



Mechanical Weed Management in Organic Crops

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Mechanical Weed Management in Organic Crops

- Necessary to understand in a system context
 - What role does tillage play in your farming system?
 - What tillage tool is critical for your farming system?
- Tillage or lack of tillage affects vertical and horizontal distribution of weed seed and vegetative propagules

Tillage and cultivation

- Timing and weed size are critical
- Tilling in fall can eliminate winter annuals and biennials along with injuring perennials
- Spring tilling can eliminate first flush of summer annuals
- Most effective methods are burial to ½ inch or cutting at soil surface

Tillage and selectivity

- Selectivity is the ratio between weed control and crop injury
- Selectivity greatest when crops differ from weeds in:
 - Growth habitat
 - Emergence time
 - Maturity time
- Weeds with short emergence period better controlled than those with longer emergence period

Tillage and cultivation

- Vary your tillage and cultivation tools to fit the situation
- Cultivation is best done when weeds are small
- Shallow tilling when weeds are in the white thread stage will avoid bringing up weed seed
- Burial versus uprooting versus cutting
 - Burial works best for small weeds especially in the crop row
 - Burial best done when crop is larger than the weed
 - If burying small weeds soil must be dry

Tillage and cultivation

- Burial versus uprooting versus cutting
 - Aim of uprooting is to eliminate soil-root contact
 - Uprooting weeds works best when the soil is damp
 - Remove as much grass roots as possible because growing point is near soil surface

Tillage and cultivation

- Burial versus uprooting versus cutting
 - Slicing or cutting can effectively destroy shoot-root connection
 - Best done when soil is dry
 - Some hoes such as stirrup hoe are designed to be pulled over soil surface to cut off weeds
 - Some weeds such as purslane and crabgrass will reroot

Stale seedbed



- Soil tilled early
 - Encourages early weed flushes
- Delay cropping until main flush of weed emergence has passed
- Emerged weeds killed with shallow tillage, flaming, or organic herbicides
 - Do not till below $\frac{1}{4}$ to $\frac{1}{2}$ inch

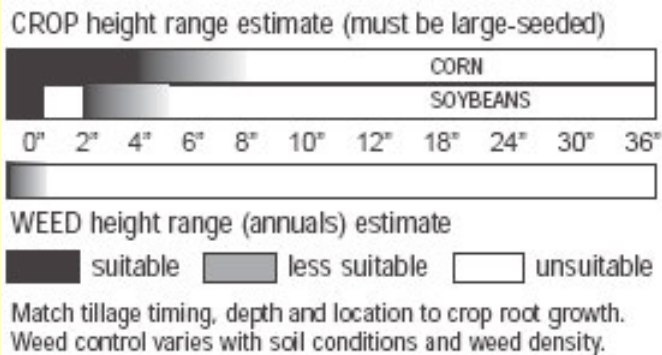
Blind tillage

- Shallow tillage of entire field after crop seeded
- Stirs soil above level of crop seed placement
 - Causes desiccation and death of tiny germinating seed
- Most effective when soil fairly dry and weather warm
- Provides the crop after emergence about a 10-day weed free period
- Examples: rotary hoes, flex-tine harrows, chain link harrows

