

Mechanical Weed Management

Tillage and Cultivation Implements

Disc Plow



Primary Tillage Implements

- ▶ Moldboard plow
- ▶ Disc plow
- ▶ Chisel Plow
- ▶ Rototiller

Disks and Offset-Disks



Moldboard Plow



Chisel Plow



Rotary tiller



Spring tooth harrow



Secondary Tillage Implements

- ▶ Harrows
- ▶ Field cultivators

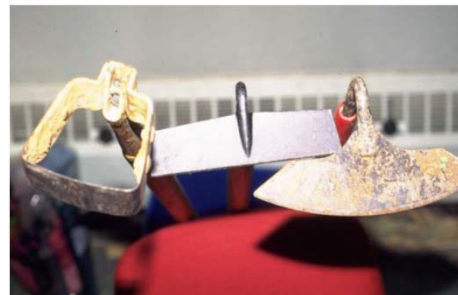
Field cultivator with double spiral roller



Spike tooth harrow



Hand-hoeing



Principles of mechanical weeding

- ▶ In-row weeding is essential!
- ▶ Cultivated rows = plant rows (or some nice fraction).
 - Exceptions - tine weeders & rotary hoes
- ▶ Cultivator must be appropriate for the growth stage of the weeds and crop.
- ▶ Create and maintain a size difference between the crop and the weeds.

Cultivation Implements

Classified according to where they are used in the crop

- ▶ Broadcast: full field or blind.
- ▶ Inter-row
- ▶ Intra-row

Principles of mechanical weeding

- ▶ The effectiveness of cultivation decreases as weed density increases.
- ▶ Increase planting density to compensate for stand loss from in-row machines
 - Especially in small grains
- ▶ Effective cultivation requires good tilth, careful seedbed preparation, and adequate soil drainage

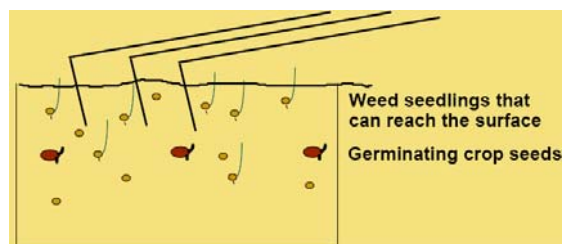
Cultivation Implements

- ▶ Broadcast: full field or blind.
- ▶ Both on and between the crops rows.
- ▶ Pre-emergence or after emergence.
- ▶ Eg flex tine harrows, rotary hoes, and spike tooth harrows.

Principles of mechanical weeding

- ▶ Cultivation and tillage in the dark stimulates germination of fewer weed seeds.
 - At night or cover the implement.
- ▶ Appropriate weather and soil conditions can improve the effectiveness of cultivation.

Preemergence blind cultivation controls weeds near the surface without harming the crop



Flex-tine harrow/tine weeder



Inter-row Cultivation Implements

- ▶ Sweep plows, shovels and weed knives
- ▶ Brush weeders
- ▶ Basket weeders
- ▶ Hilling discs
- ▶ Rolling cultivators

Flex-tine harrow/tine weeder



Sweep plows



Rotary Hoe



Sweep plows

- ▶ Good at undercutting weed root systems, depth can be adjusted to not effect crop.
- ▶ Good at burying small weeds within the row.
- ▶ Low horsepower requirement.
- ▶ Inexpensive.
- ▶ Timing is very important, if weeds get too large within rows cannot be controlled.

Brush Weeders



Brush Weeder Advantages

- ▶ The aggressive nature of the brush weeder increases the length of time available for effective cultivation
 - weeds up to 10 in tall can be controlled.
- ▶ Effective on slightly moist soils.
- ▶ Soil passing under the shields smothers weeds in the crop row.
- ▶ Dust layer that results from brushing delays new weed germination.

Horizontal Brush Weeder



Brush Weeder Disadvantages

- ▶ Requires two operators.
- ▶ Wind erosion possible with aggressive brushing on dry soils.
- ▶ Row spacing modifications are expensive and time consuming
 - all cultivated crops must have the same spacing.
- ▶ The initial implement purchase is costly.

Vertical Brush Weeder



Basket weeder



Basket weeder

- ▶ Rolling cages or rolling baskets.
- ▶ Excellent for uprooting weeds.
- ▶ Ground driven by movement of tractor
- ▶ First set of baskets loosens soil.
- ▶ Second set pulverises soil and uproots weed seedlings.

Rolling Cultivators



Hilling discs



Rolling cultivators

- ▶ Tills with gangs of 3 to 5 spiders
 - wheels of strong, curved, cutting teeth radiating from a center hub
 - Or notched disks –Disks are more aggressive than spider gangs and are more effective in residue.
- ▶ Work parallel to rows so as to not bury small crop plants by throwing soil on them.
- ▶ Can be offset later to throw soil into or away from the row.

Hilling Discs

- ▶ Can be used very effectively to bury weeds within rows of taller crops, ie. beans, broccoli, eggplant, etc.
- ▶ Discs can be inverted to gouge weeds out and throw away from plant row..
- ▶ Cannot be used on all crops.
- ▶ Virtually ineffective at uprooting and dismembering.

Intra-row cultivation

Finger weeder



Torsion weeder

- ▶ Selectivity due to the crop being better rooted than the weeds.
- ▶ Coiled base produces a flex action of the tips that dislodge weed seedlings.
- ▶ Adjusted within the field for:
 - crop stage, resistance to uprooting
 - weed susceptibility, and soil conditions.

Finger weeder

- ▶ Rubber fingers from opposite cones connect within the row to pull small weeds.
- ▶ Weeds uprooted and pulled away from crop.
- ▶ Gentle to well rooted crops.

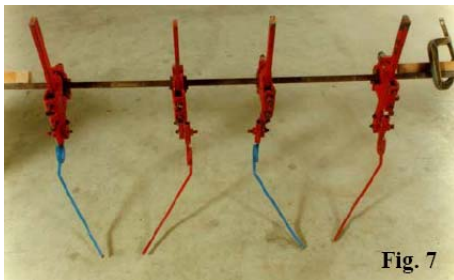
Disadvantage

- ▶ Require very accurate steering to work very close to the crop rows.

Spring hoe weeder



Torsion weeder - pairs of spring tines mounted on a rigid frame



Spring hoe weeders

- ▶ In paired sets.
- ▶ Less flexible but more aggressive than torsion weeders.
- ▶ Flex and vibrate just below the soil surface.
- ▶ Usually follow spiders or other inter-row cultivators for greater precision.