

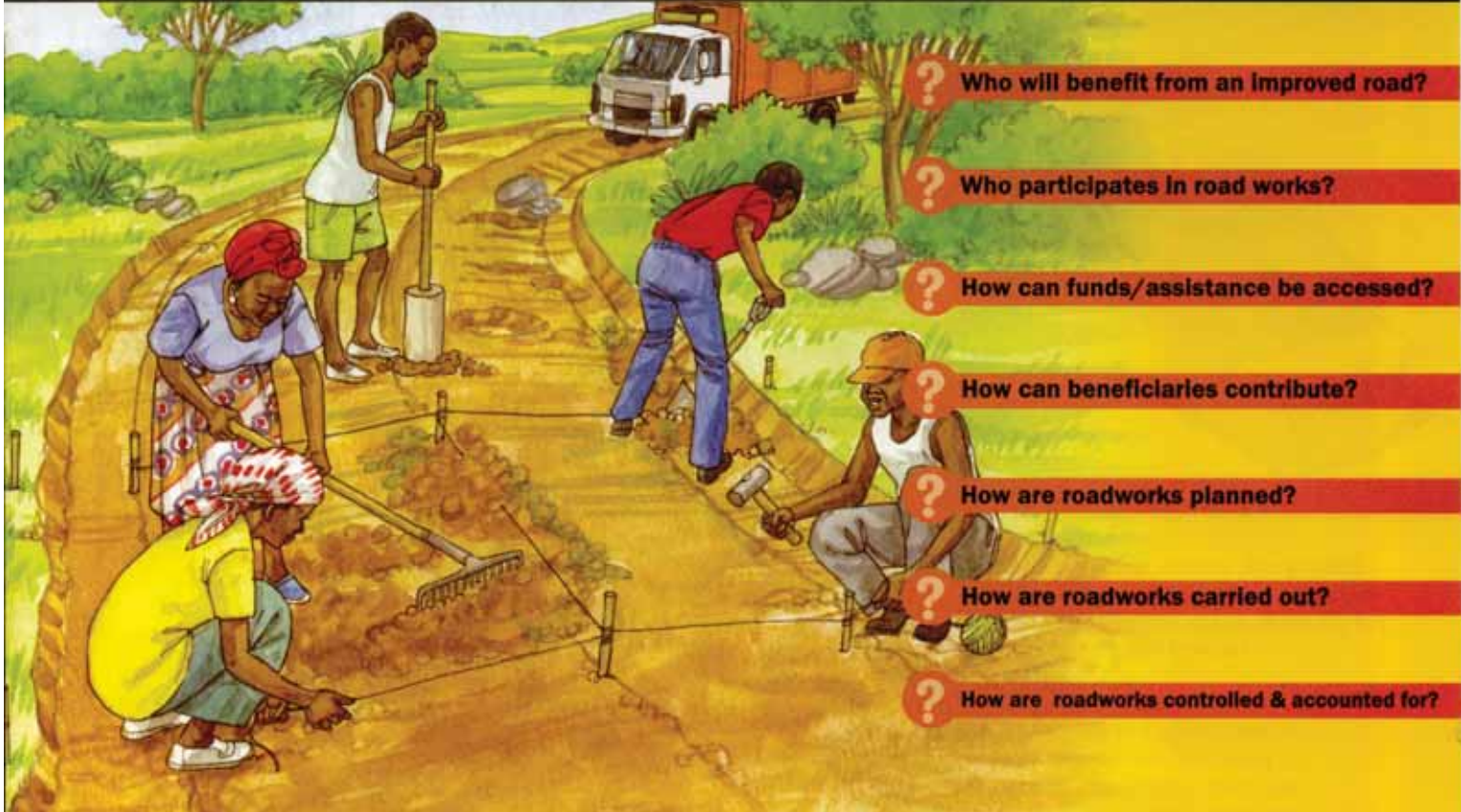


MY FARM ROAD

A SUPPLEMENT OF THE ORGANIC FARMER MAGAZINE

The
Organic
Farmer
MAGAZINE

SELF-HELP GUIDELINES FOR FARMERS AND COMMUNITIES ON HOW TO IMPROVE AND MAINTAIN ACCESS ROADS



? Who will benefit from an improved road?

? Who participates in road works?

? How can funds/assistance be accessed?

? How can beneficiaries contribute?

? How are roadworks planned?

? How are roadworks carried out?

? How are roadworks controlled & accounted for?

Why You Should Improve and Maintain Your Farm Road

Farmers need a road or track that can be used throughout all seasons to transport goods to the next market or collection centre in good condition. Maintained roads encourage new services and investment, making your life more comfortable. Good condition roads also reduce your input and transportation costs and improve the possible profit on agricultural goods.

INTRODUCTION

The Kenya Roads Board is mandated with the oversight of maintenance of all public roads in Kenya – from the biggest dual carriageway to the smallest farm access road.

Every link is important – if any road section is in bad condition then the cost of transport increase and the farmer suffers.

Through the Fuel Levy Funds paid to KRB by all road users, KRB is able to finance maintenance and improvements of roads throughout the country. However, the needs of the nearly 200,000 km are much greater than the available resources. KRB is therefore actively encouraging all stakeholders to participate and cost share in the provision and maintenance of roads.

At the District level KRB currently distributes KSHs 17 million per constituency per year for rural roads through the District Roads Committee. These funds can be accessed through the District Roads Engineer for support to community-farm access roads but the farming community must take the lead! If you improve and maintain a road I am sure the District Roads Engineer will assist you.

In this regard KRB has supported the development of this Farm Road Guideline to assist farmers to improve their roads and I look forward to visiting the first road improved using this guideline.

Dr. F. N. Nyangaga, OGW
Executive Director Kenya Roads Board



REMEMBER TO CARRY OUT THE RIGHT WORK AT THE RIGHT PLACE AT THE RIGHT TIME



How to Organise **YOUR** Roadworks



USEFUL TIP

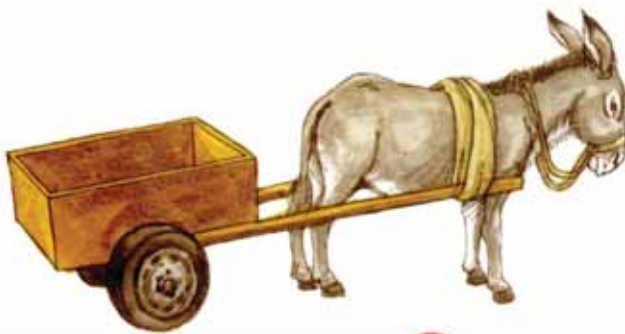
- Form a Road Committee that manages the road works and organises the necessary resources. It may be formed by farmers groups, church groups, or concerned road users.

What do you require?



MATERIALS

Existing soil, stones, timber and gravel or quarry waste where locally available. For structure works aggregate, sand and cement need to be bought.



TRANSPORT

Any kind to transport materials, be it a hired vehicle or locally available ox/donkey cart.



REMEMBER THAT ...

Usually farm roads do not 'belong' to one farmer alone but serve several farms and homesteads in one way or the other. It is therefore obvious that all those benefiting from the road should also participate in improving and maintaining it. The work methods must be simple enough so that farmers can carry out the improvement works themselves and maintain the roads afterwards while materials should ideally be locally available in order to reduce costs.



LABOUR WITH/WITHOUT SKILL

Skilled labour is used for any masonry, concrete or carpentry works, mainly for structures.



FINANCES

Through contributions from road users or from public development programmes like CDF, RMLF, DRC and LATF.



