PRACTICAL ACTION
Technology challenging poverty

IMPROVING PATHS AND TRACKS PART 2

technical brief

Paths and tracks that cross wet and marshy areas are often difficult to traverse. In certain seasons they may become flooded, preventing the passage of both goods and people. If there is no alternative access, rural areas may be effectively cut off during rainy periods of the year.

It is possible to build or improve paths through marshy areas, but the solutions tend to be expensive because of the amount of tools, labour, supervision and, sometimes, materials required. Careful planning is required to estimate the amount of resources that will be needed to carry out the improvement works. The 'cost' can then be balanced against the potential benefits that the improved access will bring.

Figure 1a: Stepping stones: flat stones are not suitable

The simplest and most obvious solution is to re-route the path around the marshy area. It can usually be assumed, however, that if this were possible it would have already been done by the local people themselves. This *Technical Brief* describes the techniques that can be used to improve paths and tracks which must pass through wet and marshy areas.

Similar problems occur where paths cross areas of loose sand, and some of the techniques used for marshy areas are also applicable in these situations. For this reason a brief note on improving paths in very sandy areas is included.

It should be emphasised that flexibility and ingenuity are required in employing all these techniques. The approaches described should be used as models to be adapted as necessary to particular local conditions.

Marshy areas

There are three main ways in which paths which cross wet or marshy areas can be improved:

- Stepping stones or stone causeways, in which large stones are firmly set into the ground to provide a stable walkway;
- Rafts or boardwalks, in which a timber walkway is built to sit on top of the wet soil; and

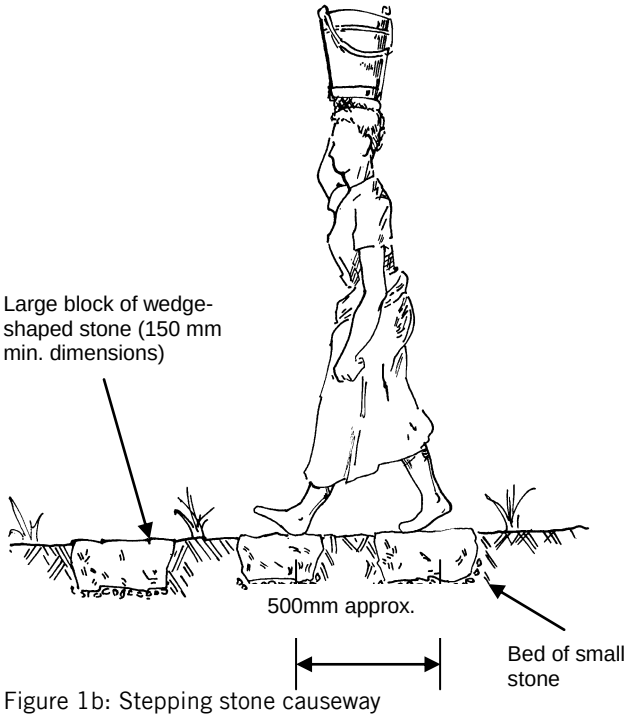

Figure 1b: Stepping stone causeway

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- 'Turnpike section', in which the path or track is built, usually as a small raised embankment, using local soil or imported soil or gravel.

Stepping stones

Stepping stones are a simple method of improving a path that has to cut across wet ground. Flat stones laid on the ground are not suitable – they tend to move when they are walked upon or to sink into the wet soil. The stones used should be as large as possible and block- or wedge-shaped. Each stone should be set firmly in the ground on a bed of small stones. The top surface of the stones should be level with, or slightly above, the ground level, as shown in Figure 1.

Variations on this method include a 'rock box' (see Figure 2) and a fully stone-paved path. Both these methods produce a surface which is rough to walk on and difficult for pack animals and carts. They are not generally recommended, although a 'rock box' covered with a thin layer of soil or sand may be appropriate for some very short sections.

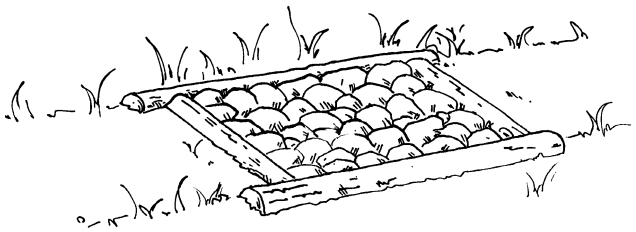

Figure 2: Rock box

In areas where suitable stones are not available, an alternative is to use sandbags filled with concrete, as shown in Figure 3. The method is to fill the sandbags with dry aggregate and cement in the proportions of about 4 to 1. These are laid on the surface of the path and gently tamped into position. They are then watered and allowed to set. If the ground is naturally very wet, watering may not be necessary. This forms a solid causeway slightly above the level of the surrounding ground.