Example 1: Rotary hoe

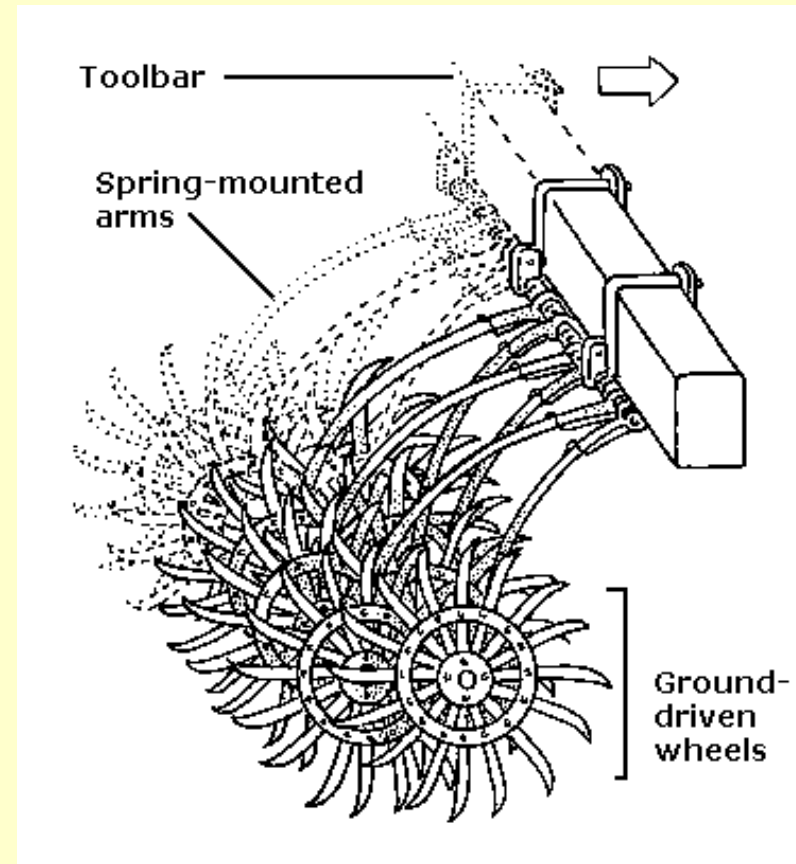


- Rotary hoes designed for low or high residue fields
- Can be used PRE or POST as long as crop more deeply rooted than weed



Rotary hoe

- Advantages
 - Rapid to use
- Disadvantages
 - Large seed crops only
 - Don't hoe bean crops in crook stage
 - Will not kill green weeds

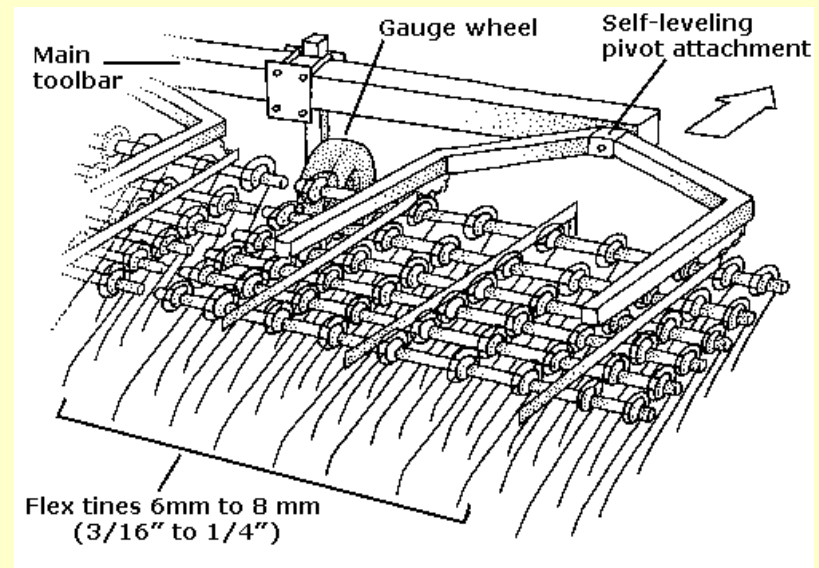


Example 2: Flex-tine harrows

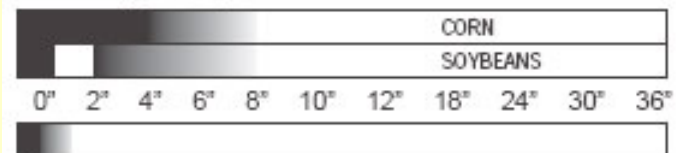
- Used broadcast over and between crop rows
- Most efficient when weeds are in white thread or cotyledon stage
- Rely on differences in emergence and rooting depth of crop versus weed
- Small seeded weeds best control

