CHAPTER 3. SEEDBED PREPARATION

3.1 INTRODUCTION TO SOIL CULTIVATIONS

3.1.1. OBJECTIVES AND TECHNIQUES FOR SOIL CULTIVATIONS

TILLAGE OBJECTIVES

Tillage involves the disturbance of soil in a manner which will create the optimum conditions for seed germination and eventual plant growth. In general terms, it is only advisable to carry out the minimum number of tillage operations necessary to achieve these ends.

Too much tillage can lead to a breakdown of soil structure, leaving it highly vulnerable to erosion in the event of high winds or heavy rain storms. Too little cultivation may allow unfair competition between weed growth and the desired crop, or will impede correct root development.

Tillage serves three main purposes:

- To control growth of weeds by destroying them or by inverting the soil and burying them
- To increase the infiltration and reduce the run-off of water falling as rain or coming from irrigation supplies
- To disturb and aerate the soil to a depth which allows the plant roots to penetrate deeper, so increasing the water available to the plant in dry conditions and providing a suitable soil atmosphere.

LAND CLEARANCE

When land has recently been cleared or has remained fallow for some time, it may be necessary to slash down heavy superficial weed growth and to remove tree stumps before the soil may be adequately cultivated. Animal power may be used to assist in these operations although the equipment required is rather specialised and its private purchase would normally only be justified when considerable land clearance is envisaged.

PRIMARY CULTIVATIONS

Once the heavy vegetation has been removed from the field, primary cultivation may be undertaken. It is normally preferable to invert the soil using a mouldboard plough to bury the weeds. For heavier soils in regions of moderately high rainfall, a longer "semi-digger" body will be found to give the best results when using animal power. Lighter soils, in contrast, can more readily be inverted and shattered using a shorter "digger" body (**Fig.1**).

Fig. 1 Longer "semi-digger" body for heavier soils (left); Shorter "digger" body for lighter soils (right). *Photos: J.E. Ashburner*

In semi-arid regions where heavy weed growth has not developed and it is more important to rapidly cultivate the land after the first or second rains of the season, it is sometimes preferable to use a scarifier which opens up the soil to improve the infiltration of the next rains. The few weeds present will be uprooted and left near the surface but will be sufficiently controlled to allow the seeds to germinate successfully once planted. Normally two passes are made with the scarifier to prepare the seedbed and secondary tillage will not be necessary.

SECONDARY CULTIVATIONS

The soil surface left by a mouldboard plough will probably contain clods which need to be further broken down to prepare the seedbed ready for planting. Secondary cultivations are aimed at both reducing the clod size and also levelling the soil surface or forming it into the required shape by ridging.

Some type of harrow is normally used for secondary tillage. It may be as simple as a few tree branches or a wooden plank, weighted down with stones and pulled across the field by the animals. A true harrow consists of a wooden frame with metal spikes which breaks the clods, mixes the soil and helps level the surface (**Fig.2**).

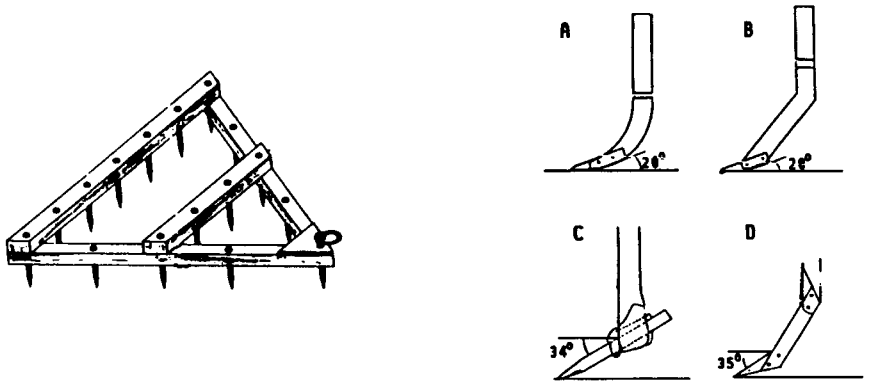

Fig. 2 Sketch of a simple wooden spike tooth harrow (left); Prototype ripper tines as studied by CEEMAT (right) Sources: Hopfen, 1969; Le Thiec & Bordet, 1988

THE RIPPER

The ripper tine (**Fig.2**) can be used to open up a narrow band of soil ready for seeding. In semi-arid climates and where the soil is free of weeds, no ploughing or scarifying may be necessary and this minimum tillage system provides an attractive way to rapidly establish the crop. The system is not however, widely used.

The ripper tine may also be useful after ploughing when few clods have been left and deeper tillage beneath the seed is judged necessary. The ripper can penetrate below the plough pan and also conveniently marks the row for planting.

The ripper may also be used after the field has already been both ploughed and harrowed although the farmer will then notice that three operations are needed before his crop is sown.

THE RIDGER

The ridger (**Fig.3**) should be adjusted to throw the soil sideways enough to construct the required row width. It is used after the soil has first been cultivated with either a plough or scarifier and sometimes a harrow should also be used before ridging is done.

Ridges channel and collect water in the furrow bottom and so should be made along contours to limit run-off during heavy storms. Even with these contour ridges, great care should be taken to protect sloping fields from excess run-off originating in neighbouring fields which could destroy all the ridges constructed and cause heavy damage and crop loss.

On flatter land, tied ridges may assist in retaining rain water from light showers. The ties can be made with a hand hoe, by simply lifting the ridger every few meters (this is tiring) or with a special animal drawn implement made for the purpose (**Fig.3**).

The tied ridges can pose an obstacle for later inter-row weeding operations with animals, unless these are carried out with the same implement or unless the farmer is willing to remake the ties after weeding with a conventional ridger.

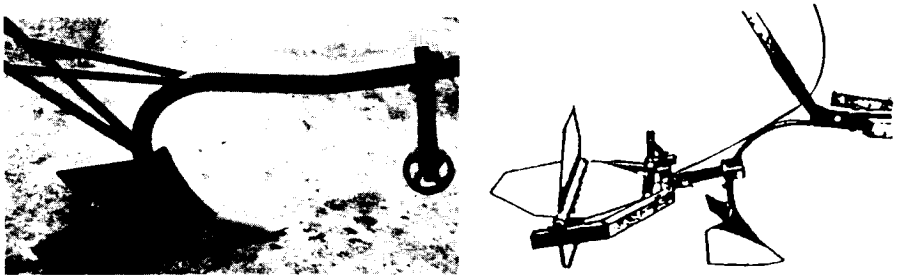

Fig. 3 The AGRIMAL ridger body (left) and an experimental tied ridger (right).
Photo: J.E. Ashburner *Sketch: after Wright and Rodriguez, 1986*