

# Weed Management and Cultivation Equipment for Vegetable Farms

Vern Grubinger

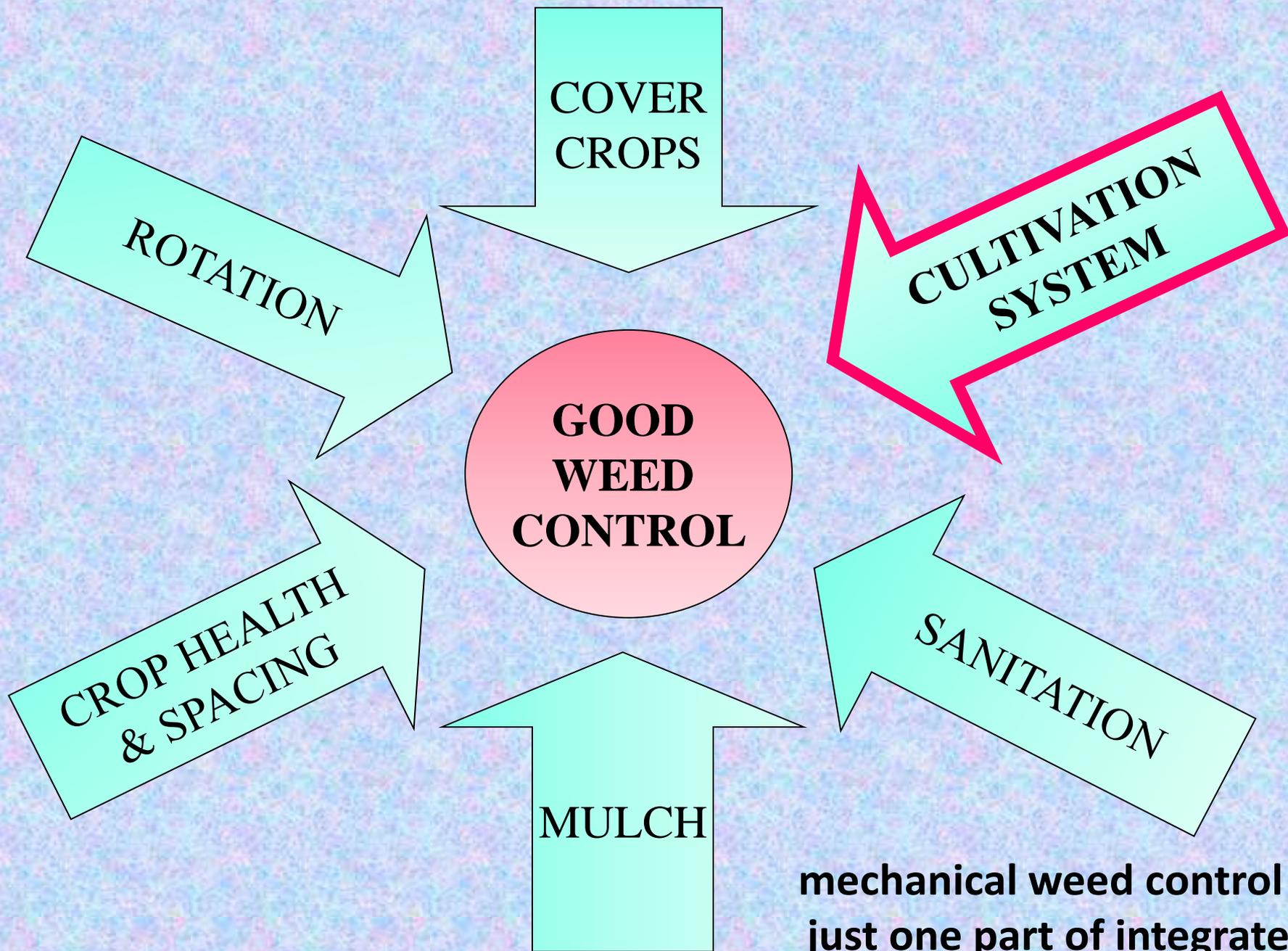


# topics to cover

**a bit of weed ecology**

**review of 'common' cultivators – chime in!**

**a look at some new cultivation tools**

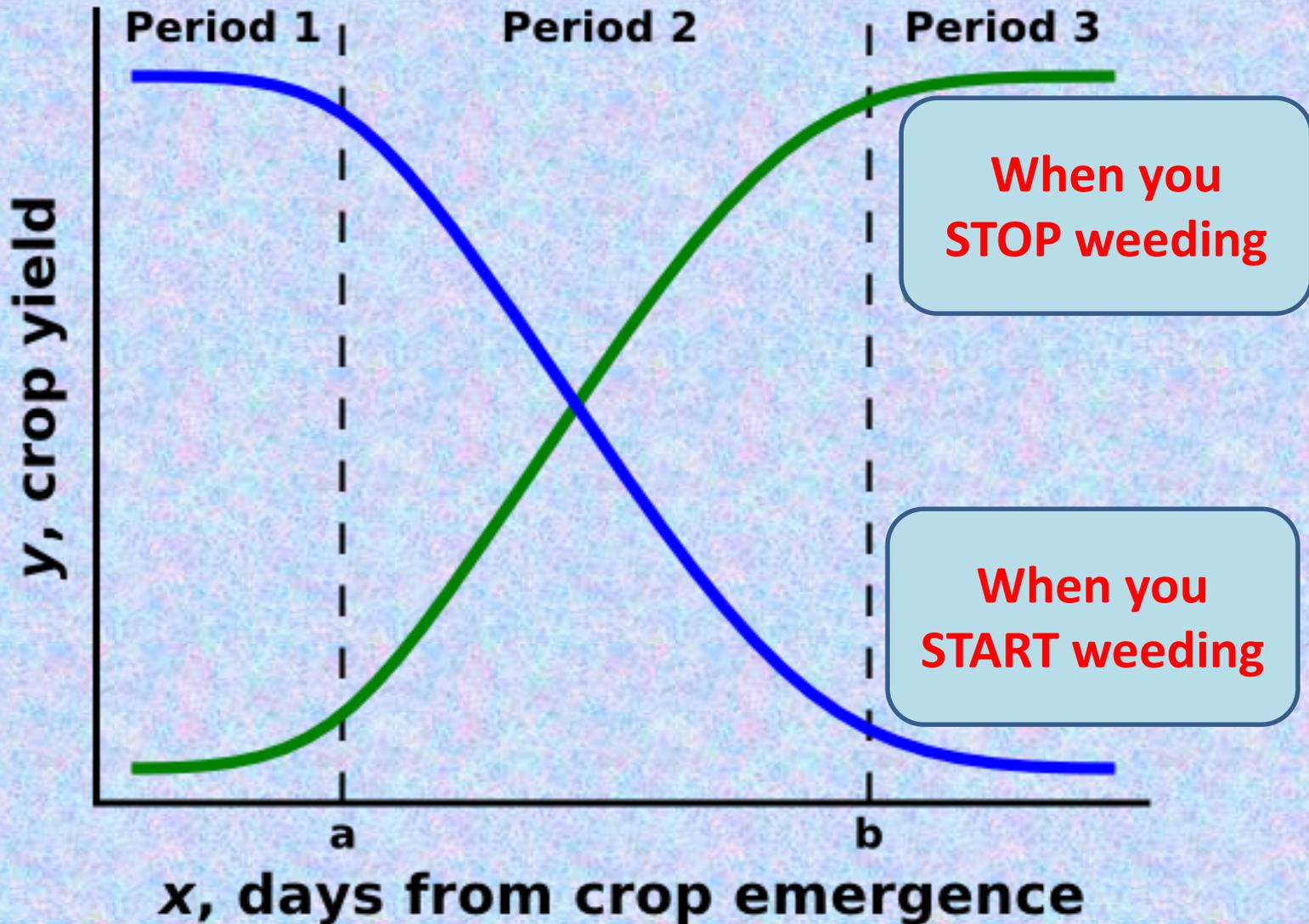


**mechanical weed control is just one part of integrated weed management**

# two key concepts:

- **critical weed-free period**
  - short term management
- **weed seedbank**
  - long term management

