

CHAPTER 5. TRANSPORT AND LAND FORMING

5.3 SPECIALIZED OPERATIONS WITH ANIMALS

5.3.1. LAND FORMATION EQUIPMENT

ANIMAL DRAWN SCOOPS

Animal-drawn scoops can be used for making ponds, grading roads, levelling fields and making areas for "water harvesting". They may be made of steel (Figs. 1 and 2) or wood (Fig. 3). Scoops consist of a collecting box to which two handles are attached. These are used for steering and for tipping (Fig. 3). The leading edge of the collecting box may have a blade or share to cut into the soil (Fig. 1). This should be replaceable, as it is a wearing part. The scoop has a U-shaped steel drawbar, which is free to articulate as the scoop is operated.

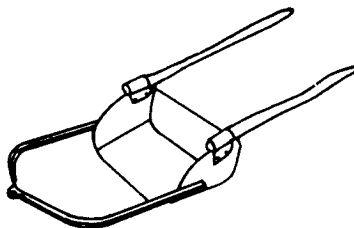
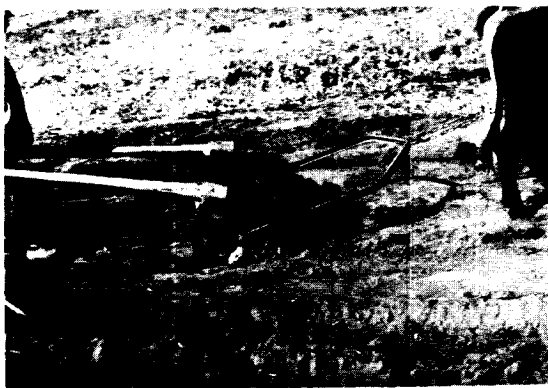


Fig. 1 Steel earthmoving scoop.

Unless the soil is very light and sandy, it is usually necessary to cultivate the land before using a scoop. This can be with a plough or a tine cultivator. It may be necessary to repeatedly alternate scooping operations with cultivation operations, to keep a loose, moveable surface.



*Fig. 2 Steel earthmoving scoop in use in Ethiopia.
Photo: Paul Starkey*

The operator can control the depth of the scoop using the handles. If the operator allows the scoop to dig in deeply, a very high draft force results, causing a strain and discomfort to the animals. With care and practice, the operator can keep the draft force at an acceptable level. In this way even quite light animals (such as pairs of donkeys or cows) can be used with scoops.

Productivity will depend on the animals used, the nature of the soil being levelled or extracted, and the distances involved. In pond-construction in Ethiopia, extraction rates of 8-10 cubic metres of soil per team per day have been achieved.



Fig. 3 Wooden earthmoving scoop in use in Egypt.

Photo: Paul Starkey

BUND FORMERS

Bunds are large ridges, and such ridges can be made using a conventional ridger, a disc ridger or a mouldboard plough. In most cases the plough will be preferred because it is readily available. The size of the ridge can be increased by repeated passes of the plough. Specialized bund formers can be used to build up ridges. One such design is shown in **Fig. 4**.

TERRACING EQUIPMENT

Conventional tillage equipment can be employed for making terraces. If there is much material to move, scoops and levellers may also be useful. Reversible ploughs are preferred for terrace construction, as these can be used to throw the soil to the same side on each pass. If a reversible plough is not available, a single mouldboard plough can be employed by ploughing in one direction only, returning in the other direction without any tillage operation. An initial ridge or bund is formed on

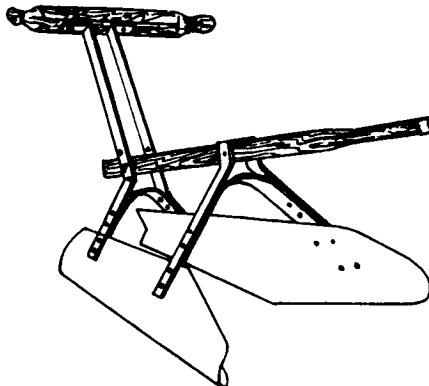


Fig. 4 Animal-drawn bund former.

Source: CEEMAT, 1971

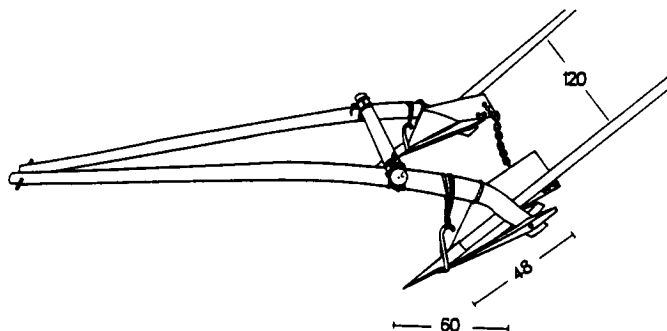
sloping land, then the mouldboard plough is used to turn soil onto it. When the terrace is wide enough, another bund or ridge is formed and the process repeated. Further ploughing with the reversible plough will increase the terracing effect. If much material needs to be moved across the terrace, a scoop can be used. It may be necessary to build up the initial bunds into terrace walls.



*Fig. 5 Broad bed maker on a Nikart wheeled toolcarrier on a research station in Botswana.
Photo: Silsoe Research Institute, UK*

BED MAKING EQUIPMENT

Broad beds have been found effective for vegetable production and for crop production in black cotton soils (vertisols). Broad beds are like large, flat ridges, and these can be made with a conventional mouldboard plough. An initial ridge is made by two passes of the plough, and the



*Fig. 6 Broad bed maker made from modified maresha ard ploughs in Ethiopia.
Source: ILCA, 1988*

width is then increased by subsequent passes. More complicated equipment mounted on a wheeled toolcarrier can be employed (Fig. 5), but these are normally too expensive for smallholder farmers.

In Ethiopia, where mouldboard ploughs are not generally available, a broadbed maker has been made by fitting simple opposite mouldboards to two traditional *maresha* ard ploughs (Fig. 6). This is effective and quick, but the draft is quite high.



Fig. 7 Simple wooden leveller in use in Egypt.

Photo: Paul Starkey

LEVELLING BOARDS

It is often necessary to level terraces or fields that are to be used for irrigation or water harvesting. A scoop can be used for levelling - taking soil from higher areas to fill depressions. Alternatively, a simple levelling board can be used. This can be a simple log (Fig. 7) or a ride-on board or buckscraper (Fig. 8). An inverted harrow may also achieve similar results. The levelling board acts as a grader, accumulating soil in front of it on raised sections, and depositing the soil in depressions. The effectiveness of it can be altered by varying the position and weight distribution the operator.

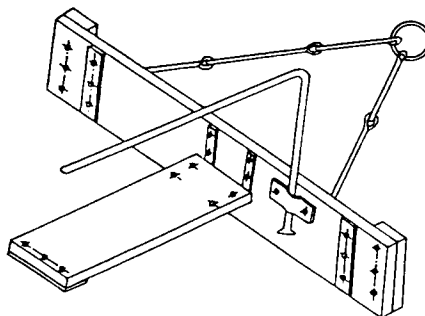


Fig. 8 Wooden levelling board or buckscraper.
Source: Pathak, 1984