Flex-tine Harrows

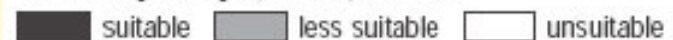
- Advantage
 - Operated at fast speed
 - Do not require much modification
 - Break soil crusts
 - Sections over crop row can be lifted to avoid injury



CROP height range estimate



WEED height range (annuals) estimate



Match tillage timing, depth and location to crop root growth.
Weed control varies with soil conditions and weed density.

Flex-tine Harrows

- Disadvantages
 - Primary action of postemergence harrowing is weed burial
 - Need to cover 1 to 1.5 inches
 - Cultivation timing is critical
 - Does not control grasses at any stage
 - Only controls broadleaves less than 4 leaves
 - Must be integrated with more aggressive cultivator
 - Can reduce stand when used before crop well-rooted

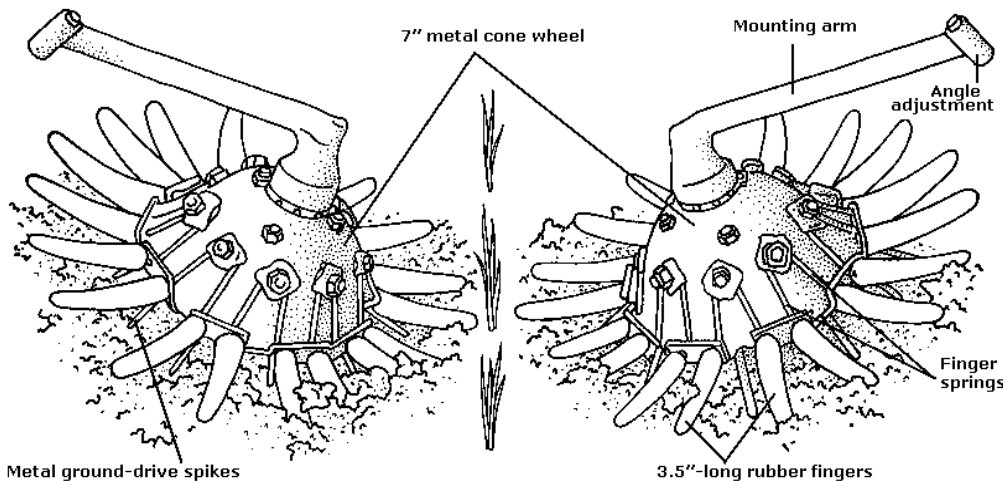
Between-row cultivation

- Should not be primary weed control
- Selectivity can be low
- Implement when weeds one inch tall and crop large enough to not be covered by dirt
- Usually requires more than one pass
- Examples: finger weeders, brush hoe, spyders + tension weeders

Finger Weeder



- In row weed control
- Three pairs of ground-driven rotating fingers
 - Front two pairs push soil and uproot weeds away from row
 - Rear pair pushes soil into row covering missed weeds

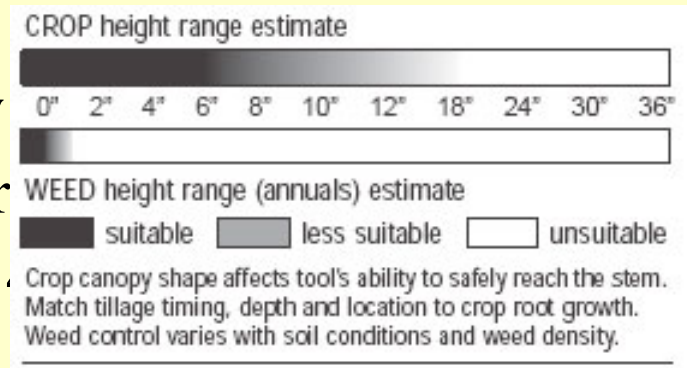


Finger wheels tilted downward

Slow speeds and adjusted so very near crop row

Finger Weeder

- Advantages
 - Excellent in-row weed control
 - Lightweight tool can be used with small tractor
- Disadvantages
 - Timing critical – very small weeds (up to 1 inch), crop must have sufficient stem strength
 - Between-row weed control poor
 - Slow, precise tillage is necessary
 - Manufacturer: Buddingh Weeder
7015 Hammond Ave., Dutton, MI
Phone: (616) 698-8613



