

Planning and managing farm roads in Namibia: “Let it go, let it flow”

An initiative of the Auas Oanob Conservancy and SASSCAL Task 41 Landscape Literacy.

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Disclaimer

This document is meant only as general guidance and the author bears no responsibility for the actions of landholders on their land. No manual can adequately address all local situations and thus caution and careful planning is recommended in planning and managing farm roads. In dealing with high flow issues, it is suggested that assistance from experienced people is sought.

Front page photograph

In the foreground is an area that now only gets rainfall and not the gentle sheet flow from above, which now goes down the road as a river after strong rains. There is no fence line – this has nothing to do with different grazing management. This is a road draining away critical sheet flow and drying out the land below.

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Introduction

Why is this issue important?

“Prevention is cheap, but repair is expensive”

Farm roads are a necessary disturbance of the managed landscape, indeed a requirement for managing well and profitably. What is not necessary is the wide range of problems associated with farm roads that are often (maybe even *usually*):

1. Poorly planned and located
2. Poorly installed
3. Poorly maintained
4. Poorly repaired.

A well planned, installed and maintained farm road network is critical for a successful farm. It will allow comfortable, safe and rarely weather prohibited travel between the farmhouse or living area and the areas needing direct attention.

This document and its associated field activities result from communal and commercial farmers asking for assistance from the SASSCAL Task 41 Landscape Literacy team. It is motivated by the Auas Oanob Conservancy’s request for a training exercise and supporting information. It is envisaged that this document will be improved as we work with more farmers and in different conditions. All feedback is very welcome.

The approach we use is based on the principles of Ecosystem Management Understanding (EMU)[™], fundamental to which is building knowledge within the landholder community to address critical issues such as farm roads. Our job is to support and enable, not to preach, and this document collates lessons learnt through partnerships with farmers in Namibia as well as Australia. As such, it is the Intellectual Property of all EMU[™] participants to date and therefore the responsibility for its use lies wholly with the readers on their land.

The style of this document is brief and hopefully thought provoking. The aim is to change the way farmers think about and so manage their road networks to their benefit, rather than to tell them exactly what to do.

1. The value of good roads to a farm business

1. Little maintenance required and less cost as a result
2. Minimal disruption of natural surface flows
3. Easy and safe to use in managing the farm
4. Quick drying and ready for use soon after rain
5. Gentle on vehicles and machines (\$\$\$\$s)
6. Appreciated by visitors/tourists.

A good farm road network is obviously an asset to any farm, but many farm roads lead to problems that just increase and get costlier to repair temporarily.

A good starting point may be to avoid creating new problems?

2. Typical problems with poor farm roads

1. Eroded roads are difficult to use –sometimes even unsafe
2. They are bad for your vehicles and machines (\$\$\$s!)
3. They suck water out of the land above them and starve land below them
4. They release “angry” flows in valley floors, exacerbating erosion and spreading weeds
5. They can even move water flows from one system to another if a natural drainage boundary is cut through by a “road river”
6. They can initiate erosion upslope wherever oncoming flows drop into the road base.



Figure 1. A farm road is intercepting flow (“Track thief”) and sending it to the north, into a different catchment. This leaves the area below starved of sheet flow (“Dehydrated fan”)

