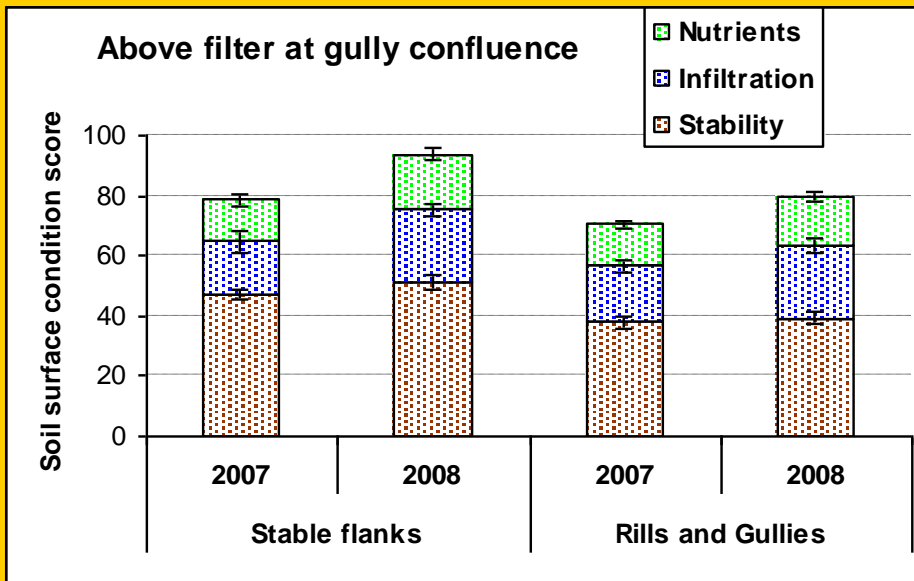


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Soil Surfaces Assessments

Above the confluence

Below the confluence



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Overall conclusions

- **Some farmers face problems from inadvertently harming biodiversity.**
- **Problem trees can help them differentiate between symptoms and causes.**
- **Although treating causes is better, sometimes symptoms must be treated too.**
- **Some farmers actively promote biodiversity and useful lessons can be learnt from them.**



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Conclusions continued

- The parasite control trials that were suggested to farmers are not that well implemented by them.
- They seem to be too busy chasing symptoms in crisis management mode.
- They are in greater need of assistance to transform to proactive management.
- Innovative farmers who already apply preventative, biodiversity-friendly management are useful research partners for joint learning, as they are in better control of their situations.

Outlook

- Identify benchmarks of best practise farmers and monitor the management and outcomes for others in the same land unit to learn from,
- Since benchmarks provide a realistic vision that shows the potential of any land unit under varying climatic conditions.
- Establish benchmarks for key land units lacking examples of optimum ecological functioning.



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