HAND TOOLS

Mostly farm tools, such as hoes, shovels, pangas, rakes, wheelbarrows are suitable for road works. Additional tools required are tape measure, strings and pegs, sledge hammer, etc.



USEFUL TIPS

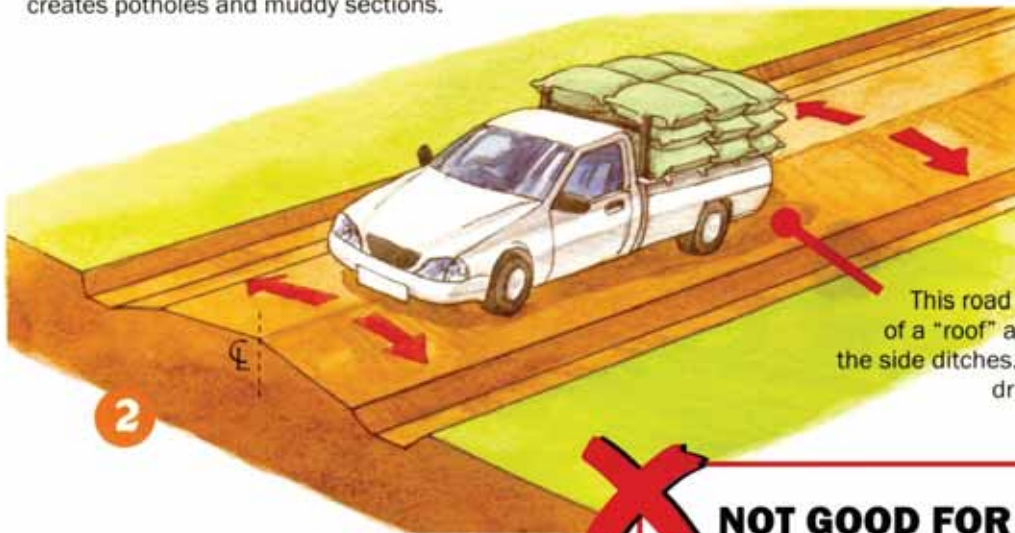
- Road works have to be affordable to the farming community or the people living along the road.
- Before starting any road works one has to know and understand the problems that need to be tackled.



Identifying your problems



This road is a channel and water cannot flow off the road surface. Flowing water creates erosion whereas standing water weakens the soil and creates potholes and muddy sections.



This road has the correct shape of a "roof" and drains the water to the side ditches. The road surface can dry up quickly after rain.

After knowing the problems one has to identify the causes. Usually it is not one factor alone but a combination. However, one has to clearly identify and analyse each and every problem to plan for the correct treatment.



NOT GOOD FOR YOUR FARM ROAD



1

Trouble spots

Very often one gets stuck at particular problem spots because of a muddy place, a bridge or culvert that is missing or a steep section that is too slippery.



2

Rain

The biggest enemy for an earth or gravel road is water. Heavy rains can destroy a road in no time. The secret of a good road is simple: Keep water off the road!



3

Traffic

Especially heavy vehicles, like tractors and lorries can destroy a road during rains when water softens the soil



4

Soil type

Some soils are weak, such as black cotton and dusty soils. They may need to be improved or covered with better material.



ALWAYS CHECK ...

- Where the trouble spots are,
- Whether water can drain from the surface to the side ditch and therefore dries up quickly,
- Whether water can cross the road through culverts or drifts or open channel across the road,
- Whether heavy vehicles damage the road during rains,
- What type of soil there is.

How to Improve **YOUR** Road



USEFUL TIP

- After diagnosing the problems and causes, you now have to prioritise the work to be done. Identify those problem spots that are the worst and are the main reason why your transport gets stuck.

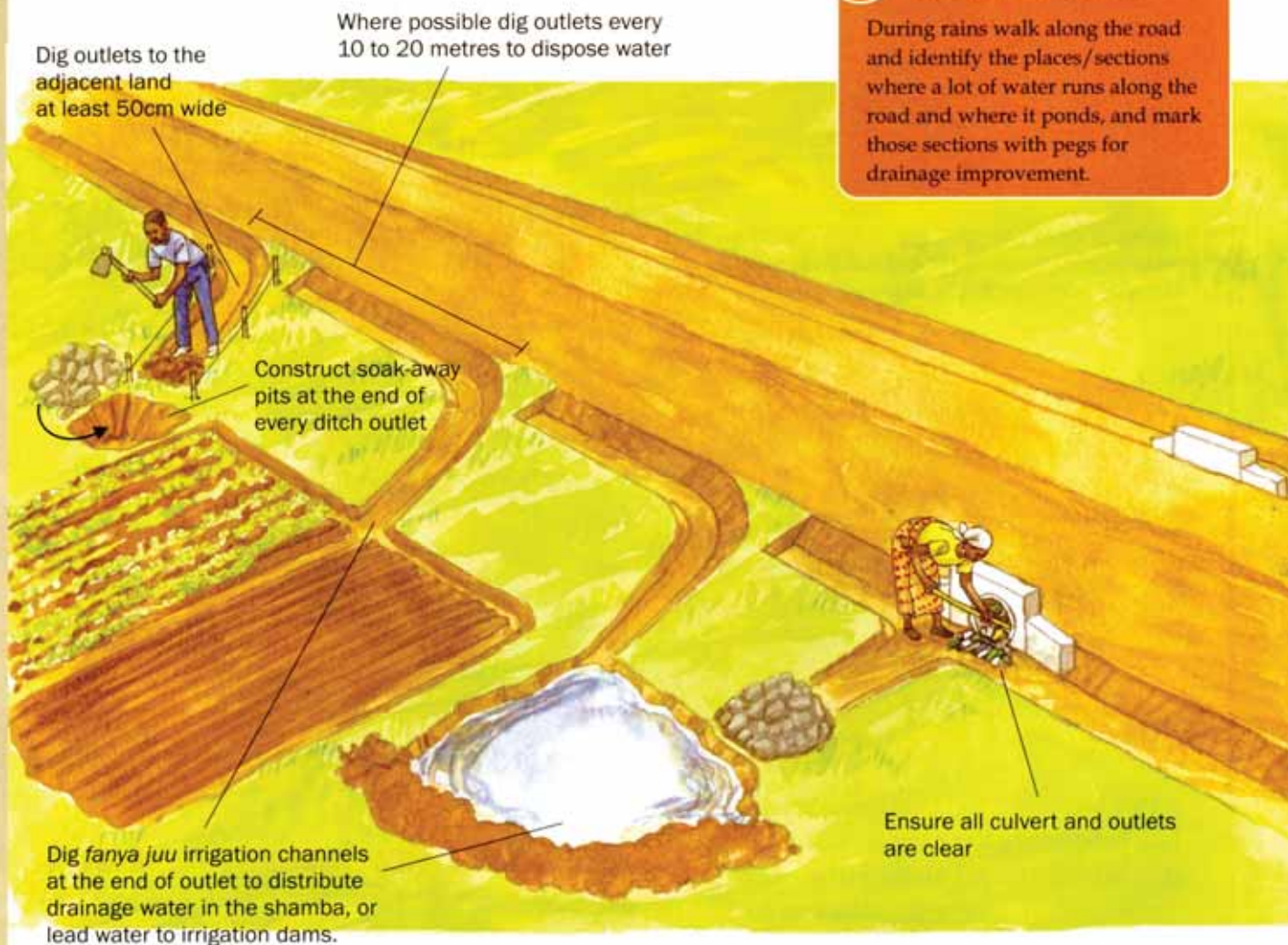
CASE 1

Blocked or non-existing drainage



ALWAYS CHECK ...