Figure 3: Concrete sandbags

Rafts

Rafts, sometimes called boardwalks or puncheon, are made of timber. They form a walkway which is raised above the wet ground. Rafts are by nature of light construction and for this reason are better suited to areas of waterlogged soil than true marsh. There are a number of different designs, but the one shown in Figure 4 is one of the most appropriate for rural areas.

Two logs, approximately 15 to 20cm in diameter, are placed close to each other along the line of the path. Planks or boards one metre long and 5cm by 15cm in cross-section are laid side-by-side across the two logs. The planks are fixed to the top of the logs with 10 to 15cm-long nails. A small gap is left between the planks to allow rainwater to drain through. The gap should normally be 20 to 25mm wide, but this distance should be reduced to 16mm at most if small-hoofed animals such as sheep and goats will be using the raft.

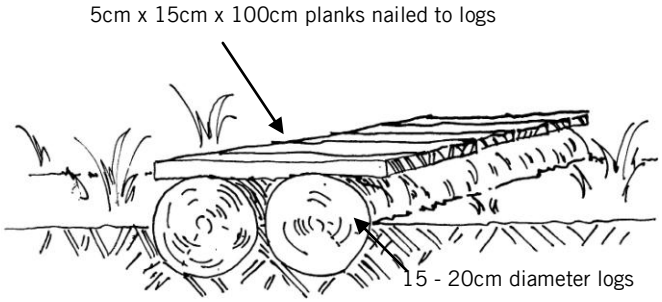

Figure 4a: Raft section

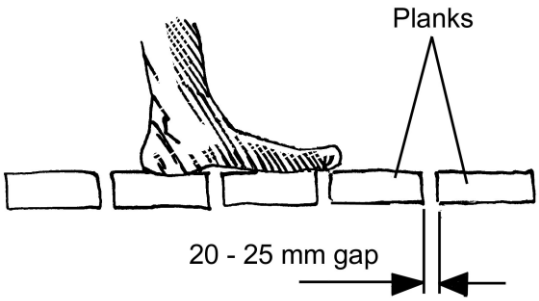

Figure 4b: Detail of raft planks

Turnpike sections

Turnpike sections are used for lengths of path improvement over about 50 metres. The general method, illustrated in Figure 5, uses material excavated from the side ditches to raise the path or track above the surrounding ground.

Two logs 15 to 20cm in diameter are laid along the edges of the path one metre apart. They are fixed in position by wooden stakes 6 to 8cm in diameter and about 80cm long, driven in on each side of the logs. Ditches are excavated on both sides of the path and the soil from the ditch is used to fill in between the logs. The soil is compacted and the top surface formed to make a crown at the centre, about 5cm above the level of the top of the logs.

In areas where logs are not easily available, they can be replaced by large stones or rocks. The rocks should be fixed by partly burying them in the ground. Similar-sized rocks are required to provide an even finish to the path edge. This method leads to a more irregular path than one constructed using logs.

A variation on the general method is to use imported soil or granular material to fill the space between the logs instead of soil from the adjacent ditch. This can result in a more durable path but is obviously more expensive. It may be necessary if the area through which the path is being constructed is permanently waterlogged.

A further variation on this method is to use either brushwood or a man-made membrane beneath the fill material to prevent it from sinking or being pressed into the underlying wet soil by the passage of people and animals.

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Brushwood

Brushwood does not make a very comfortable surface to walk on but it can be a useful method if the ground is very wet and soft, such as 'black cotton soil'. In these circumstances a lot of material will be needed at first before a dry causeway is formed. Brushwood material must be continually added to the path until it no longer sinks and has stabilised and consolidated. The method is illustrated in Figure 6.