Brush Hoe



- PTO-driven plastic bristles rotate on horizontal plane, ripping weeds from soil
- Very aggressive
 - Shields above soil to protect crop row
 - Operator on rear seat required to steer shields over crop row

Source: European Weed Research Society

Brush Hoe

- Advantages
 - Can control weeds up to ten inches tall
 - Effective on slightly moist soils
 - Soil passing under shields smoothes weeds in crop row
 - Dust layer from brushing delays new weed germination

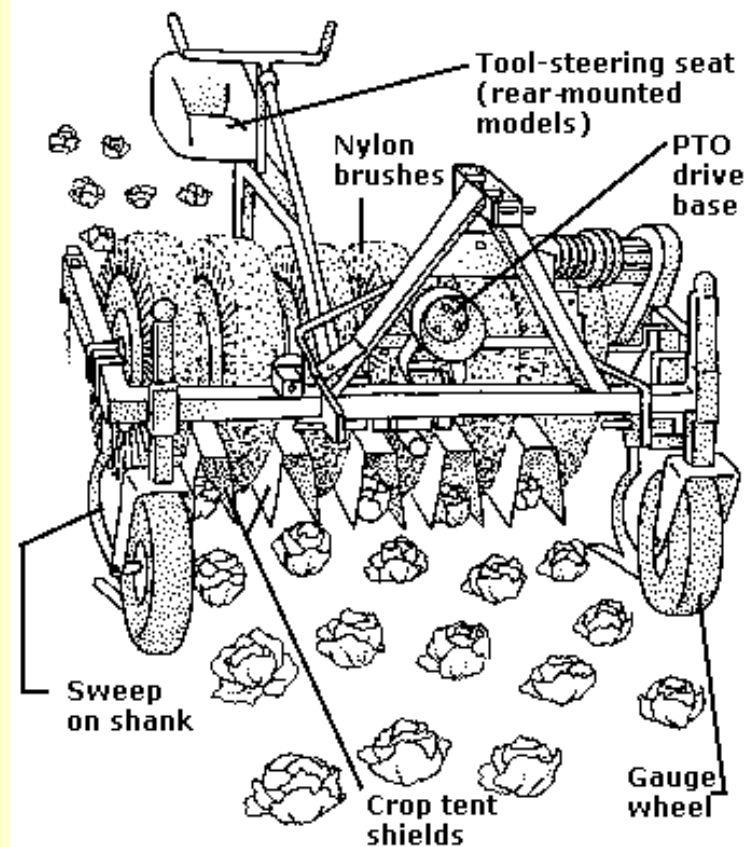
CROP height range estimate

0" 2" 4" 6" 8" 10" 12" 18" 24" 30" 36"

WEED height range (annuals) estimate

■ suitable ■ less suitable □ unsuitable

Match tillage timing, depth and location to crop root growth.
Weed control varies with soil conditions and weed density.



Brush Hoe

- Disadvantages
 - Requires two operators
 - Cultivated crops must have same spacing
 - Implement is costly
- Manufacturer
 - Baertschi FOBRO, 1715 Airpark, Grand Haven, MI 49417, Phone: (617) 847-0300, Fax: (616) 842-1768

Summary

- Integrate mechanical weed management with farm goals and systems
- Maximize selectivity
- Minimize weeds emerging with crop through blind tillage
- Do not use cultivation as primary weed management method