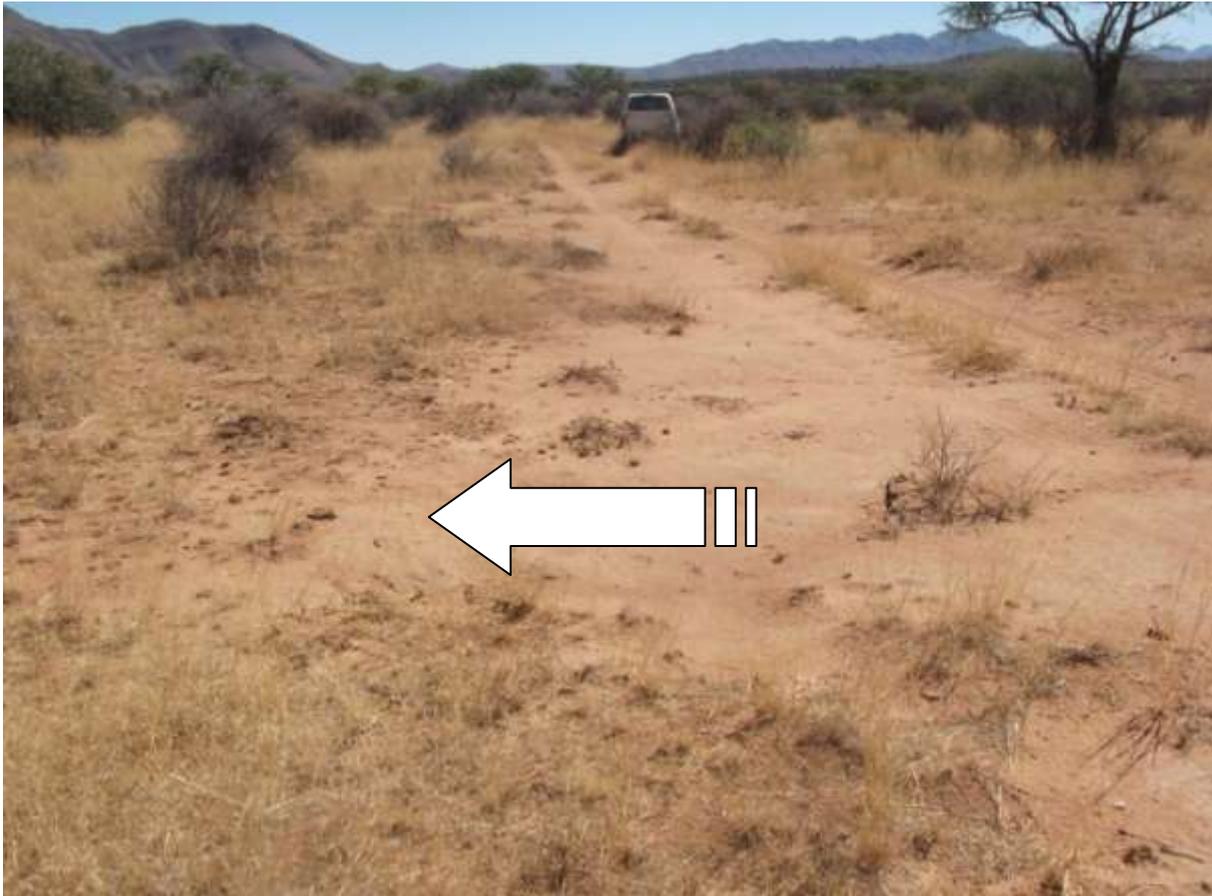


Figure 2. The “Track thief” farm road in Figure 1. Notice the erosion cutting back from the road to the left.

3. An overall strategy for farm roads

You have what you have; in most cases you have some good farm roads and many that are a costly problem. Even so, you may need more roads to farm as well as you can. One key idea can guide you;

“Let it go, let it flow”

This is a favourite saying of one of my mentors, Col Stanton who has been a soil conservation officer in central Australia for four decades. It is a key thought process in planning the management of farm roads. When planning, making and maintaining roads, a good principle is to minimise alteration of natural flows.

Whatever you do, allow natural processes to remain as little altered as you can, because when we alter them, we do not know all the consequences. Our knowledge and our minds cannot truly anticipate all undesirable consequences when we alter natural processes substantially. In practice, these hints might help:

1. Stop creating new problems by poor road planning and management
2. Develop a clear repair plan based on your priorities
3. Repair or replace key roads on the basis of;
 - a. Safety
 - b. Importance to the business

- c. Importance to the ecosystem
 - d. Etc...these criteria are not mutually exclusive...manage what matters to you.
4. Shut down problem roads and restore natural flows
 5. TRAIN AND SUPERVISE ANY MACHINE OPERATORS!!!!!!
 6. Develop a user-friendly pamphlet for use of roads on the farm so everyone is aware of expectations and why they matter.

4. Some key principles for planning new farm roads

‘If you need to go from A to B, you may not be able to plan the perfect road’

BUT, what you can do is minimise the risk of disturbing natural processes and so also minimise your maintenance costs. Some key ideas are listed and explained briefly below, but they need to be regarded as guides, not rules, for practicality and cost reasons:

1. Higher is better
The higher in the landscape a road is planned, the less water flows to it. This has to be within reason, avoiding steep slopes wherever possible
2. Contouring is better
The closer a road is to nature’s contours, the less likely it will capture and divert natural flows along it rather than allow natural cross flow
3. Go away from contours when a road needs to go up & down in “quiet” flow areas
Typical areas are “spurs” where the drainage is away on each side and so easiest to avoid capturing by the road. Spurs are higher “fingers” between adjacent ravines of valleys where the flow is strongest
4. Cross narrow strong flows at right angles
Angled roads across strong flows will tend to capture and divert flow along the road. Where crossing broader valley floors, try to keep to the contour so as to avoid capturing flows.
5. Cross broad watercourses or floodplains close to the contour
Crossing these broad, concentrated flows at right angles (see point above) will tend to draw water to the lowest point and create problems. Also, in building a road across such systems, never cut through “bumps” as these keep floodplain flows separate and counteract any drawing of flows to the lower areas.
6. Avoid fragile areas
Roads built through powdery soil will inevitably develop expensive problems – as is the case with other fragile situations such as sand dunes. Consider the direction of potentially damaging water or wind (and wildfire).
7. Avoid areas likely to spread weeds
Areas with weeds will spread if allowed to by installing a track through them.
8. Consider fire risk and response needs
In some areas that are prone to wildfire, compromises may need to be made, particularly in steep terrain. A “perfect” farm road is impossible. The challenge then is to minimise the problems and deal with them as locally as possible, before they gather energy. For instance, get water out of the road as frequently as you can with short-spaced spilling bunds (that

then don't need to be so big either!). Roads needed in times of fire or flood should be planned and implemented *before* the pressure is on, where this is predictable.

If you need to make an emergency road, repair it soon after you needed to use it. Sometimes in a fire or flood you need to make a road in hurry and you won't get it to fit the landscape because that is the last thing on your mind. BUT, please go back and rehabilitate it when the pressure is off, preferably before the next major rain event as the repairs will be comparably quick and cheap before major damage can occur.

5. Some key specifications for building (well-planned) new roads

This section assumes that you have already planned the alignment of the road to minimise disruption of natural water flows and so minimise future maintenance costs. Remember;

“Let it go, let it flow”

A new farm road usually looks beautiful and you feel like you want to drive on it. But, if it is built badly, it is the start of many problems and maintenance costs. Here I collate what we have learnt to date for normal farm roads that seem to work:

1. Do not cut the land when clearing the vegetation
You can use the vegetation cleared to “sweep” the new road in front of a big machine or drag something (e.g. angle iron implements, bound tyres) that should not dig in behind your bakkie or tractor. Be careful not to cut the land if you use the dragging method. The key is to ensure that water will flow across the road and not be captured and flow down it.
2. Make the road wide enough so that vehicles can choose different paths each time and NOT CREATE TWO WHEEL RUTS, which will become channels (“spread the load”)
3. NO WINDROWS...if the “sweeping” causes some windrows, come back and spread them back across the road to allow totally natural cross-flow
Note, you may need to ensure all thorny branches that could puncture tyres are removed before spreading any windrows back across the road.
4. Open up angry flow sections above and below the road crossing, but keep the landscape level.
This allows turbulent flow to calm down before it meets the road and then allows easy cross flow. Ideally, keep the natural ground level so that you don't “dam” water, or conversely start gullies by cutting into the natural ground level. If it is feasible to bring in good road material (preferably limestone based), this may reduce long-term repair costs as it is less likely to wash away.
5. Locate trafficable humps in awkward sections to release captured water calmly
Sometimes (e.g. along steep hills) you cannot follow the contour to get from A to B, identify stable areas to “spill” flow safely and not “shoot” it and cause gullies to cut back up the road
6. If drains are absolutely necessary, make them *short, flat and wide*.

6. Maintaining farm roads

A well planned and built road can be destroyed by poor maintenance. Some hints;

1. Watch the TV when the roads are wet – don't go out and cut your roads into future creeks

2. If you cut the land because you had to – repair your damage before small problems get bigger
3. Supervise any road works by contractors (or you may have more repairs to do!)
4. Fix problems as soon as you can (early fixes are easier, quicker and CHEAPER!!!)
5. Enforce your “road rules” for staff and visitors.
Maybe make a pamphlet or handout with the “Rules for using farm roads” so that everybody on the farm knows the risks and the rules.

