

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY



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COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF AGRICULTURAL ENGINEERING

AI3402 SOIL AND WATER CONSERVATION ENGINEERING

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3.2 Tillage Operations

Tillage operations carried out for conservation of soil are

- (a) Minimum tillage
- (b) No tillage
- (c) Strip tillage

The special benefit of tillage operations are to:

- (1) Increase the soil infiltration capacity
- (2) Improve the soil moisture retention capacity
- (3) Improve the humus content of soil
- (4) Create a rough land surface to protect it against erosion by water or wind.

Minimum Tillage

It is the operation in which tillage and sowing are combined in one operation, as illustrated in Fig. 1.1. Such operations create a coarse soil surface and fine lumps of soil between rows. The loose and porous texture of the soil allows a good infiltration capacity. The surface runoff by this operation is reduced by about 35% and soil erosion by about 40%.



Fig. 1.1. Minimum tillage. (Source: <https://www.dave-koenig.com>)

No Tillage

In the no-tillage system of operation, the soil surface is not disturbed much and left more or less intact. The operations performed are under cutting, loosening and drying of the upper soil layer, so that weeds do not grow and stubbles of the previous crop remain as such in the field.

When there are no weeds, the under cutting operations are not required, and seeds are sown directly into the soil by special types of seed drills. Incidentally, the shifting (Jhoom) cultivation, as illustrated in Fig. 1.2, prevalent in north-east India, is perhaps the best example of no-tillage traditionally followed since hundreds of years. In jhoom cultivation, a part of a forest land is burnt to clear it and seeds are manually dibbled without any ploughing or major soil disturbance. When the naturally occurring soil nutrients are exhausted, the land is abandoned and a new piece of forest land is selected for burning and subsequent cultivation. However, this method of cultivation has a risk of aggravating soil erosion problem if practiced on hill slopes (which usually is the case).



Fig. 1.2. Terrace rice cultivation in Phek district (Jhoom Cultivation).(Source: http://gbpihedervis.nic.in/html/vol16_2/S.S.%20Rathore.htm)

It is found that reduction in soil erosion up to 70% has been obtained through this method of tillage.

Strip Tillage

This operation is an improvement over the no tillage system. In this type of cultivation, narrow strips of approximately 0.2 m width and 0.1 m depth are generally laid out following the contour, and the land between the strips left uncultivated. These are also called loosening strips. In the constructed narrow strips, there are no stubbles, which help in sowing operations and facilitate better plant growth. Fig. 1.3 and 1.4 shows strip tillage done by tractor drawn implement and animal drawn implement.



Fig. 1.3. Strip-tillage. (Source: <https://www.bighambrothers.com>)

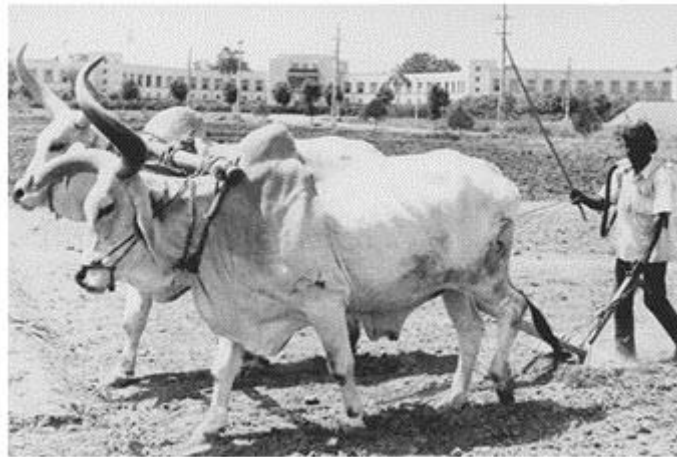


Fig. 1.4. Bullock-drawn shallow chisel desi plough.

(Source: http://www.ilo.org/oshenc/images/stories/enlarged/Part10/AGR_imgs/AGR100_F1.jpg)

The farm implement normally used for conservation tillage operations are:

- (1) V-shaped sweeps
- (2) Arrow shaped blades for control of erosion caused by water
- (3) Chisel like blades for control of erosion caused by wind
- (4) Rod weeders etc.

Mulching

Mulches (soil covers) are used to minimize rain splash, reduce evaporation, control weeds, reduce temperature of soil in hot climates, and allow temperature which is conducive to microbial activity. A view of mulches is shown in Fig. 1.5. Stubbles, trash, other type of vegetation and polythene are some of the most common types of mulches used. These materials are spread over the land surface. Mulches help in reducing the impact energy of rain water, prevent splash and destruction of soil structure, obstruct the flow of runoffs to reduce their velocity and prevent inter-rills erosion, and help in improving the infiltration capacity by maintaining a conducive soil structure at the top surface of the land.



Fig. 1.5. Mulching. (Source: <https://www.thailand.ipm-info.org>)