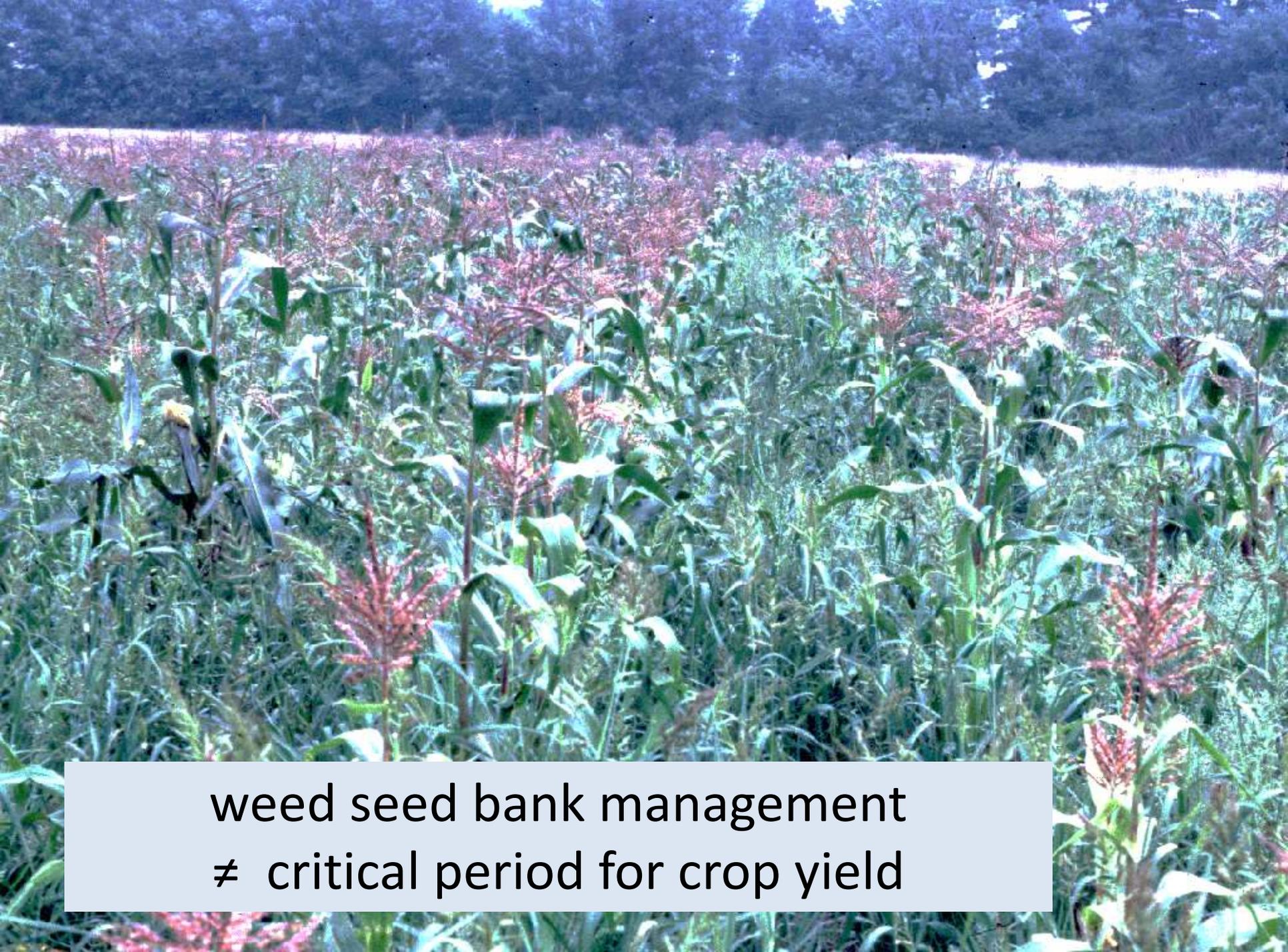
# Critical Weed-Free Period = avoiding yield reduction



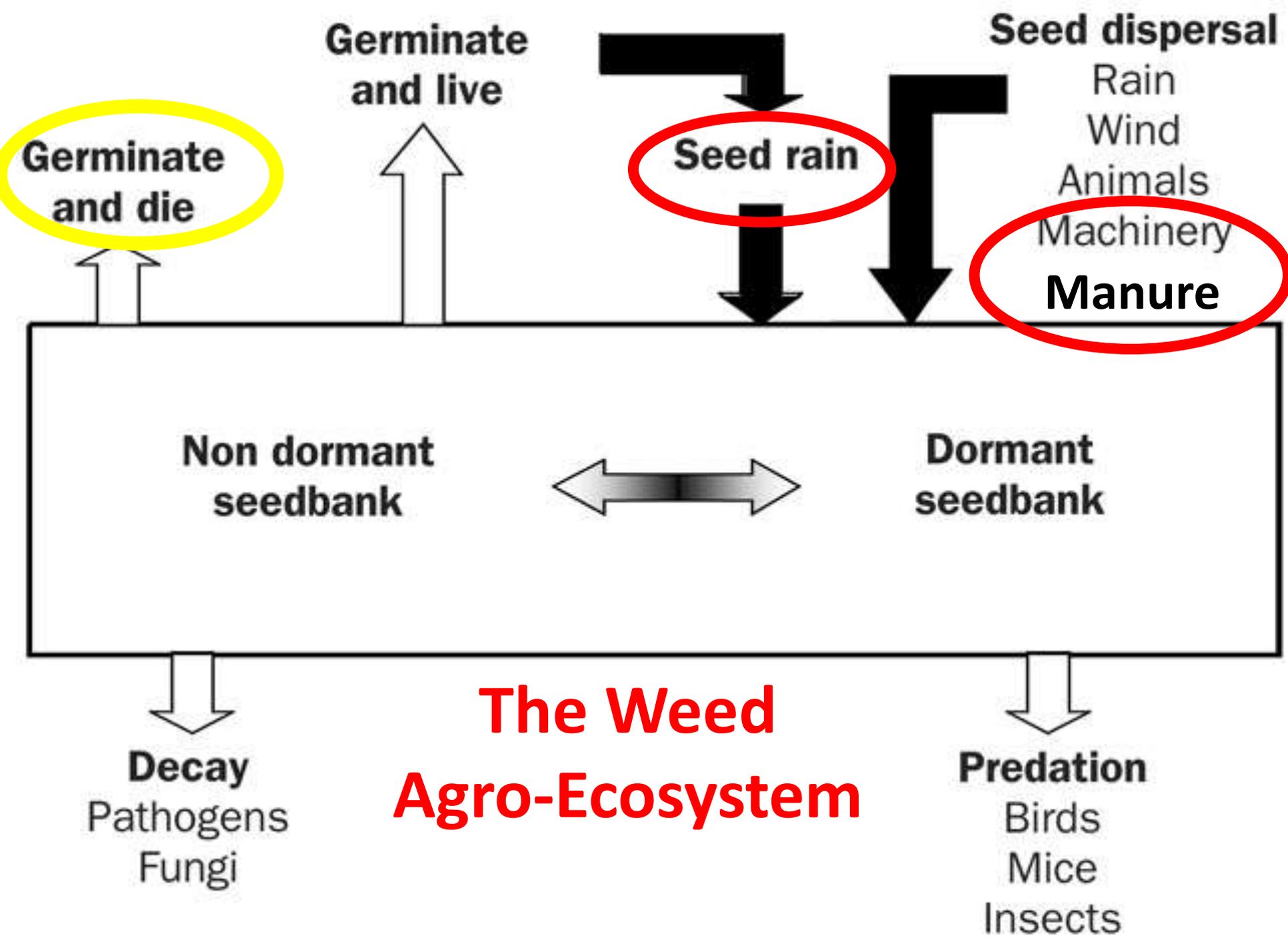
vs. ease of cultivation, weed seed bank...