During rains walk along the road and identify the places/sections where a lot of water runs along the road and where it ponds, and mark those sections with pegs for drainage improvement.



NOTE

The first priority is to open the drainage so that water can quickly flow away from the road surface. This is the most effective way to improve your road. This activity does not require any material, only tools and labour.

Farmers often regard water from culverts and ditch outlets as a threat to their shambas and crops. This is not a problem as long as the amount of water running off the road and into the shambas is controlled using the following methods:

- First of all discuss with landowners about the problem and possible solutions before starting the work.
- Dig as many ditch outlets as possible to reduce the effects of large water volumes.
- Culvert and outlets cannot always be directed into existing water streams, so small dams can be built at the end of the outlets and may even serve as small water reserves during dry seasons.
- Soak-away pits can be excavated and filled with stones to allow water to seep into the ground.
- Water from the ditches can also be directed into fanya juu irrigation channels in the shambas.

How to Improve **YOUR** Road

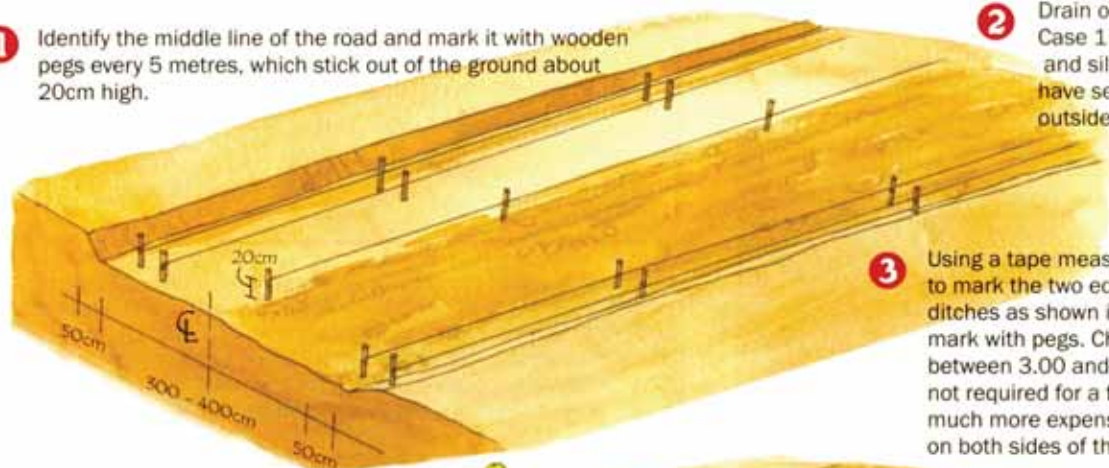
DO NOT USE QUARRY DUST!

Be very careful about your choice of material for building your road. Very often farmers use quarry dust on their roads because it is cheap and easy to acquire. This ends up damaging your road even more in the long run. Use only the best soils, gravel or stone on your road! However, quarry waste, which usually consists of stones and chippings may be used as surface material but needs to be carefully placed (see page 9 for details).

CASE 2

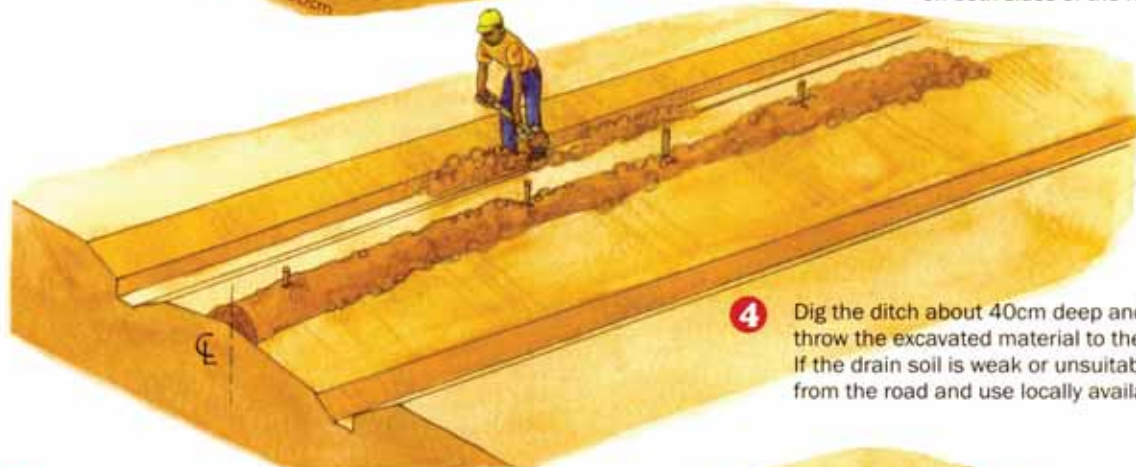
Muddy road sections where road is flat or sunken

- 1** Identify the middle line of the road and mark it with wooden pegs every 5 metres, which stick out of the ground about 20cm high.



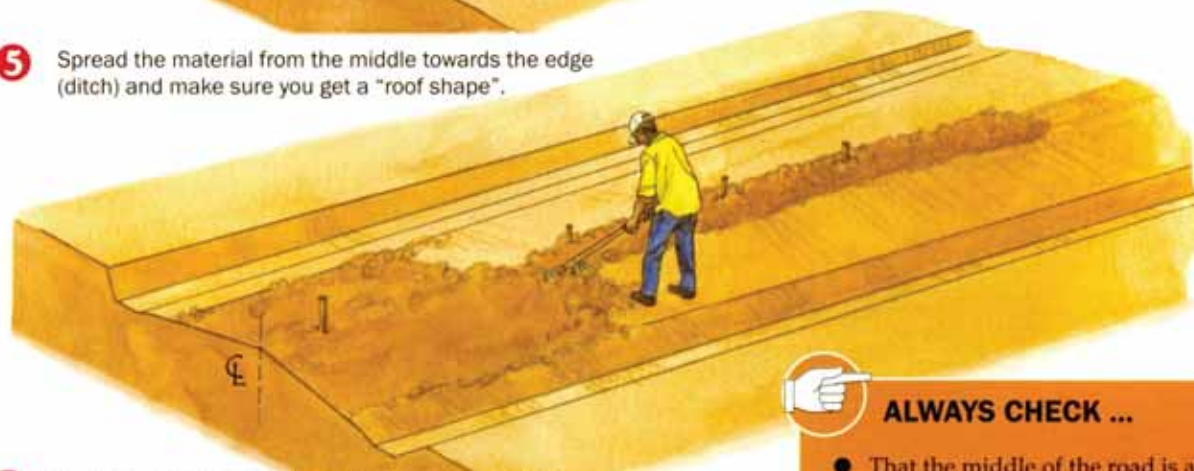
- 2** Drain off any standing water using Case 1 methods. Remove any topsoil and silt within the area you have set out and deposit it well outside the road.

- 3** Using a tape measure, from the middle or centre to mark the two edges of your road plus the ditches as shown in the drawing and also mark with pegs. Choose the road width to be between 3.00 and 4.00 metres (a wider road is not required for a farm road and would make it much more expensive). Also set out the ditches on both sides of the road, about 50cm wide.



- 4** Dig the ditch about 40cm deep and 50cm wide and throw the excavated material to the middle of the road. If the drain soil is weak or unsuitable, then discard it away from the road and use locally available better quality soil.

