



Successful Weed Management

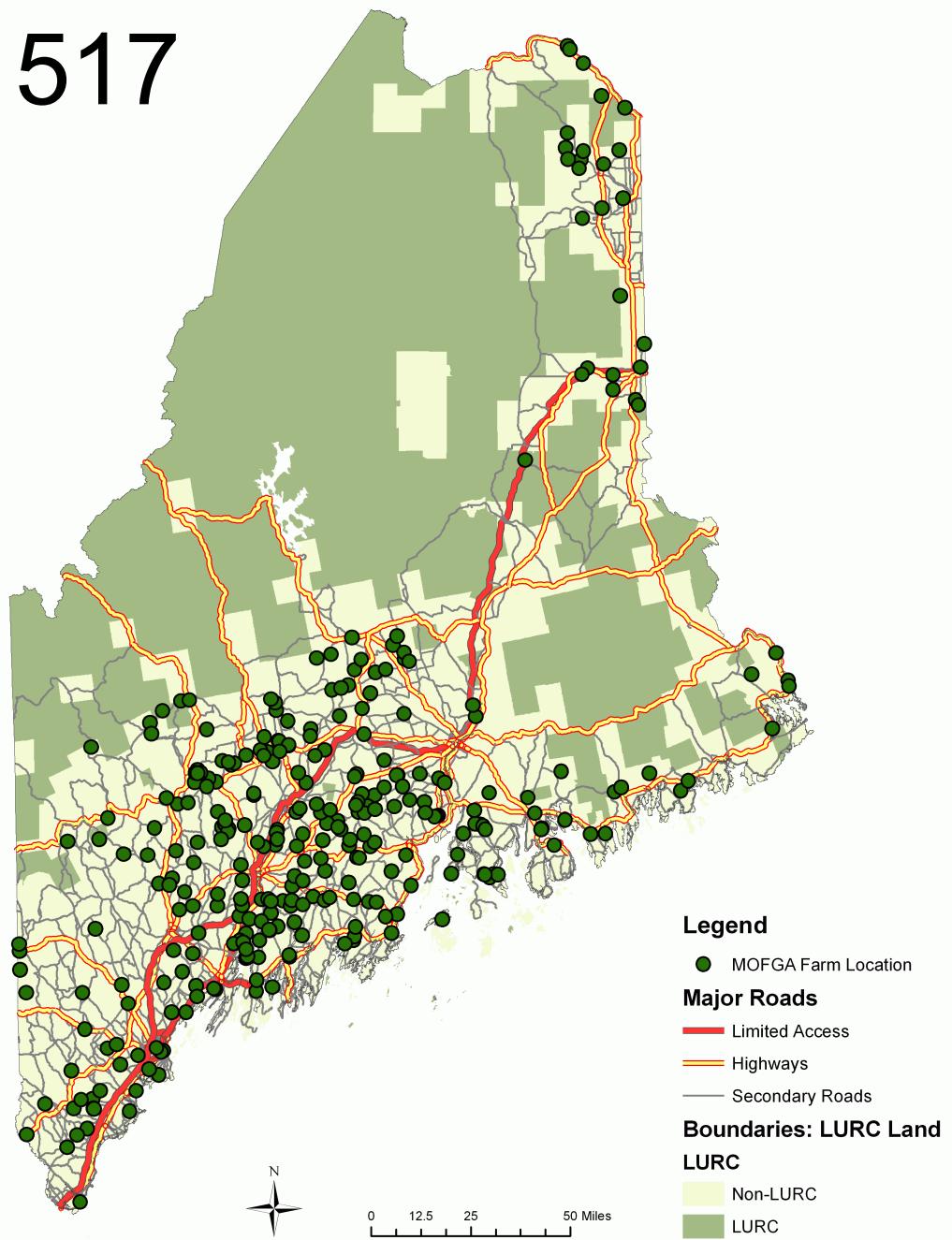
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Theory and Practice