stop weeding late in crop growth = small yield loss...  
though other bad things may happen

A photograph of a cornfield where many plants have developed red, branched inflorescences, likely a weed species. The plants are densely packed, and the background shows a line of trees under a bright sky.

weed seed bank management  
≠ critical period for crop yield



weed seed importation



weed 'seed rain' when you least expect it



Galinsoga setting seed  
within a Sudex cover crop

looks good from a distance



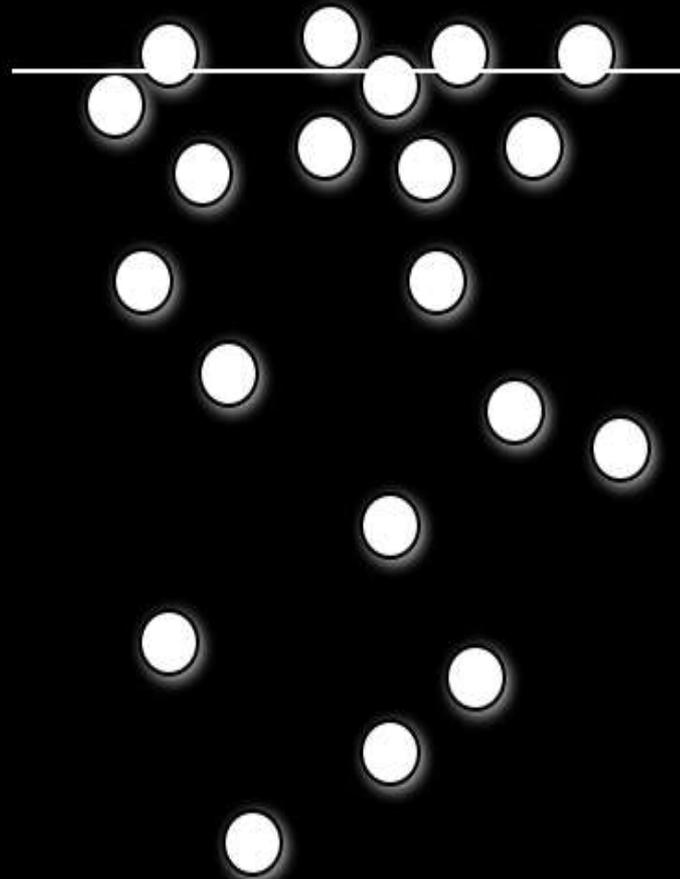
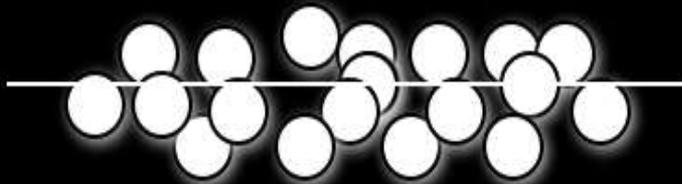
up close is what matters



# cover crops and weeds

- in weedy fields, use short-term covers
- fallow / stale bed before long-term covers
- use high seeding rates; drill seed if possible
- scout long term cover crops for weeds
- time cover kill to avoid key weed reproduction

the weed seed bank is 3-dimensional



# General effect of weed seed depth on dormancy, germination, and mortality

from: [www.extension.org/article/18528](http://www.extension.org/article/18528)

<u>Depth (inches)</u>	<u>Dormancy</u>	<u>Germination</u>	<u>Mortality</u>
0–0.5	Low	High	High
0.5–2	Low	High	Medium
2–5	Medium	Low	Low
5–10	High	Very low	Low

Small seeded weeds tend to have low dormancy and high germination at the soil surface; large seeded weeds have medium–high dormancy and low germination at the surface.

# optimizing mechanical weed control



remember that  
tools are part of a  
cropping system

- equipment fits row spacings / bed width
- tools properly adjusted, sharp
- **straight, parallel rows with uniform spacing**
- stimulate weed germination early
- cultivate shallow as possible
- withhold irrigation afterwards
- have a back up plan...

uniform bed formation is important



Beefed up Buckeye bed former with side mounted cow mats to prevent spillover of soil on next bed. Roxbury Farm, Kinderhook NY