- 5** Spread the material from the middle towards the edge (ditch) and make sure you get a "roof shape".



- 6** Compact the spread material using a loaded vehicle. Drive several times over the road from one edge to the other.
- 7** Reshape again in case of uneven places and correct the "roof shape" where necessary.
- 8** Open ditch outlets as described in Case 1. If the water will still not drain away, then it may be necessary to use more material to build up the road "roof" to a higher level. This will cater for the frequent sunken road profile where the road needs to be effectively built up on an embankment.
- 9** Add gravel or quarry waste as described on page 9.



ALWAYS CHECK ...

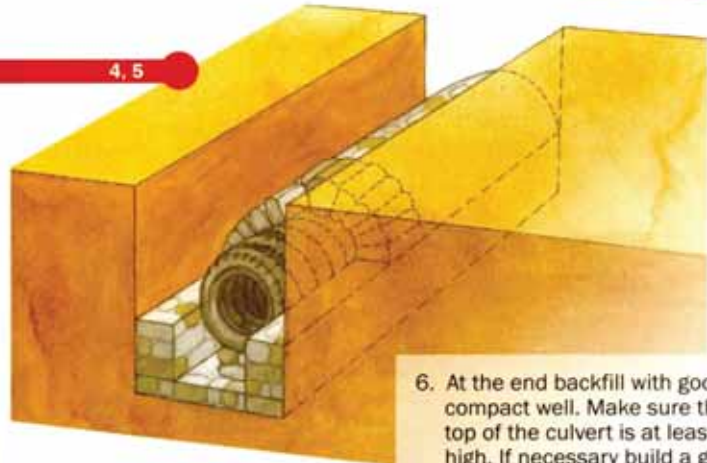
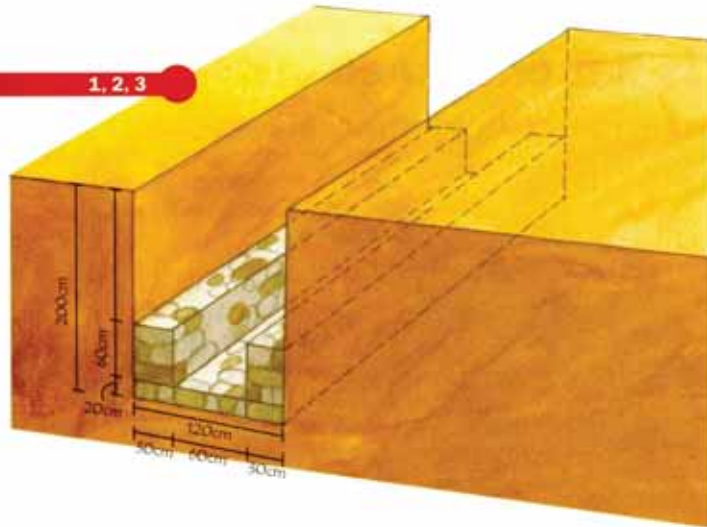
- That the middle of the road is at least 20cm higher than the edge.
- That the ditch is at least 40cm deep, 50cm wide and that the bottom has a uniform gradient.
- That water can drain from the surface to the side ditch and therefore dries up quickly after rains.
- Where potholes are; usually where the road is too flat or often under trees where the road cannot dry up quickly after rains.

CASE 3

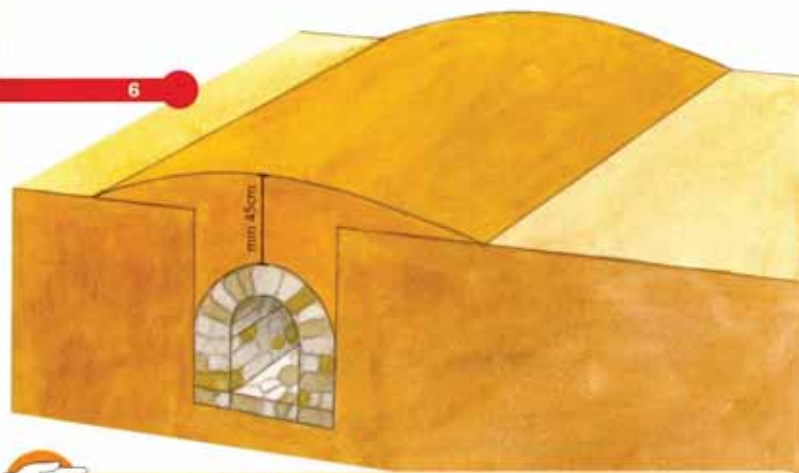
Missing cross-drainage (culverts, drifts)

Masonry Arch Culvert

This is a possible solution where stones are available.



6. At the end backfill with good soil and compact well. Make sure the fill at the top of the culvert is at least 40 - 50cm high. If necessary build a gentle ramp over the culvert.



CULVERTS

In cases where roads are passing through land that is sloping across the roadway, water collected in the ditch on the hillside has to be lead through culverts or drifts to the valley-side so that it cannot damage the road.

Concrete culverts are the common solution but are expensive to buy.

Incase you cannot get concrete culverts, making cheaper alternatives is possible, as explained in these two pages.



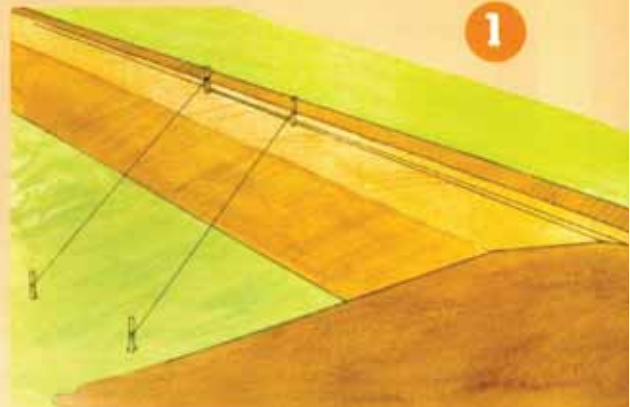
BEFORE YOU START ANY WORKS

Visit your local District Roads office and ask the District Roads Engineer whether you can be assisted with concrete culvert rings and a technical person who can advise on how to lay them.

1. Dig the trench for the culvert. The width should be about 120cm, the depth should be about 200cm from the road surface. Make sure the bottom of the trench has a slight gradient (about 1cm drop every 25 - 50cm) to the outlet to allow water to run off. You must ensure that the culvert will drain properly from the outlet to the surrounding ground or watercourse. Build up the road surface if necessary.
2. Construct the foundation and bottom about 20cm thick. Either use well shaped stones that fit together with very thin clay joints, or use untrimmed stones with sand-cement mortar joints (usually preferable).
3. Build the sidewalls, each about 30cm thick, to a height of about 60cm.
4. Use old tyres to make a formwork for a section of about 100cm length. Build an arch on top.
5. Remove the tyres carefully and continue with the next section. Make sure the sections interlock well.

Mini- Drift

An open cross-channel leads the water from the upper ditch and the road surface to the other side and off the road. The drift may have to be shallow to enable vehicles to pass through.



Set out the location and four corners of the drift. The drift should be about 2 to 3 metres wide and may have to be skewed to ensure a gradient for the water to easily run across and away from the road.



ALWAYS CHECK ...