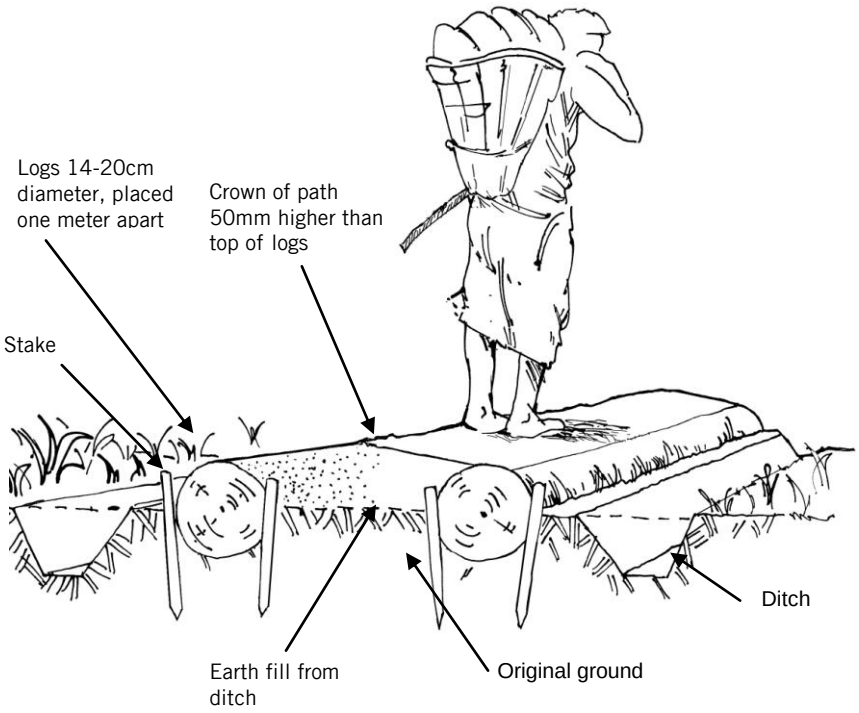

Figure 5: Turnpike section with timber edging

Geotextile membranes

In soft ground the use of geotextile membranes can be effective in constructing a stable path or track. The purpose of the membrane is to separate the material used for the path construction from the underlying soil. This prevents the path's foundation material from sinking into the soft ground and eventually being lost.

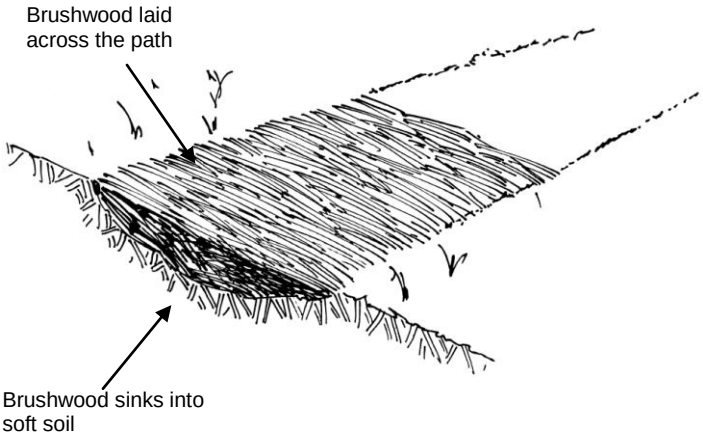

Figure 6: Brushwood causeway

Suitable geotextile

membranes are made from polypropylene and polyethylene, and are manufactured in several different thicknesses. They are supplied in rolls, typically about 4 to 5 metres wide and 200 metres long. Proprietary geotextiles are relatively expensive and may not always be affordable. Possible substitutes are old fertiliser bags or large sheets of heavy-duty plastic. Hessian is also a cheap and easily available alternative – but it will eventually rot away.

The membrane can either be laid at ground level, as shown in Figure 7, or at the bottom of an excavated trench on the line of the cleared path. In both methods, the membrane should be cut wider than the finished path. The edges of the material can then be tucked into the adjacent soil to fix it securely.

Sandy areas

Areas of loose sand may appear to present the opposite problem to wet and waterlogged soil, but many of the same techniques can be employed for improving paths and tracks

through these areas. Particularly useful are rafts or turnpike sections using imported material, with or without membranes.

Loose sand is a problem to walk across because:

- it does not contain clayey particles and therefore does not bind together well; and
- the sand particles are all similar in size and therefore tend to act like tiny 'marbles', with little interlocking of adjacent particles.

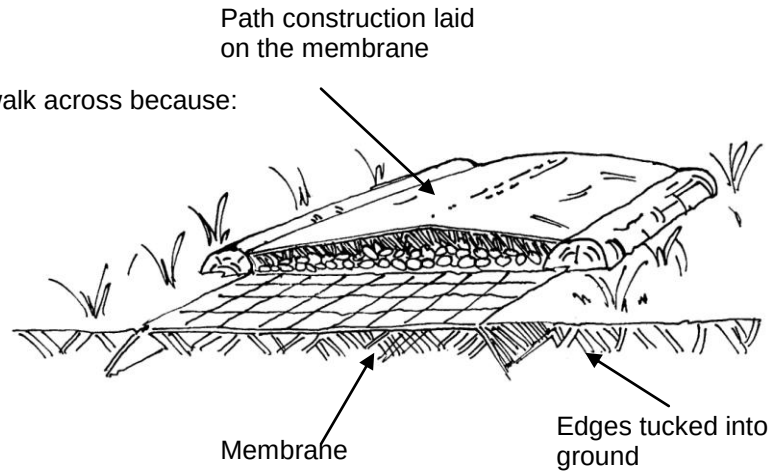

Figure 7: Turnpike with membrane at ground level

The loose sand cannot, therefore, be used directly as fill material in the 'turnpike' method of construction. It will however be suitable if mixed with clayey material brought to the site from elsewhere. Some granular material can also be used in the 'mix' if appropriate. A little experimentation with the proportions of sand and clay available locally will be necessary to arrive at the correct combination. Obviously, the aim should be to use as much local sand as possible to reduce the amount of clay which must be carried to the site.

References and further reading

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Consultants in transport for rural development.
http://www.ittransport.co.uk/documents/Footpath%20manual.pdf (2.4MB pdf)

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