Eric Galland

Professor, Weed Ecology & Management
University of Maine

Organic





problems

low & variable efficacy

density independent efficacy

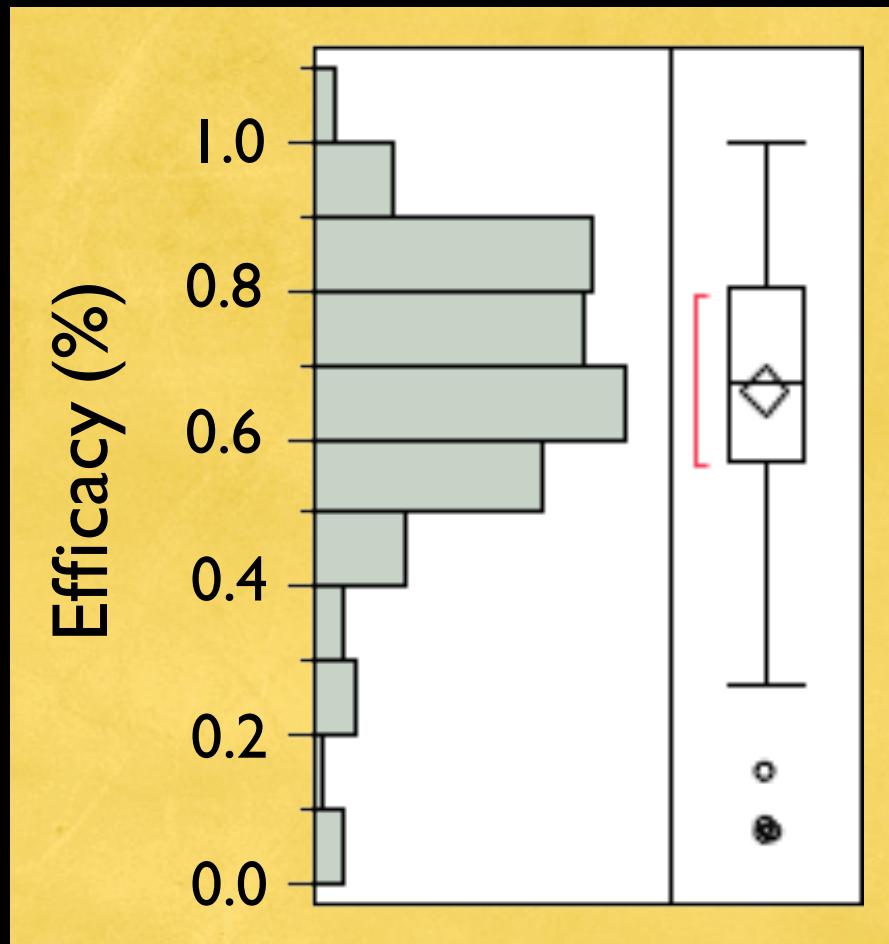
increasing weed seedbank

Measuring Efficacy



(proportion of seedlings killed)