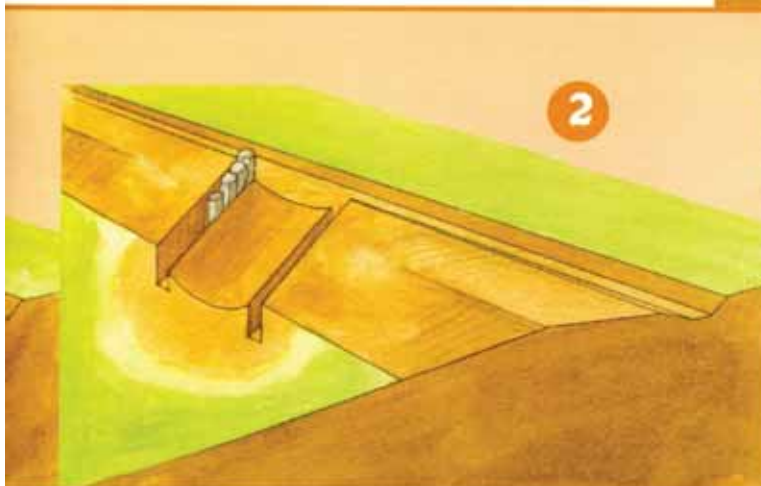
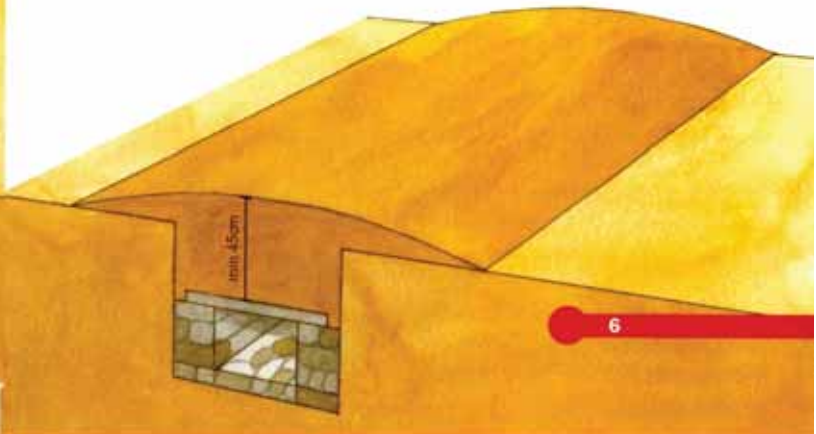
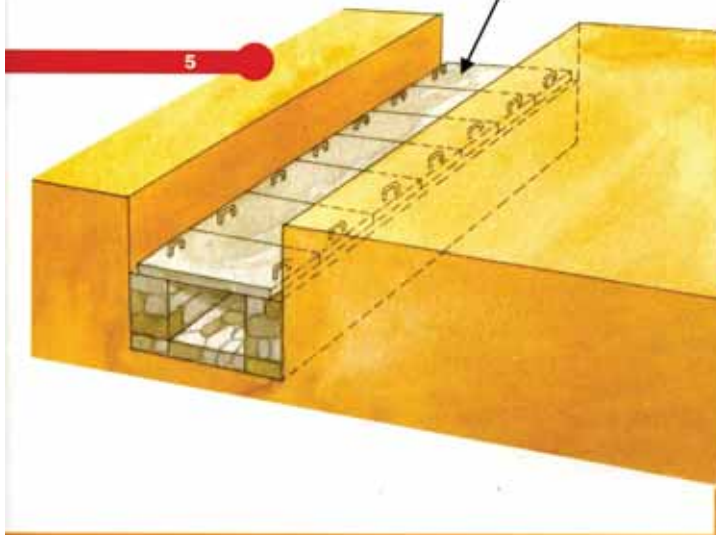
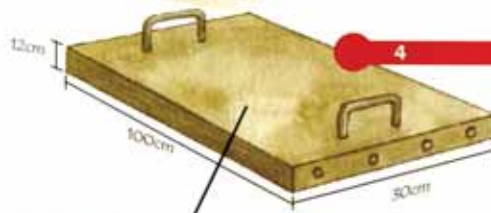
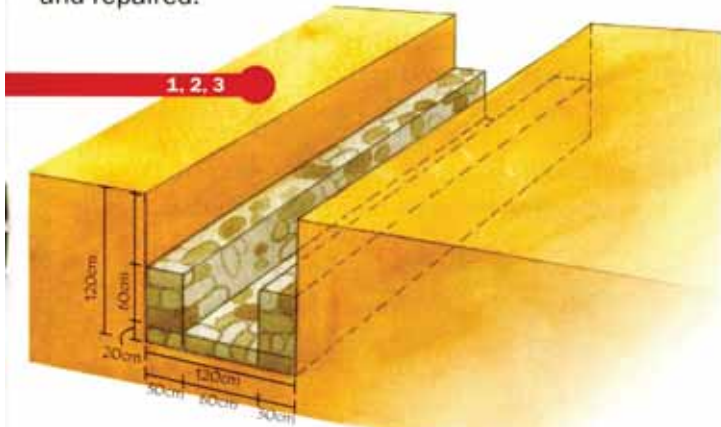
Establish the correct culvert levels to avoid them getting blocked by ensuring that:

- the inlet level of the culvert is below the ditch level,
- the culvert has a gradient of 2% to 4% (about 1cm drop every 25 - 50 cm),
- the culvert outlet has a similar gradient or is steeper, so that the water can run off freely.

Masonry Box Culvert

This culvert type can be built where stones are available for masonry works but there is insufficient height for an arch. An advantage of this culvert is that it can easily be de-blocked and repaired.

1. Dig the trench for the culvert. The width should be about 120cm, the depth should be about 120cm. Make sure the bottom of the trench has a slight gradient (about 1cm drop every 25 - 50cm) to the outlet to allow water to run off. You must ensure that the culvert will drain properly from the outlet to the surrounding ground or watercourse. Build up the road surface if necessary.
2. Construct the foundation and bottom about 20cm thick. Either use well shaped stones that fit together with very thin clay joints, or use untrimmed stones with sand-cement mortar joints (usually preferable).
3. Build the sidewalls. Bed the slabs on clay or (preferably) sand-cement mortar, each about 30cm thick, to a height of about 60cm.
4. Cast concrete slabs (100cm long, 30cm wide and 12 cm high). Add 4 reinforcement bars of 12mm diameter and allow for protruding loops to be able to carry them.
5. Lay the concrete slabs as culvert covers on top of the sidewalls. Bed the slabs on clay or (preferably) sand-cement mortar.
6. Backfill with good soil with a minimum of 40cm and compact. Build up the road surface if necessary.



Dig the trenches for the two edges. The stones forming the edge have to be at least 40cm high and need to be firmly packed into the soil. Dig out the oval bed for the stones forming the bed.

Then place the stones upright which should be at least 25cm high. Voids between the single stones should be filled with smaller stones that are wedged in using hammers and very well compacted. Ensure that the outlet of the drift is freely draining. If available you can also set the stones into cement mortar (mixture - cement 1 part : sand 4 parts) for a more durable drift.