bed / row marking is important



cultivation timing: crop

*Pre-Plant -- Pre-Emerge -- Seedling*

*Growing on -- Mature -- Post- Harvest*

cultivation timing: weeds

*White Thread -- Seedling Growing on -- Seed Set*

cultivation location

*Between Row -- In Row -- Tire Tracks*

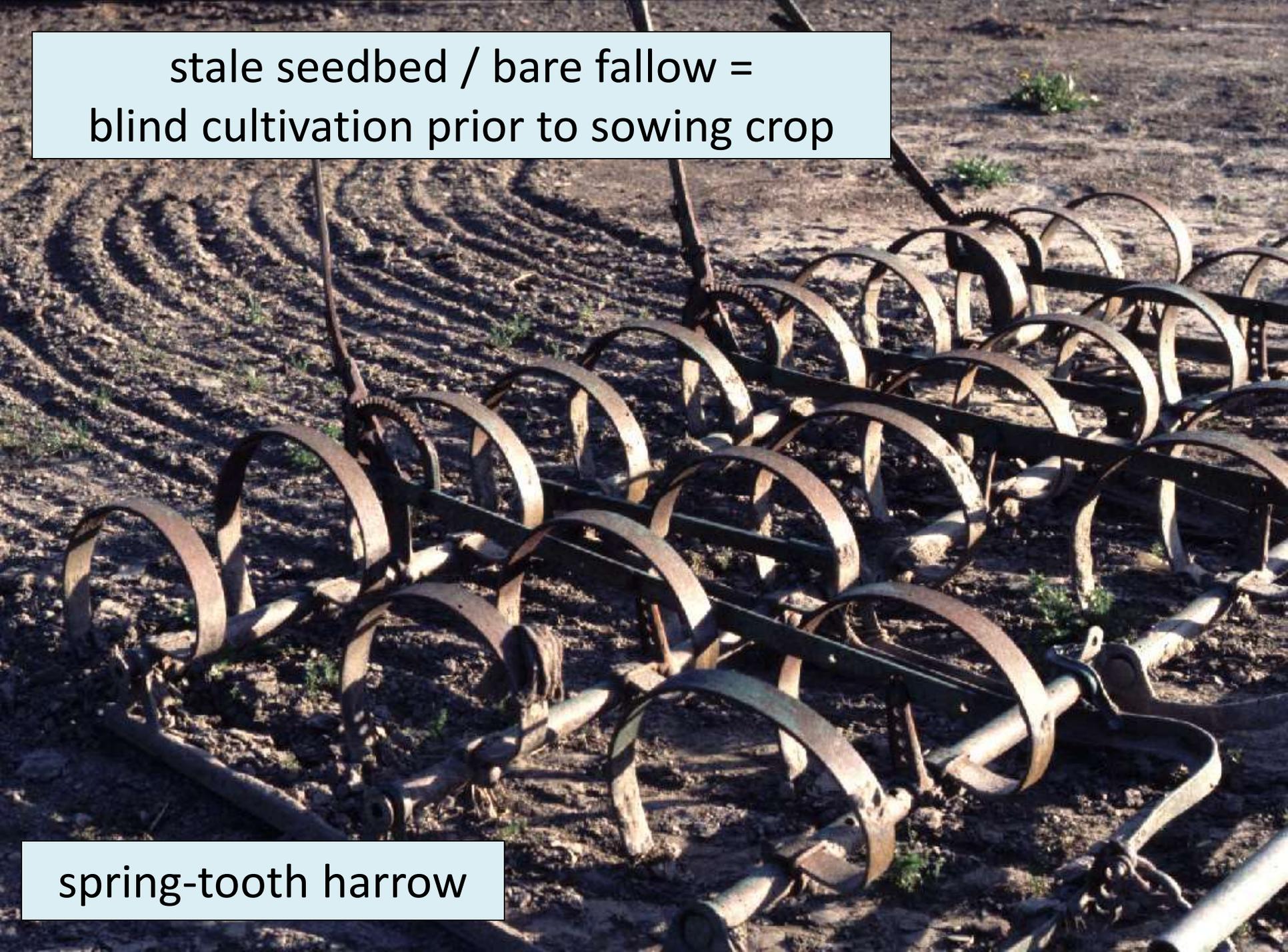
*Whole Bed -- Whole Field -- Alleyways*

# blind cultivation

- entire field is 'stirred' 0.5 to 1.5 inches deep
- small germinating weeds dry out and die
- first pass usually right before crop emergence
- second pass about a week later
- most effective in dry soil, with sunshine, wind
- equipment includes: rotary hoe, tine weeder, spike tooth harrow, spring tooth harrow, chain link harrow

stale seedbed / bare fallow =  
blind cultivation prior to sowing crop

spring-tooth harrow





aggressive stale bed for quackgrass:  
Danish S-tines with rollers lifted or removed

flex-tine weeder – white thread or just-emerged weeds

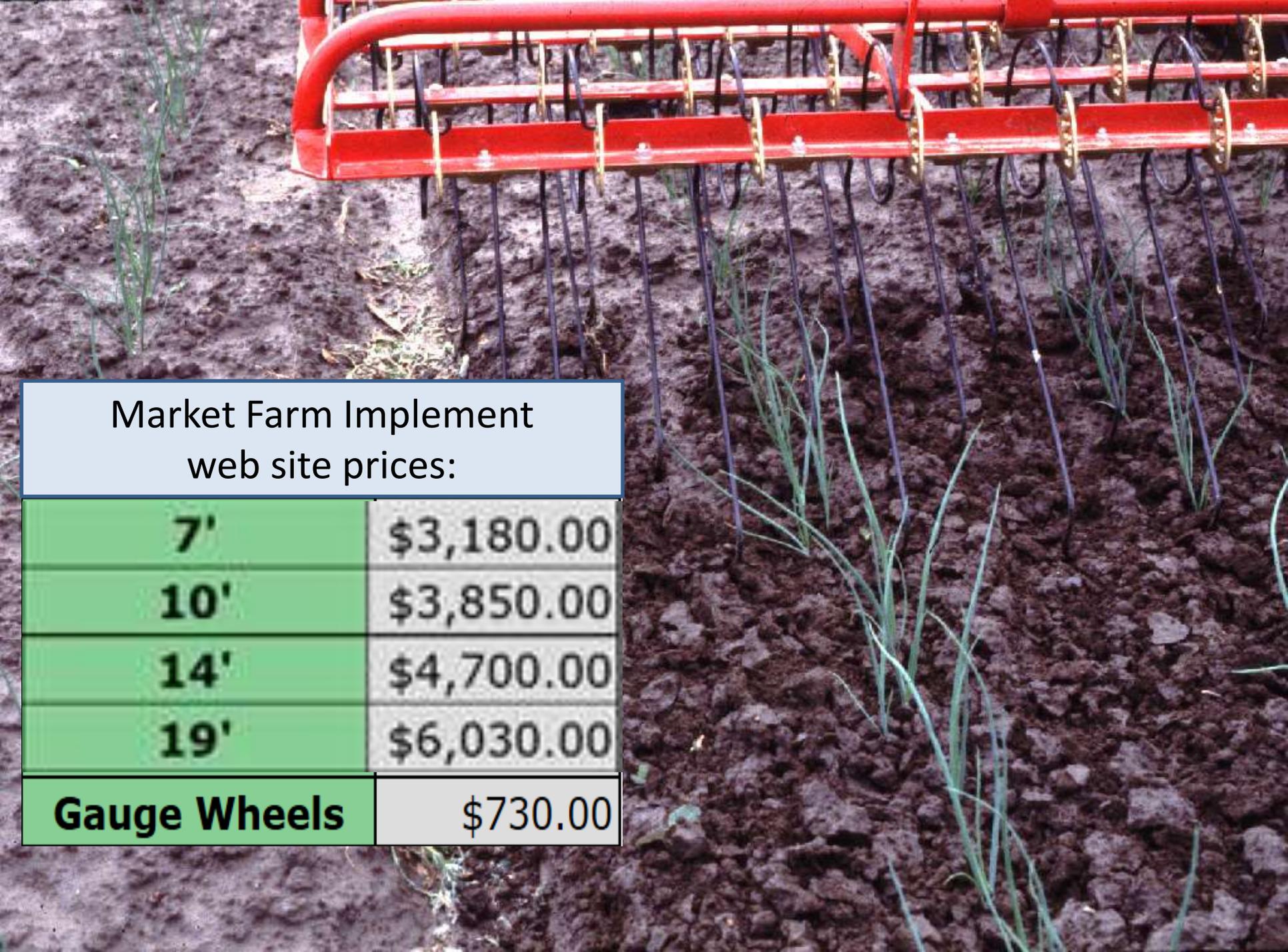


seedlings must resist a 'tug' prior to bind cultivation



Lely flex-tine weeder  
has individual tine adjustment





Market Farm Implement  
web site prices:

**7'**

**\$3,180.00**

**10'**

**\$3,850.00**

**14'**

**\$4,700.00**

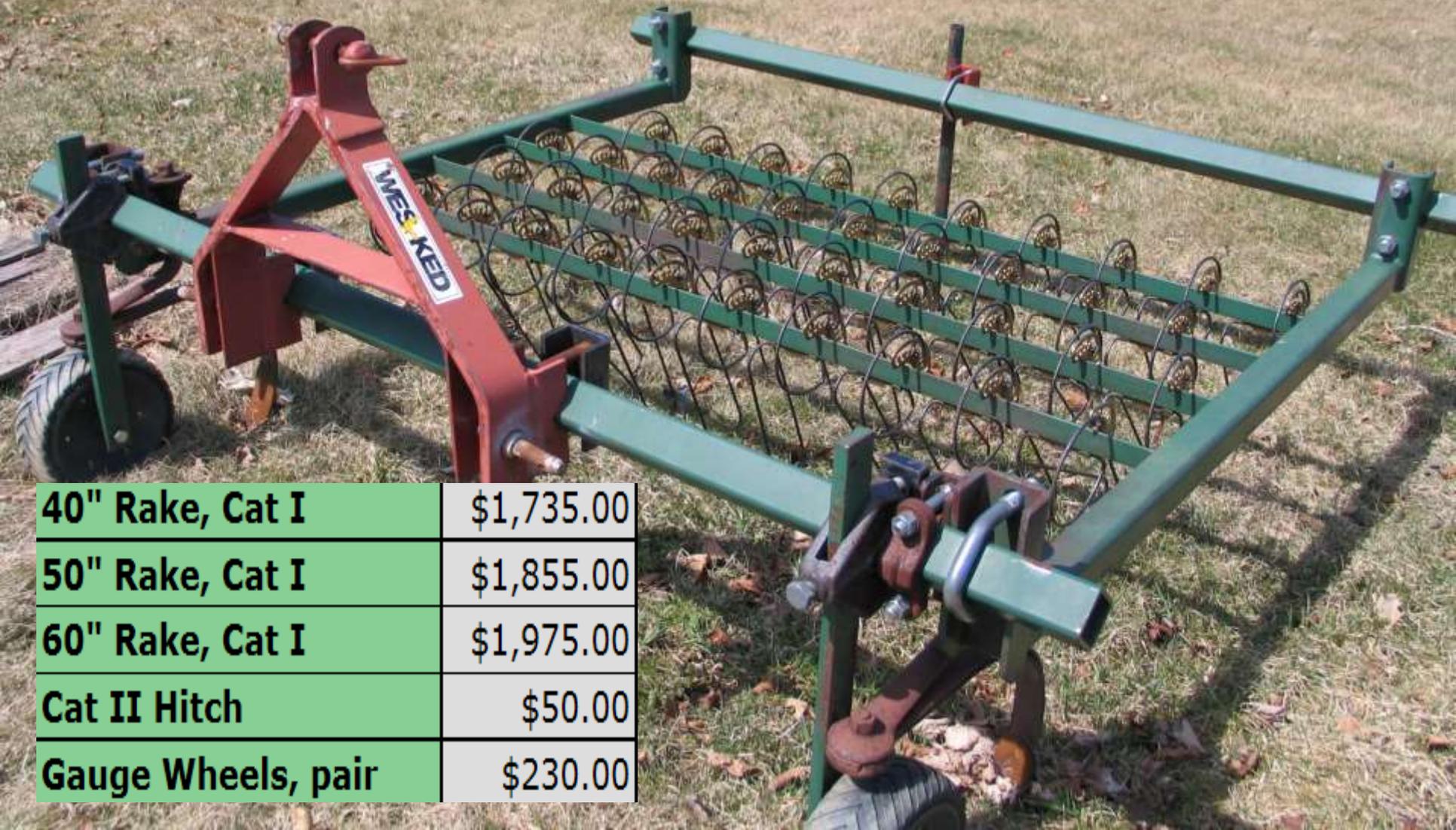
**19'**

**\$6,030.00**

**Gauge Wheels**

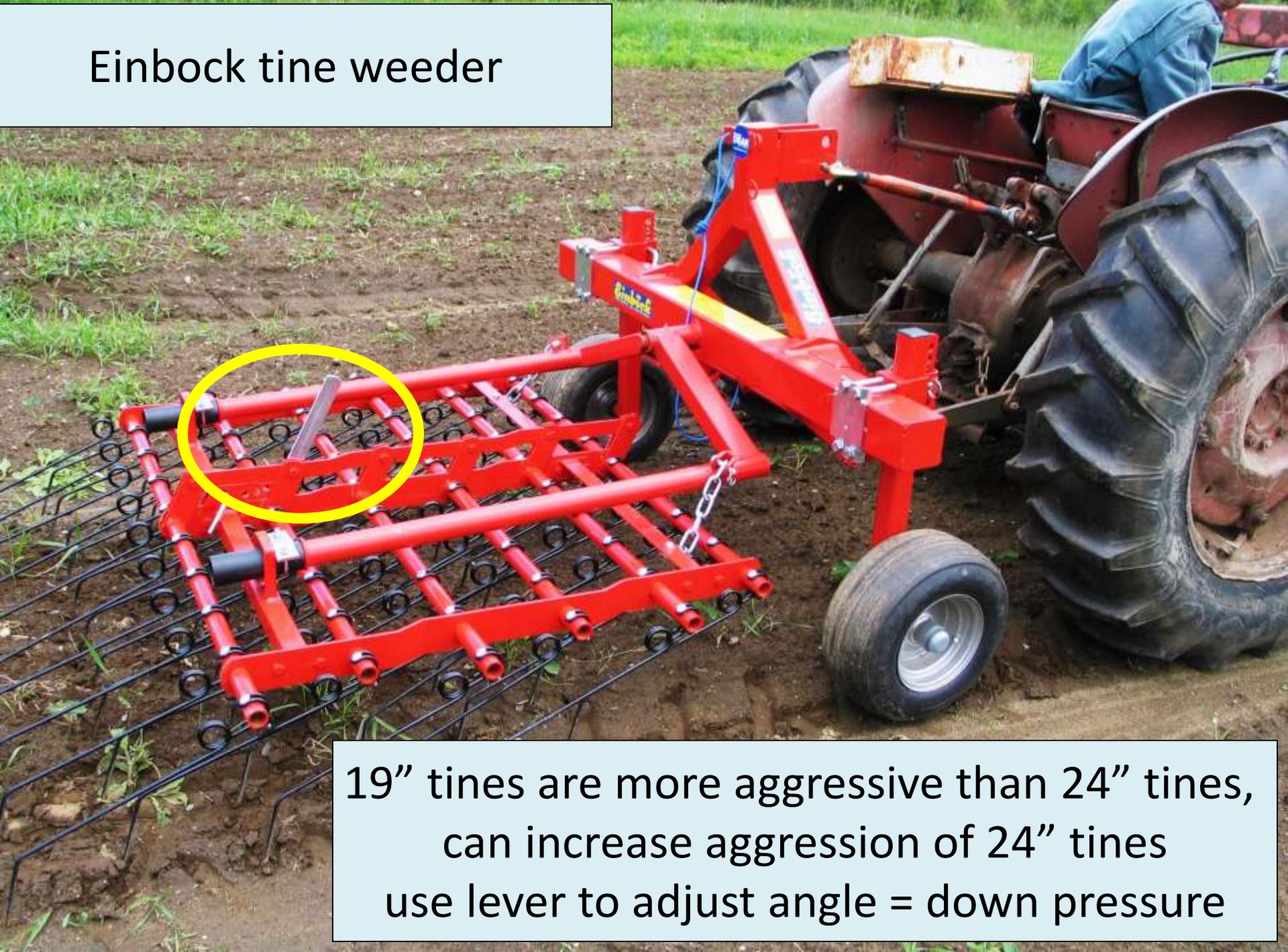
**\$730.00**

Williams tool system  
from Market Farm Implement:  
Lely plus tool bars



<b>40" Rake, Cat I</b>	<b>\$1,735.00</b>
<b>50" Rake, Cat I</b>	<b>\$1,855.00</b>
<b>60" Rake, Cat I</b>	<b>\$1,975.00</b>
<b>Cat II Hitch</b>	<b>\$50.00</b>
<b>Gauge Wheels, pair</b>	<b>\$230.00</b>

# Einbock tine weeder



19" tines are more aggressive than 24" tines,  
can increase aggression of 24" tines  
use lever to adjust angle = down pressure

from Guy Machinery, Illinois

5' \$2,590

6.6' \$2,775

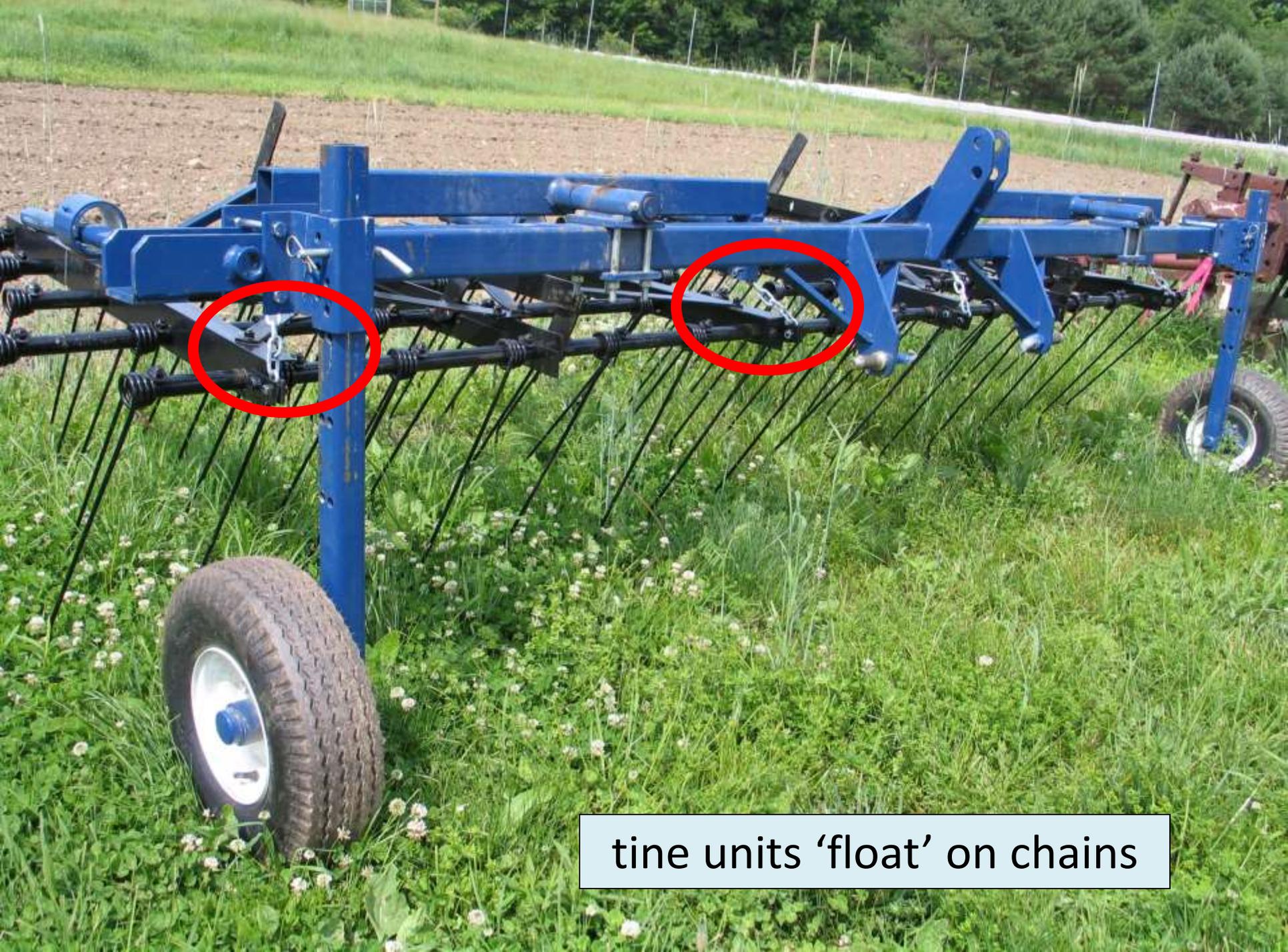
10' \$3,725

15' \$6,055 (hydraulic fold)



Kovar 'spring tooth harrow'  