Efficacy



Range: 0.67 to 1.00

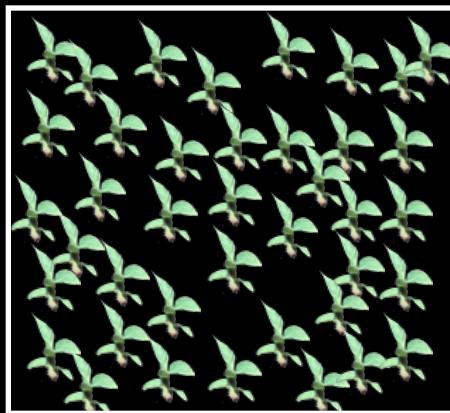
Mean: 67%

Median: 68%

N = 139

Density independent efficacy

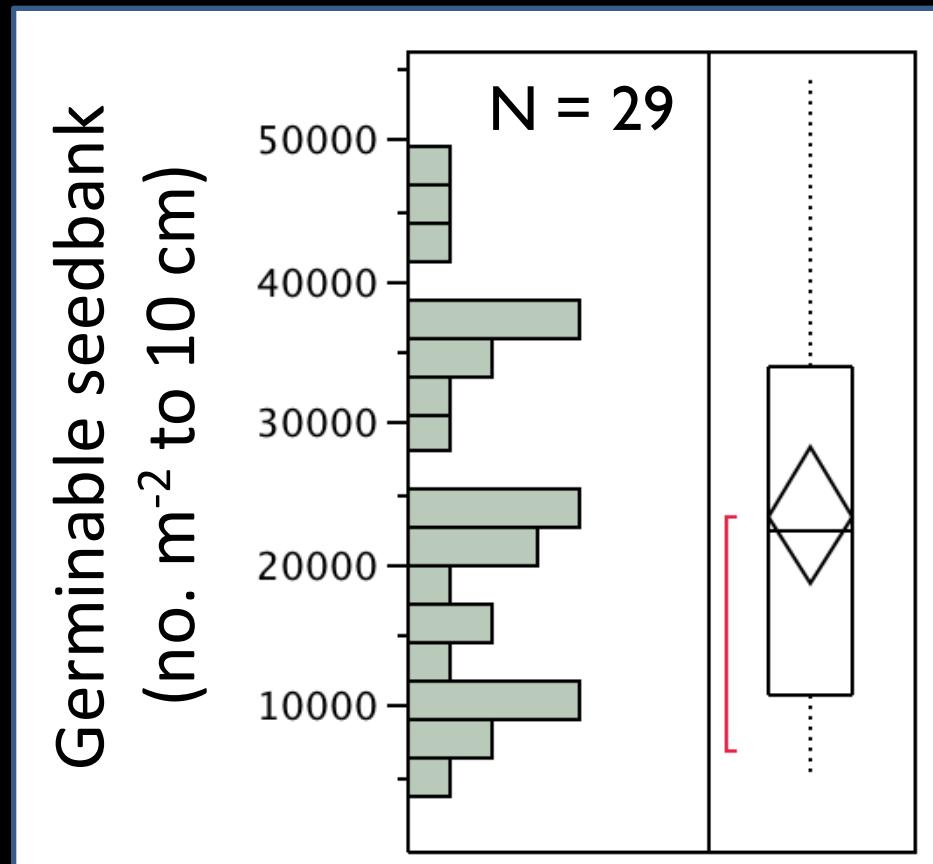
Assume efficacy is 67%



$n = 40$



Abundant seedbank