7. Repairing problem roads

Poor farm road networks make farming more difficult, are expensive to maintain (as the problems usually get worse) and cost money directly (e.g. damage to vehicles) and indirectly (less grass per rain event). In many cases, farmers appreciate these issues and try to repair the roads, but do not have experience in doing so and hence can make matters even worse. This is what we have learnt through EMU™:

1. Bring the windrows back onto the road and spread them
(Windrows are the banks of soil pushed to the side when grading a road to make it smooth. They act as a dam wall until they are breached and then the banked up water is released in an angry flow). You may have to remove vegetation that has grown on the windrows, especially if this includes thorns likely to puncture car tyres.
2. If too much soil has been lost and after the windrow soil has been brought back the road base is still too low to allow cross flow, you may need to build trafficable humps (these are called “whoa boys” in Australia – as in calling out “whoa boy” to your horse coming upon a hazard). It is advisable to rip the base of the proposed hump across the road (not up and down because all the water coming to it will find the rip lines and undercut it) so that the hump “marries” into the road surface below land level and does not have a weak area at ground level. Roll the hump with whatever you have at hand to make it solid.
3. If you make drains to take the water away always:
 - a. Make them flat, wide and short
 - i. flat - no angled bottom flow to increase water speed and erosion
 - ii. wide - the wider the flow, the lower its energy as it leaves the works
 - iii. short - no distance for collected flow to gather speed

Aim them GENTLY down slope (“spill” the flow, don’t “shoot” it)

- b. Put them in the best place for that section of road
- c. Avoid sending flow to problem areas below
- d. Spread and calm flows in difficult, steep situations by keeping the “drain” on the contour and blocking its end to then spill over the length of the drain, rather than out of the end.

In most cases, a well planned and maintained road will not capture cross flowing water and drains will not be needed. The more drains you need, the less your road fits the landscape by planning, implementation or maintenance.

4. Avoid building the road above ground level unless it is of critical importance to be usable in wet weather
5. Avoid cutting the road deeper to smooth it; this just increases the ability of the road to steal natural water flow and increase the speed of water coming from above (because the water in front can get away so easily).
6. Consider re-aligning some sections and close down abandoned sections to restore natural flows (see section 7).



Figure 3. This farm road was a virtual river flowing towards the reader, with channels and sand deposits along it. Now it is smoothed out and has trafficable bunds to spill any harvested water calmly back onto its natural course. This is sandy country, so some material was brought in for the bund from nearby. This road has had major storms over it with no maintenance required at all.

For many farmers, the situation of poor roads affecting productivity and ease of travelling around the farm may seem overwhelming. This is a state of mind, not truly a reality. Instead of thinking “I know, but it’s all too big, where would I start?”, think about some small things you could do that in a single rainy season’s time (if the rain comes), you will say, “That was worth the effort”. If you have access to maps and satellite images, map your “bang for the buck” priorities and work on them. Perhaps start with small problems to build skill and confidence....making sure you create no new problems while healing past damage. Accelerate as you see the benefits and build your skill. Share both wins and losses with your neighbours, build a “farm road smart” community.

Farm roads are so important to the farmers with whom we have worked that this package has been developed. That said, it is just one of many interacting issues on a farm and should not be an obsession that distracts farmers from holistic management of their landscapes. Farm road management must obviously fit into the “bigger picture” and contribute to what you are trying to

achieve . Ideally, any farm road initiatives are selected on the basis of their potential contribution to what you want from the farm as a whole.



Figure 4a,b. Road drains: On the left is a long, narrow angled drain blasting water at the landscape below. On the right is a short, flat drain that spills water calmly.

8. Closing down problem roads with machines

“Let it go, let it flow”

In some cases you will have roads that simply don't fit the landscape and will require ongoing high maintenance and costs. That is the landscape telling you that the road does not “fit”. In such cases, the best option is to close the road down and restore natural flows. The key points are to:

1. Restore natural flows
2. Avoid creating any new problems
3. Repair any problems the road has caused nearby (e.g. sheet or gully erosion).

If one accepts these three key objectives, there is still a budget decision to be made. How much harm to the land is the road doing and how much can you spend? If you do the job well, you will save money by spending money, but you may not have that luxury. So, I start with the Gold standard:

1. The Gold Standard
 - a. Bring the windrow banks back into the road
 - b. Put in humps where needed to spill water gently away to its natural path
 - c. “Snake rip” areas between humps to increase infiltration, but break up flows along individual rip lines
“Snake ripping” simply involves at least two winding passes with rippers or scarifiers down the track, crossing over as much as possible to break up any flow within a single ripper line. Ideally 3 or 4 passes on different, crossing paths are used.
 - d. Bring in desired seeds/propagules and reticulation for re-establishment of vegetation if desired

- e. Contour rip above and through any lateral erosion cutting back from the road to “stop it in its tracks”.
- 2. Medium Standard
 - a. Bring in the windrows
 - b. Build strategic banks to restore natural flows with wide, gentle spill areas
 - c. Contour rip above and through any lateral erosion cutting back from the road.
- 3. Low cost option
 - a. Build check banks with windrows and allow gentle spill ways
 - b. Contour rip above and through any lateral erosion cutting back from the road.