(really a tine weeder)



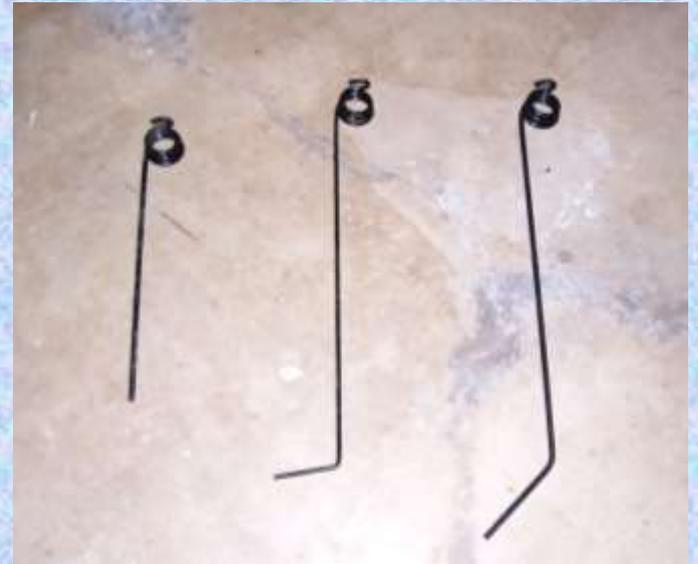


tine units 'float' on chains

three lever adjustments determine depth and rotational severity of the 'teeth'



tine diameter, tine bend angle, and tine length  
also affect Kovar aggressiveness



**tine diameters: 1/4" or 5/16"**

**14" straight tine**

**25" tine with 45-degree bend**

**23.5" tine with 80-degree bend**



Ferguson tine weeder, 1950's?





lawn de-thatcher tines plus  
spydres used for aggressive  
stale bedding sandy soil beds

farm-made cultivation tools

hay rake tines belly-mounted  
on Cub, removable for  
different crop row spacings



“I am a huge fan of tine weeding Brassicas. I absolutely nailed a half acre of fall broccoli this year. We did one pass 10 days after transplanting and then exactly zero hand weeding.