CASE 4

Steep, slippery section



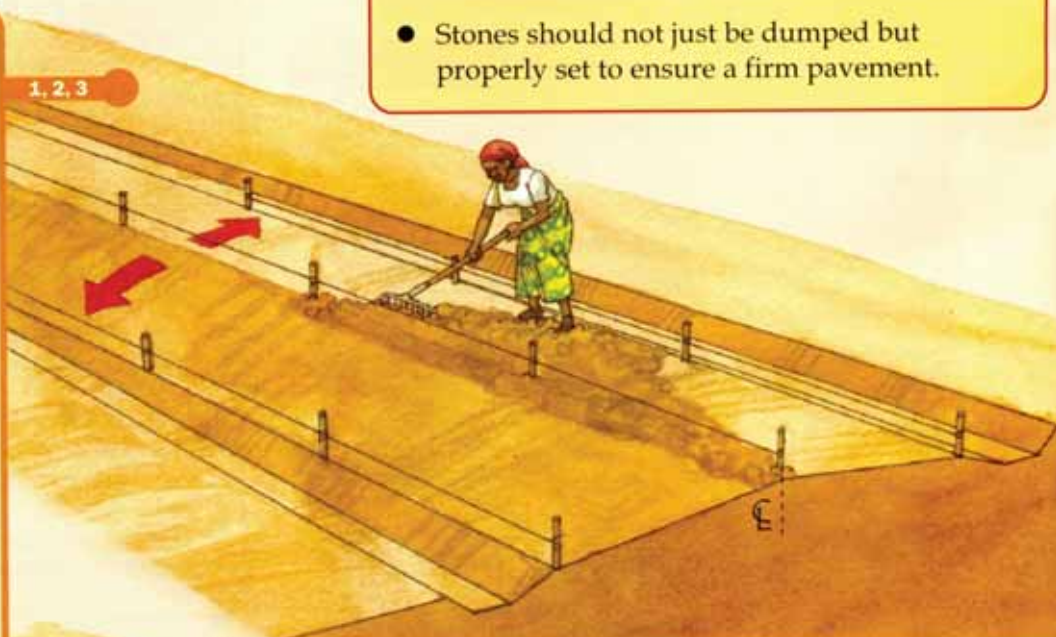
USEFUL TIPS

- Earth or gravel steep sections will quickly erode and should be covered with a more durable surface.
- Stone paving is a durable solution that utilises local materials and is relatively affordable.
- Stones should not just be dumped but properly set to ensure a firm pavement.

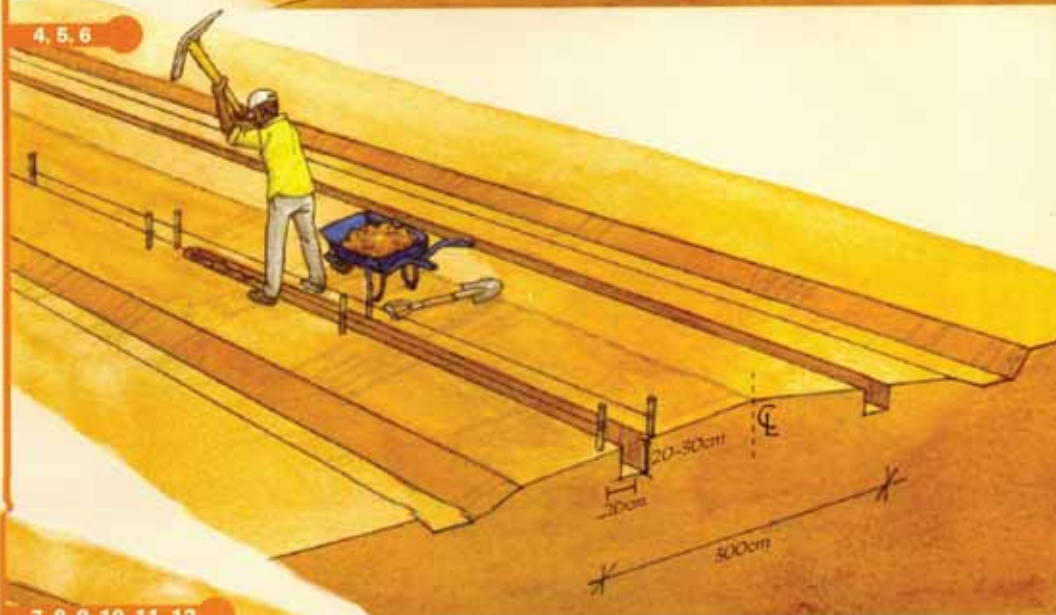
Stone Paving

1. Construct the road first with a 'roof' shape as shown in Case 2.
2. Let the road section settle for at least one rainy season or use a compactor to improve the surface.
3. Reshape the road again to ensure the surface is smooth and has the 'roof' shape.
4. Set out the 3m wide pavement area.
5. Excavate trenches about 20 - 30cm deep and 20 cm wide along both pavement edges.
6. Firmly set the biggest stones in those trenches so that they still protrude about 10 to 15cm.
7. Fill in between the two edges (kerb) with well placed stones.
8. Fill the gaps between the larger stones with small ones and wedge them in well.
9. Should you have sand nearby you can fill the gaps between the stones with a mixture of sand and clay.
10. Fill material from the ditch along the kerb on the shoulder and compact well.
11. Plant grass on the shoulder to ensure it stays firm.
12. Stone paving can also be used as a surface for other problem road sections.

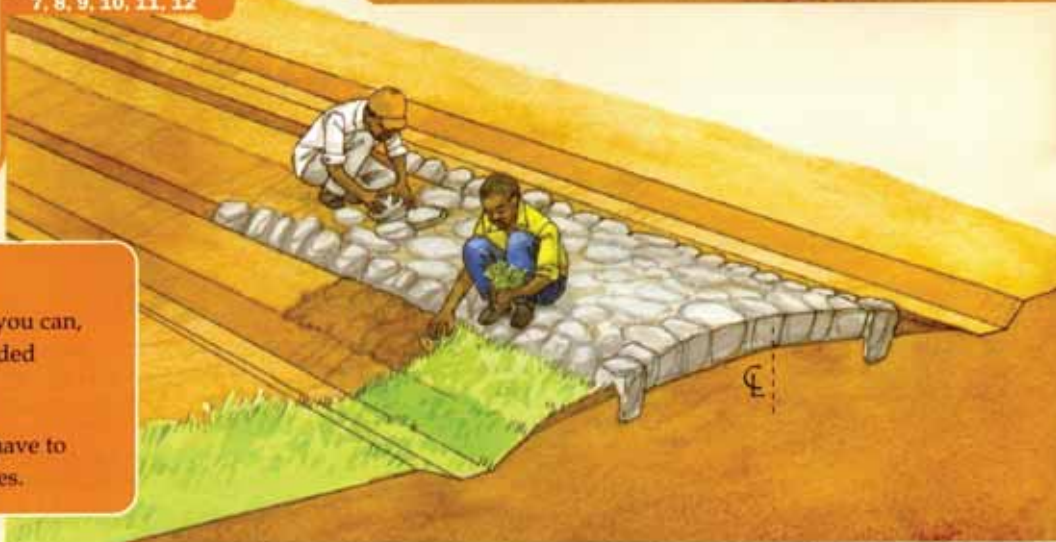
1, 2, 3



4, 5, 6



7, 8, 9, 10, 11, 12



ALWAYS CHECK ...

- Compact the surface as much as you can, using either a roller or a fully loaded tractor or lorry.
- If you cannot compact you may have to regularly add/replace some stones.

Running Strips

This is an alternative economic solution for steep, short sections with little traffic on poor soil. They can be made using stone masonry.