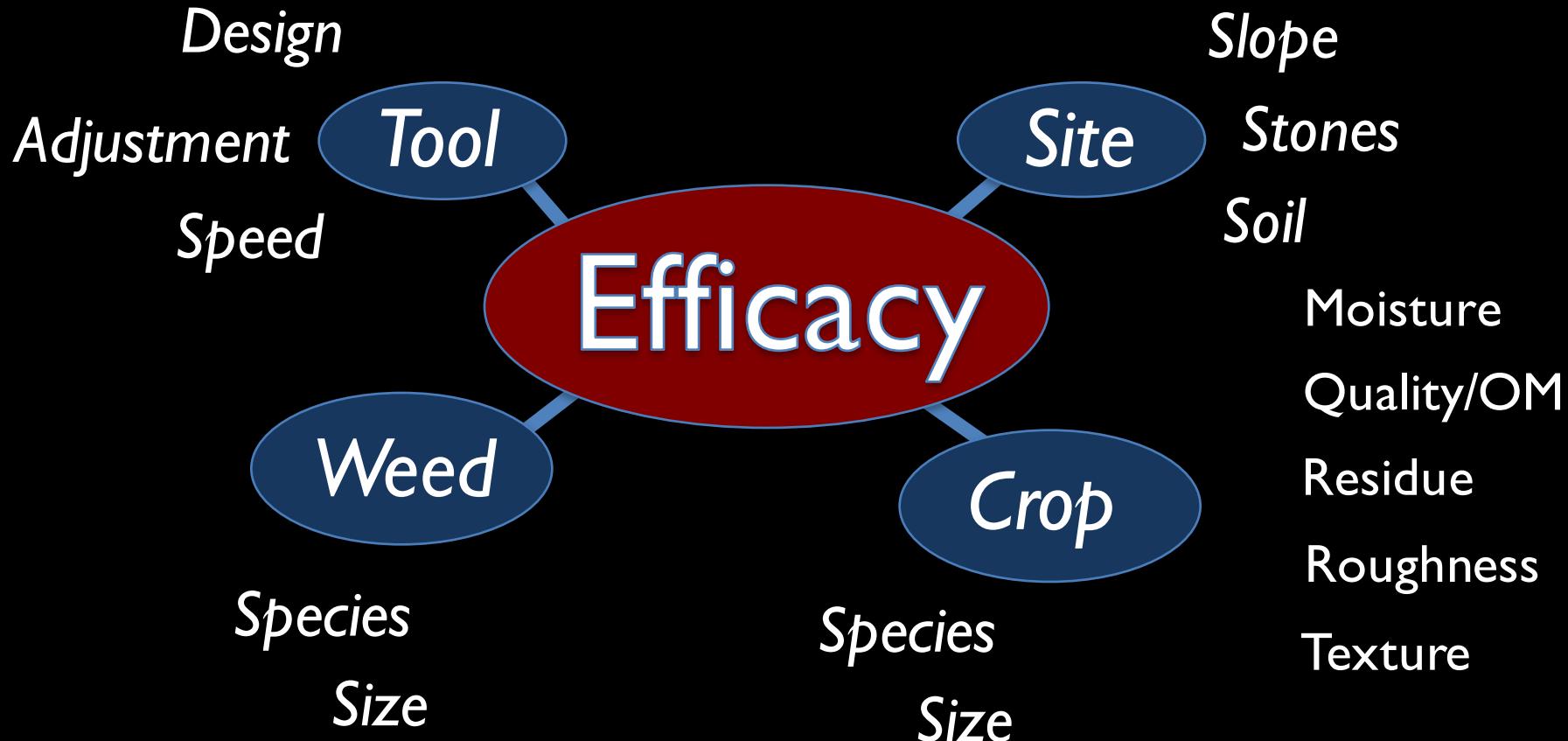
solutions

cultivate more

cultivate better

start with fewer weeds

“Art” and “Science”



HAK Schoffeltechniek

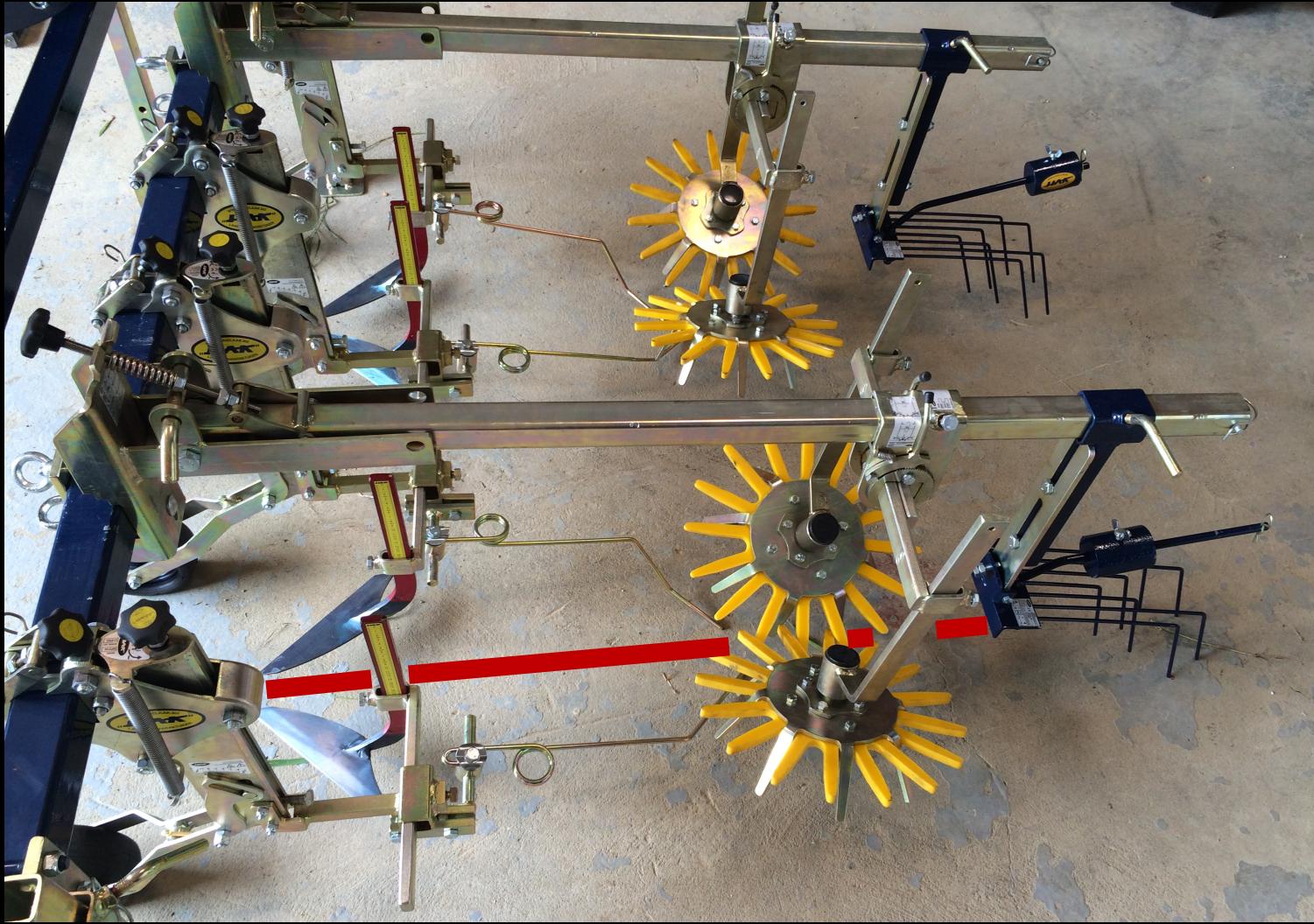
S-Series Hoeing Machine, Moerkapelle, Netherlands