Timing is of course important as is bed prep and your transplants have to be good. I use a 2-meter Einbock, with the longer tines set at the shallowest angle and driven at a very particular speed that depends on conditions but is almost always on the fast side.

The degree of damage you do to the crop plants guides you to the correct speed. There will be a moderate number of leaves ripped off and a small number of plants uprooted - not too many. Soil moisture/texture has to be on the dry/friable side; it won't work with wet soil or even an overcast day.”

--NY Farmer 12/31/14



hand-held flamer for stale seed bed



bed-width flamer



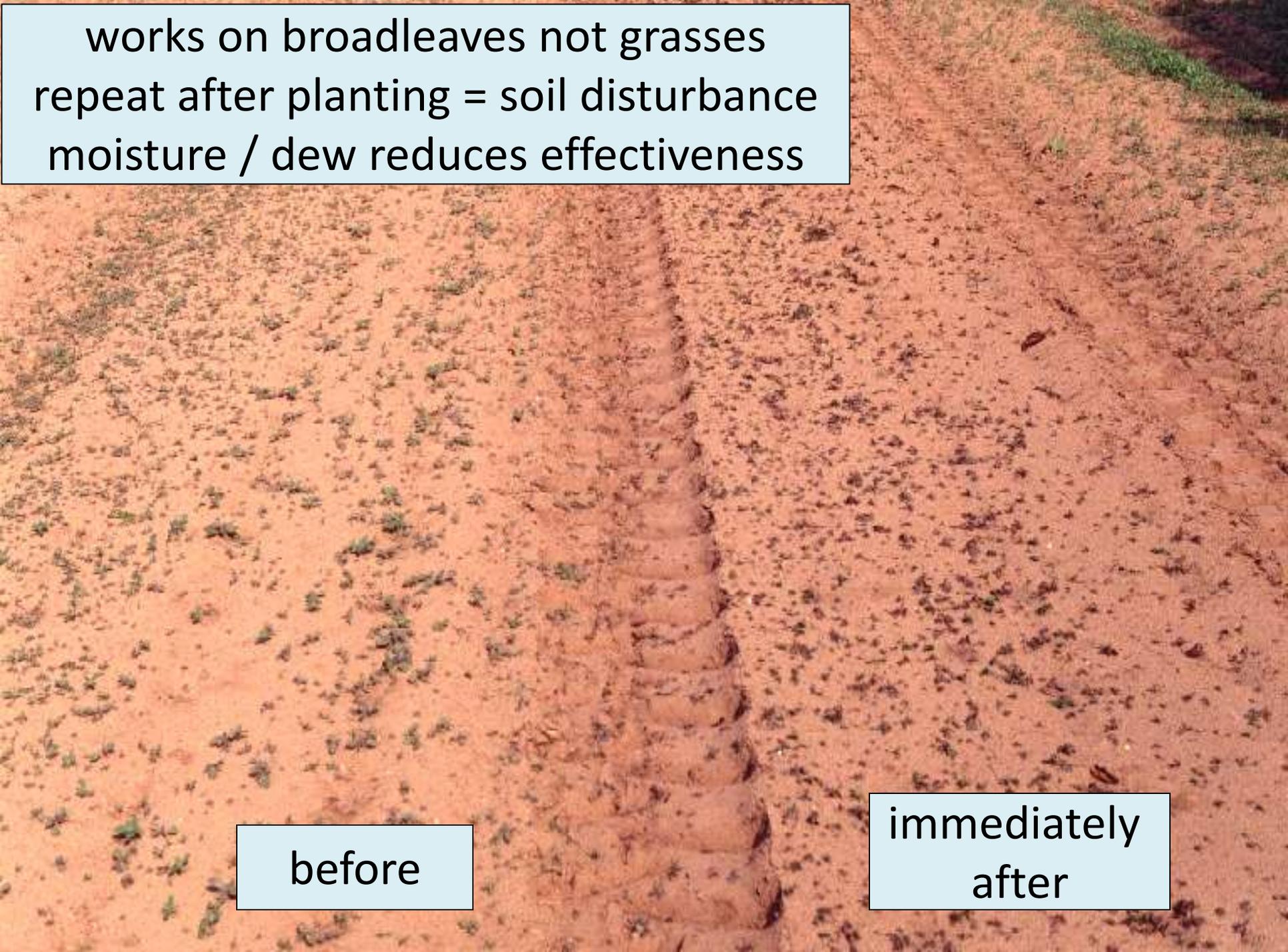
tractor-mounted 'liquid' flamer



KUBOTA M4030SU

Utility Special

works on broadleaves not grasses  
repeat after planting = soil disturbance  
moisture / dew reduces effectiveness



before

immediately  
after

between-row cultivation:  
move soil in, or out, or not



remove central tines over crop row,  
creates little soil movement

field cultivator with Danish  
S- tines over removed





several European between-row tine designs



Budding basket weeder  
shallow, no movement into row

50-inch frame works 46 inch bed  
\$3,100 plus \$300 shipping, ~30 days



close up one side then back the other, until plants fill in



70" frame, 3 row, 10" baskets with 6" outside baskets.  
~3,500 new from Buddingh; used \$2,250 Roeters Farm Equip.



between-row cultivation that moves more soil





sweeps, shovels, knives, etc. attach to some type of shank



S-tine  
shank



forged foot  
shank



side offset  
shank



coil  
shank



straight  
shank



springtooth  
shank



springtine shank  
with sweep

side knives  
on straight shanks



moving the shank or the toolbar to adjust for crop growth and/or spacing





double toolbar retro-fit to replace old cultivators



side-knives to reduce depth and soil movement vs. shovels



triple toolbar, double bed



Bezzeries spiders and spring hoes





Bezzerrides spyders and torsion weeders  
~\$200 per pair of spyders

sweeps and torsion weeders, note guidance wheels



# Steketee 'robotic' torsion weeders



# I & J row crop cultivator

optional hilling disks, shields, etc.