USEFUL TIPS

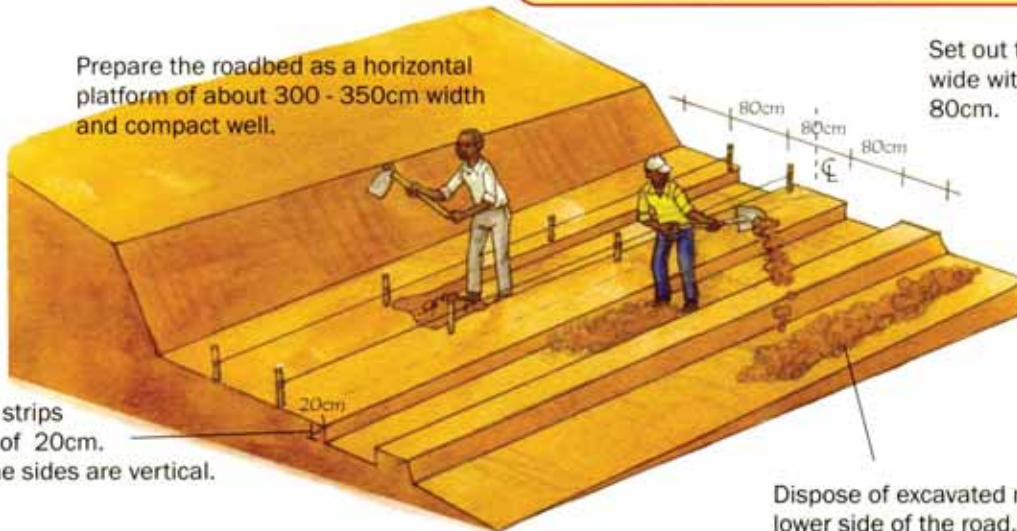
- Use gravel only if it can be found near the road and if it is of acceptable quality (see quality guideline on last page). Long transport distances can make gravel very expensive.
- Instead of gravel also quarry waste can be used. Quarry waste consists usually of stone chips and stones. Do not just dump stones onto the road but place them carefully as explained for Stone Paving on page 8. Add a thin layer of sandy soil on top to smoothen the surface.

1

Prepare the roadbed as a horizontal platform of about 300 - 350cm width and compact well.

Set out the strips each 80cm wide with a gap in between of 80cm.

Excavate the strips with a depth of 20cm. Make sure the sides are vertical.

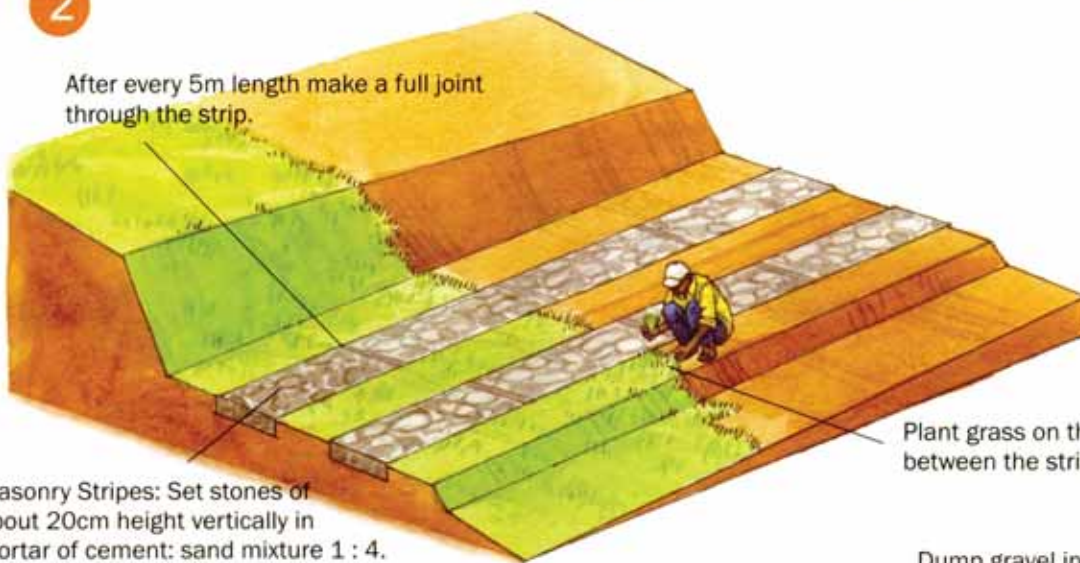


Dispose of excavated material on the lower side of the road.

2

After every 5m length make a full joint through the strip.

Masonry Stripes: Set stones of about 20cm height vertically in mortar of cement: sand mixture 1 : 4.

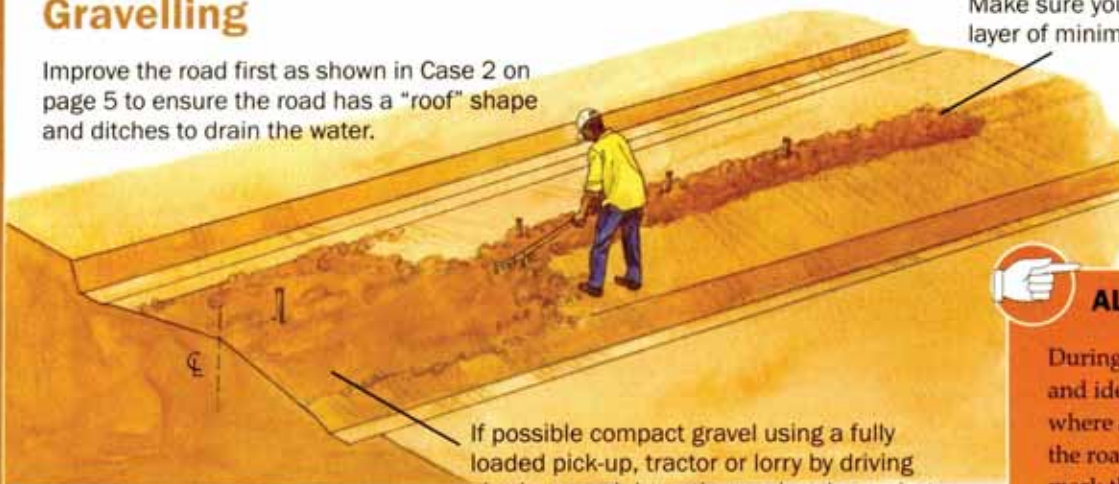


Plant grass on the shoulder, slopes and between the strips.

Dump gravel in the middle of the road and spread uniformly towards the edge. Make sure you add enough gravel to have a layer of minimum 10cm thickness.

Gravelling

Improve the road first as shown in Case 2 on page 5 to ensure the road has a "roof" shape and ditches to drain the water.



If possible compact gravel using a fully loaded pick-up, tractor or lorry by driving slowly up and down the road and covering the whole surface from one edge to the other.



ALWAYS CHECK ...

During rains walk along the road and identify the places/sections where a lot of water runs along the road and where it ponds, and mark those sections with pegs

Why Maintenance is Important



REMEMBER THAT ...

The effects of neglected maintenance are serious for you and your neighbours:

- Your road disintegrates very quickly, especially during the rains. **No road = Little income!**
- All the efforts and money you have spent to improve your road are lost in no time!

Road maintenance ensures that:

- Your road remains open at all times so that you can transport your farm products and reach the market, collection centre, clinic, school and other important places.
- Your transport costs are lower if vehicles can reach on time and are not damaged by a rough road.
- You safeguard the money and efforts that you have invested at the time when you improved and repaired your road.

Repair works: Running strips ☀️ 1 2 6 7

? When do I do what

? How do I do it?

? How do I pay for it?

Carrying out Main

Reshape carriageway to roof-shape ☁️ 2 5

Open side drains ☁️ 1 2

Open outlets, culverts, mini drifts ☁️ 1 2



REMEMBER THAT ...

