Mechanical Weed Management

Tillage and Cultivation Implements

Primary Tillage Implements

- Moldboard plow
- Disc plow
- Chisel Plow
- Rototiller

Disks and Offset-Disks

Moldboard Plow

Chisel Plow
Secondary Tillage Implements

- Harrows
- Field cultivators
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

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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.

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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

- Weed seedlings that can reach the surface
- Germinating crop seeds
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

Rotation 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.
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.

Brush Weeder Advantages

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.

Brush Weeder Disadvantages

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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.

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, i.e. 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

- 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.

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.

Spring hoe weeder

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