rolling cultivators  
swivel to push or pull soil

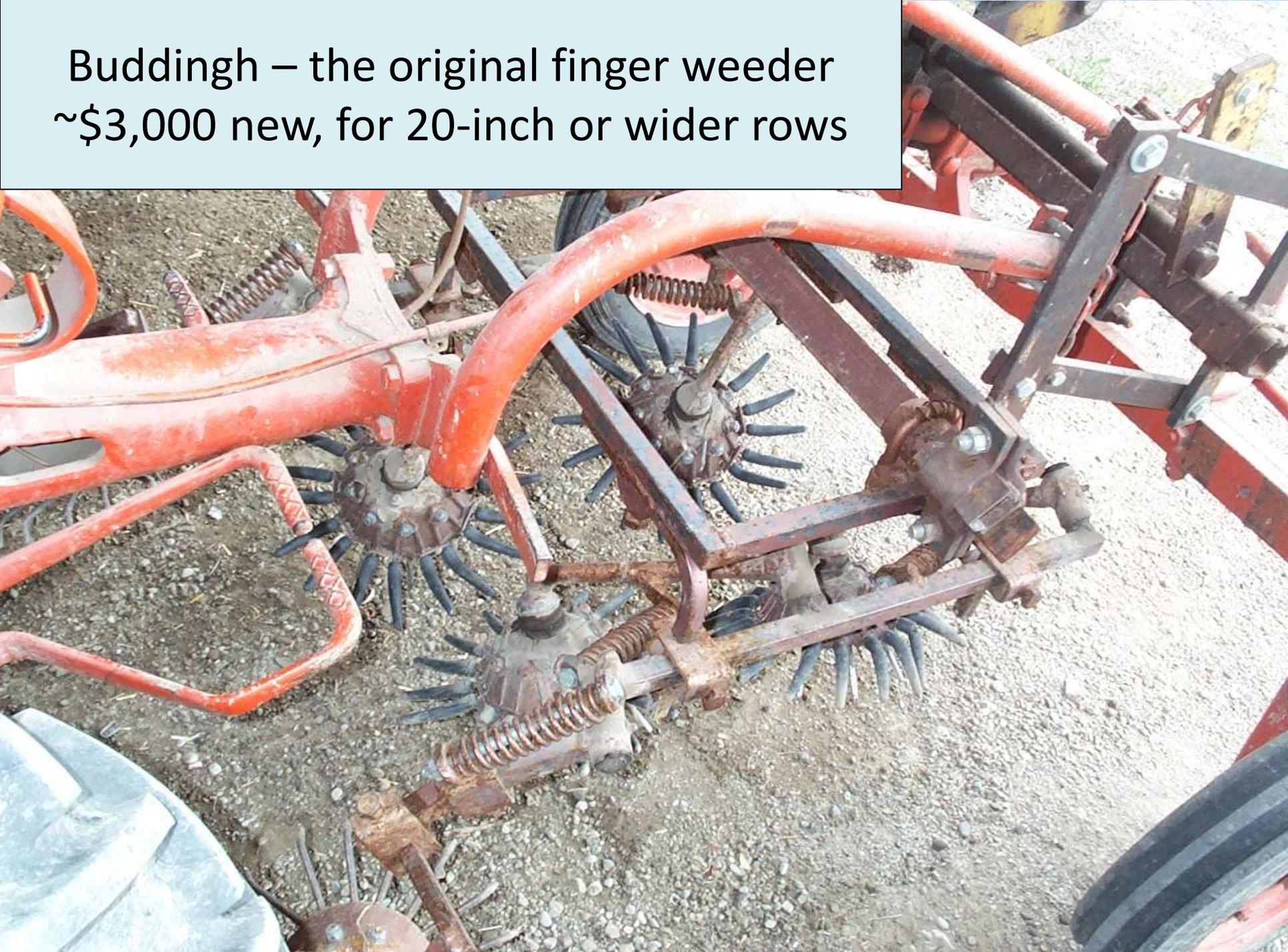
rolling cultivator or tine weeder better for this?



In-row cultivation



Budding – the original finger weeder  
~\$3,000 new, for 20-inch or wider rows



# Kress finger weeder - German



# HAK tools - Dutch



finger  
weeders

torsion  
weeders



# Steketee finger weeder - Dutch



each 'arm' floats on the soil independently



*Polyurethane finger weeders are suitable for most crops.*



*Brush finger weeders are an option for more delicate crops.*

Brush type finger weeder

<http://store.suttonag.com/other-farm-equipment/weeding-equipment.html>



Finger Weeder, 13" (340 mm)

\$215.00

[Details](#)

[Add to Cart](#)

Finger Weeder, 9" (220 mm)

\$190.00

[Details](#)

[Add to Cart](#)

Finger Weeder, 16" (400 mm)

\$226.00

[Details](#)

[Add to Cart](#)



Univerco Eco-weeder - Quebec  
in-row cultivation with operator

Eco-weeder 'hub' options: 16, 10 and 7-inch



works OK on bony ground



2-row Eco weeder



up to 6-row units



different passes for in-row and between-row weeds



Ted Blomgren, Wildflower Farm NY  
put Steketee cultivators on a modified G  
*independent between-row cultivation on rocky uneven ground*



linkage lets each row 'float'





Ted also fabricated a steerable cultivator  
*for better in-row cultivation on rocky uneven ground*





all adjustments are made with a  $\frac{3}{4}$ " wrench, including sweep depth, finger tension, and finger separation



# according to Ted...

## Pros:

Tractors with a 3-pt hitch become cultivators

Person steering the implement sees all the tools and can make adjustments

## Cons:

Two operators are required

Communication breakdowns can lead to problems (person in rear seat must speak up)

many ways to combine tools...



S-tines and discs plus rolling cultivators belly-mounted



tine weeder with gauge wheels plus belly-mounted baskets

Kress: modern in-row and between-row tools on one unit.



many choices when hand hoeing is necessary





tractor-pulled hand-weeder, Roxbury Farm, Kinderhook NY

self-propelled hand-weeder, in development,  
Pitchfork Farm, Burlington VT



# VEGETABLE FARMERS

AND THEIR Weed-Control Machines

This video features nine New England vegetable farmers who explain and demonstrate how they use a variety of weed management equipment.

Time	Description	Farmer	Location
1:25*	Four Corners Farm	Bob Gray	Newbury, VT
2:30	Custom field cultivator for between plastic		
7:35	Lilliston rolling cultivator		
8:45	Sweeps		
10:40	Budding in-row weeder		
13:30	Arena Farms	John Arena, Jr.	Concord, MA
14:50	Custom cultivator for plastic edget		
17:30	Crossroads Farm	Tim Taylor	Post Mills, VT
18:45	Rotary hoe		
21:10	Budding basket weeder		
22:05	Custom "batwing" shovels		
24:45	Perfecta field cultivator		
25:50	Fiddlehead Farm	Chuck Armstrong	Brownsville, VT
27:00	Lely spring-tine weeder		
27:50	Bezerides cultivator		
30:45	Edgewater Farm	Pooh Sprague	Plainfield, NH
31:30	Lely spring-tine weeder		
34:00	Budding basket weeder		
36:20	Sweeps		
42:20	Harvest Farm	Gary Gemma	Whately, MA
44:55	Budding basket weeder		
47:15	Sweeps		
48:40	Kestral Farm	Tom Harlow	Westminster, VT
49:25	Custom-made flame weeder		
52:35	Roller for stale seedbed		
53:40	Applefield Farm	Steve & Ray Mong	Stow, MA
55:55	Bezerides cultivator		
61:40	Flame weeders		
65:15	Killdeer Farm	Jake Guest	Norwich, VT
65:50	Backpacker flame weeder		
69:50	Tractor-drawn flame weeder		



## VEGETABLE FARMERS AND THEIR Weed-Control Machines



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## AND THEIR Weed-Control Machines



on line: Video Clips on Organic Weed Management  
[www.extension.org/article/19644](http://www.extension.org/article/19644)

and flaming equipment.



[www.uvm.edu/vtvegandberry](http://www.uvm.edu/vtvegandberry)