The removal of windrows (the banks of soil each side of the road) is highly desirable. Even if a road is lower than ground level, flows will cross it if there is not a sharp barrier on the top side and then again on the lower side. The momentum of flow will push the water across the road if it does not encounter such barriers. The diversion of flow will then reflect that landscape slope, NOT the banking effect of windrows and steep road edges. “Smooth” the road cross-ways to allow cross flow.

WINDROWS ARE **ALWAYS** BAD!!!!



Figure 5. A “road creek” with a windrow on the down slope side (left) that keeps the water on the road to discharge violently when it finally breaches the windrow.

9. Closing down roads without machines

“Let it go, let it flow”

The objectives above remain the same, but different techniques are needed. When machinery is not available, repairing ecosystem requires farming skills that might bring farmers closer to their land and how it “works”. Even when machinery is available, some of these ideas might be very useful.

1. Herd cattle across “road creeks” to break down windrows and fertilise the soil
2. Where captured flows are not strong, build ground-anchored bush filters across the road and then at least half as wide each side, anchored with trees/posts and wire
3. Build suspension filters of bush tied to wires across the road to slow and spread the flow if it is too strong for a ground-anchored filter to “hold”
4. Build gabions/weirs with whatever solid materials are available to focus flows in the centre of the road and not the sides.

Rocks, crushed limestone, carefully placed sets of logs, even bowed tree trunks have been used successfully elsewhere. BUT, this needs skilful implementation or things can go horribly wrong. I suggest “softer” approaches unless you know exactly what you are doing.

Always extend any works at least half as wide each side as the channel being addressed and “key” the structure into the base and sides if using solid materials.

This is an area open to tremendous creativity and innovation and SASSCAL TASK 41 Landscape Literacy has already learnt a great deal to share with others from our relationships with the Auas Oanob Conservancy and Conservation Agriculture Namibia in the Kunene.



Figure 6. Branches are attached to tightened wire across a “road creek” at Erora Village in the Kunene. Groundwater levels are recovering and water starvation has been reversed.

10. Some special cases

Simply applying the “let it go, let it flow” approach will not always work. Sometimes special techniques are needed and this is definitely not a “manual” for them. Rather, I alert you to some issues that require different thinking and approaches.

1. All wetlands –areas that are prone to flooding and/or seasonal inundation from vast floodplains to local ephemerally inundated depressions

Avoid them at all costs when planning roads. If possible, avoid building roads:

- a. Above them that capture natural inflows above the wetland and divert water away from them
- b. Across them that bring in invasive weeds and change the critical variations in wetting and drying by draining water towards low points
- c. Close to overflow areas below and so prevent any gully head formation that could “unplug” the wetland.

2. Weedy areas

Areas infested by problem weeds can be easily managed if protocols are put in place and observed by road users. Until the population has been eradicated, vehicle hygiene protocols are warranted. Where weeds have prickly seeds, signpost quarantine lines on all tracks through them so any car travelling through checks the tyres once through, before continuing on. This is very efficient at keeping roads clean of most problem weeds with prickly seeds.

This must also partner addressing the cause directly (how the weeds got there in the first place).

3. Major drainage features

Inevitably, roads need to cross major creeks and rivers. From a practical perspective (as discussed previously) the challenge is to slow and spread oncoming flow and then allow it to pass by easily. The closer to natural ground level (often well above the current level), the greater the catchment calming above. This can be achieved in steps as sediment accumulates on the upslope side. To simply restore the natural (base) ground level of an unnaturally incised channel invites an undesirable confrontation with a big flow event that might end up worse than in the original situation and quite costly to bring back to at least that state.

4. Main road culverts

Main roads are built to suit the wider community and economy and hence have objectives (e.g. minimum periods of road closure) and associated specifications (get the water across, preferably below the road - as quickly and easily as possible). That ensures problems for local ecosystems and farmers in several damaging ways that I have not seen a Government address for local ecosystems and landholders anywhere in the rangelands globally, not just developing Namibia. The key challenges for the farmer are to:

- a. Slow the flows down to the culvert by making it more difficult for raindrops to get there by good grass and litter cover, but also perhaps filters or banks that reset the land level above the culvert to stop its “sucking” effect on the catchment upslope.
- b. Break up the flow and its energy as soon as you can below the culvert and try to restore calmer flows with whatever tools you have available that can either block and spread flows or filter and spread them.

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