- **Preventive maintenance;** are activities carried out to ensure that the road will not be seriously damaged by rain or traffic.
- **Minor repairs;** are activities for small defects, such as filling potholes, replacing loose stones in mini-drifts or stone pavements, etc.

PLANNING

Maintenance Works



When do we do what?

- Before the rains make sure all drains are open and potholes are filled.
- During the rains it is important to always clean out blocked drains.
- After rains carry out repair works like filling potholes, repairing structures and stone paving.

How do we pay for it?

- Collect contributions from road users.
- Request support from the CDF and LATF and other funds.
- Ask for voluntary work from road users and beneficiaries.

How do we do it?

- Form a road-user committee to manage your road works.
- Carry out work through voluntary contributions. For example organise official road maintenance days where each family provides one family member to carry out works.
- If you have collected enough money from road users, you can employ a person or groups of people to carry out maintenance works.
- If you have technical problems or questions, ask for advice from the District Roads Engineer of the Ministry of Roads.

Maintenance Activities



Activity Season

- before rains
- rainy season
- dry season

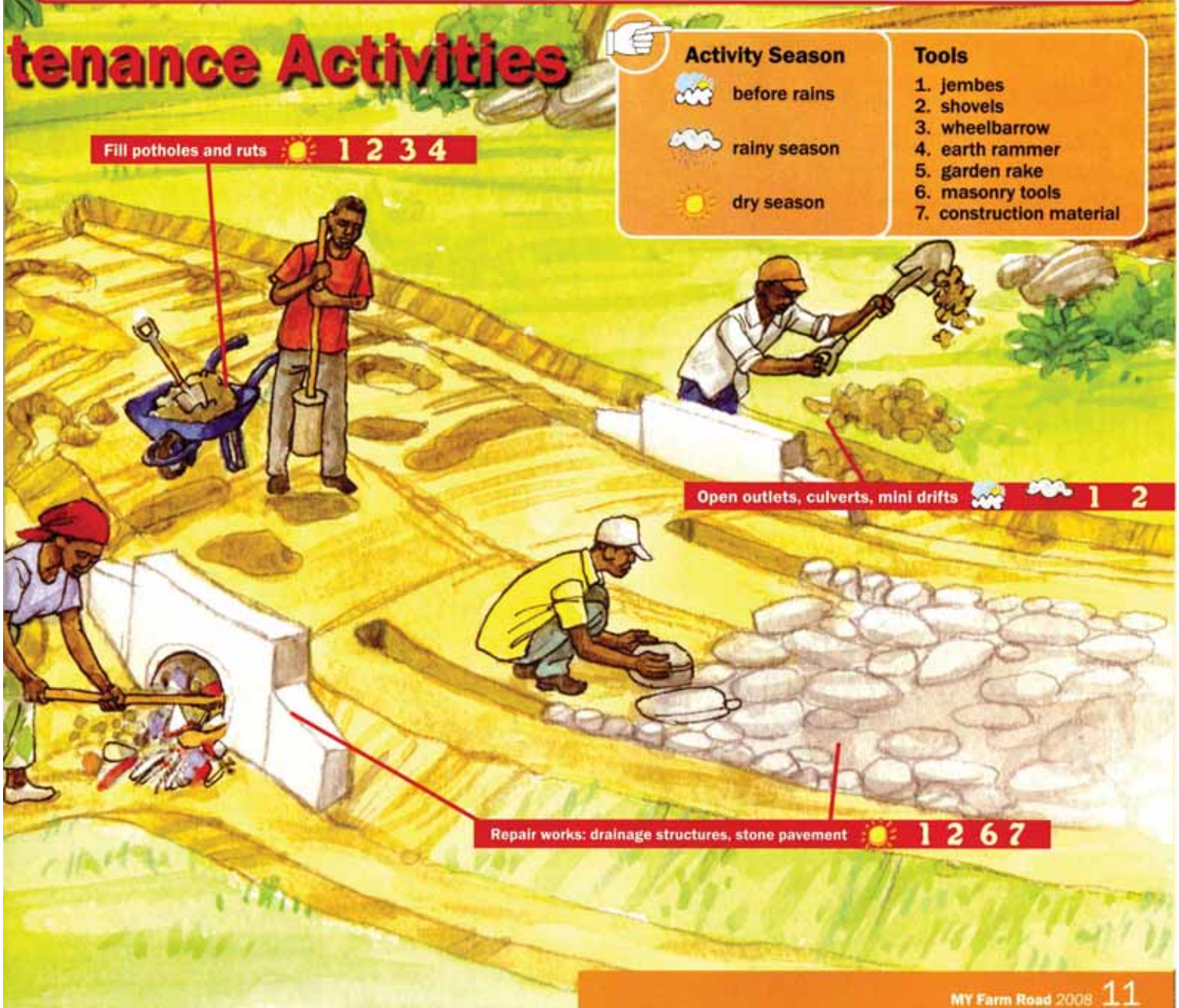
Tools

1. jembes
2. shovels
3. wheelbarrow
4. earth rammer
5. garden rake
6. masonry tools
7. construction material

Fill potholes and ruts 1 2 3 4

Open outlets, culverts, mini drifts 1 2

Repair works: drainage structures, stone pavement 1 2 6 7



How to Test Soil for Your Road Works

Useful Tips

Soils suitable for road works: ✓

- Gravel with Little Clay = GOOD
- Gravel with Much Clay = FAIR
- Sand with Much Clay = FAIR
- Sand with Little Clay = POOR
- Clay is suitable for road works in combination with sand and / or stones only (see gravel). Clay acts as the binder to keep the stones and sand grains together.

Soils unsuitable for road works: ✗

- Silt and organic soil
- Clay only (without stones and/or sand)

How to Differentiate Clay from Silt

Mould a pat of soil to the consistency of putty, adding water if necessary. Allow the pat to dry completely and test its strength by breaking and crumbling between the fingers.



- Clay has a high dry strength and does not crumble easily,
- Silt has only very slight strength and crumbles easily

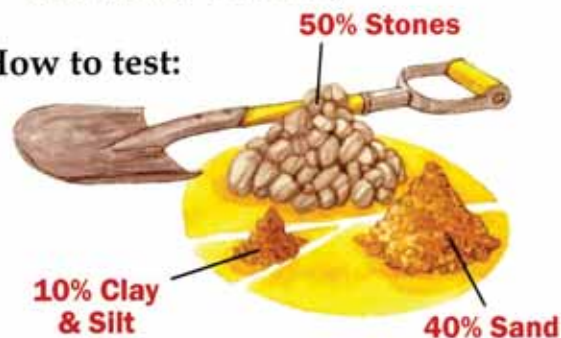
What is gravel?

Rule of the Thumb:

Gravel is a mix of:

- Fine Grain Soil = 10% Clay and Silt (smaller than 0.06mm looks like powder)
- Medium Grain Soil = 40% Sand (0.06mm - 2.0mm)
- Coarse Grain Soil = 50% Stones (bigger than 2.0mm - 37.5mm)

How to test:



1. Collect about two full shovels from the gravel that you think is suitable for your road work,
2. Spread the material on a clean platform and if wet let it dry first,
3. Select all stones from the sample and keep it on a separate heap,
4. From the remaining material try and separate sand and clay/silt from each other,
5. Estimate the approximate percentage of the three separated samples.

**The
Organic
Farmer**

THE MAGAZINE FOR SUSTAINABLE AGRICULTURE

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www.organicfarmermagazine.org

PUBLISHED BY
Kenya Roads Board

© KRB June 2008

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