Bryan Brown, Ph.D. Student
University of Maine



“Stacked” tools



10
cm



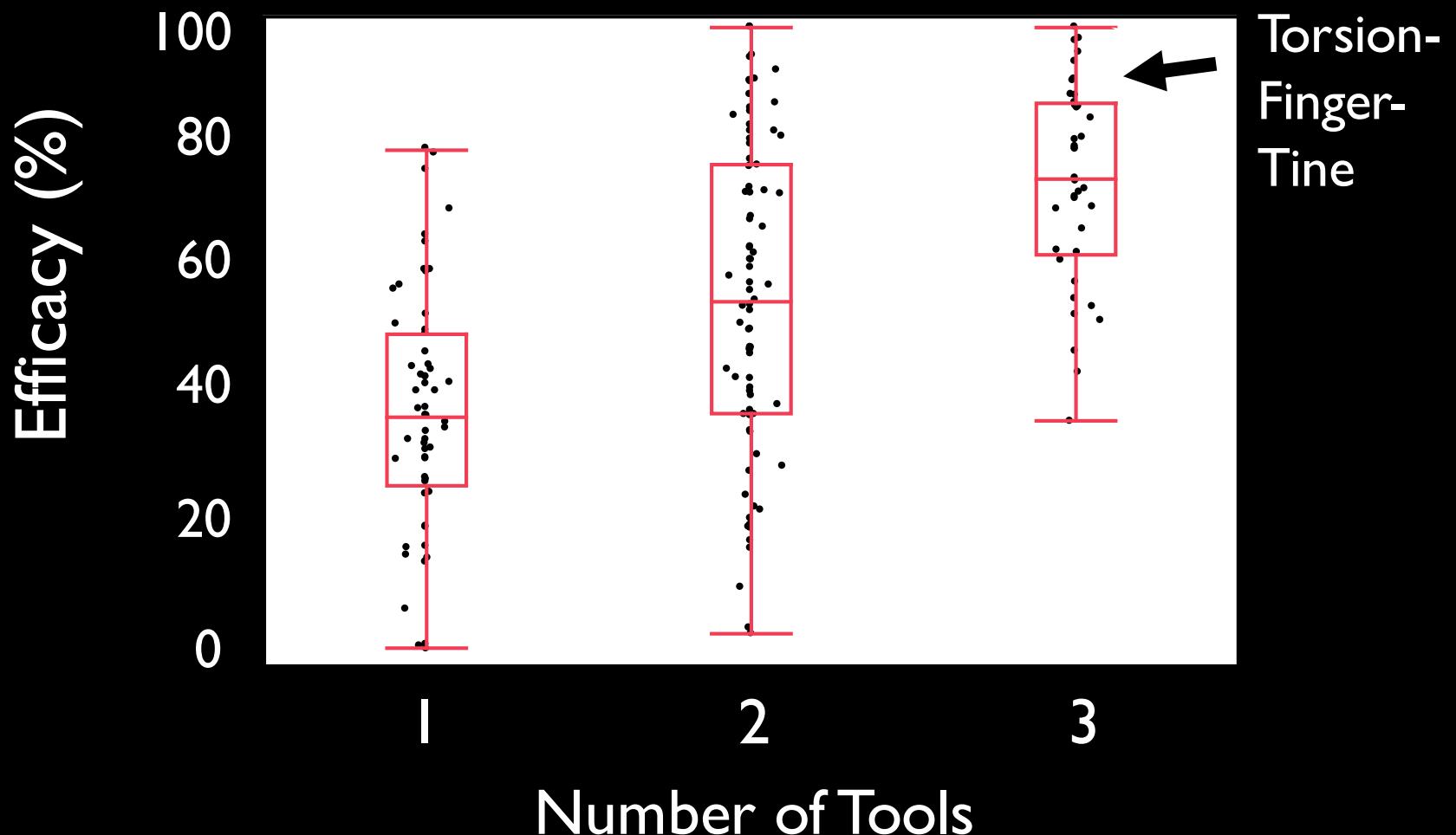
Intra-row



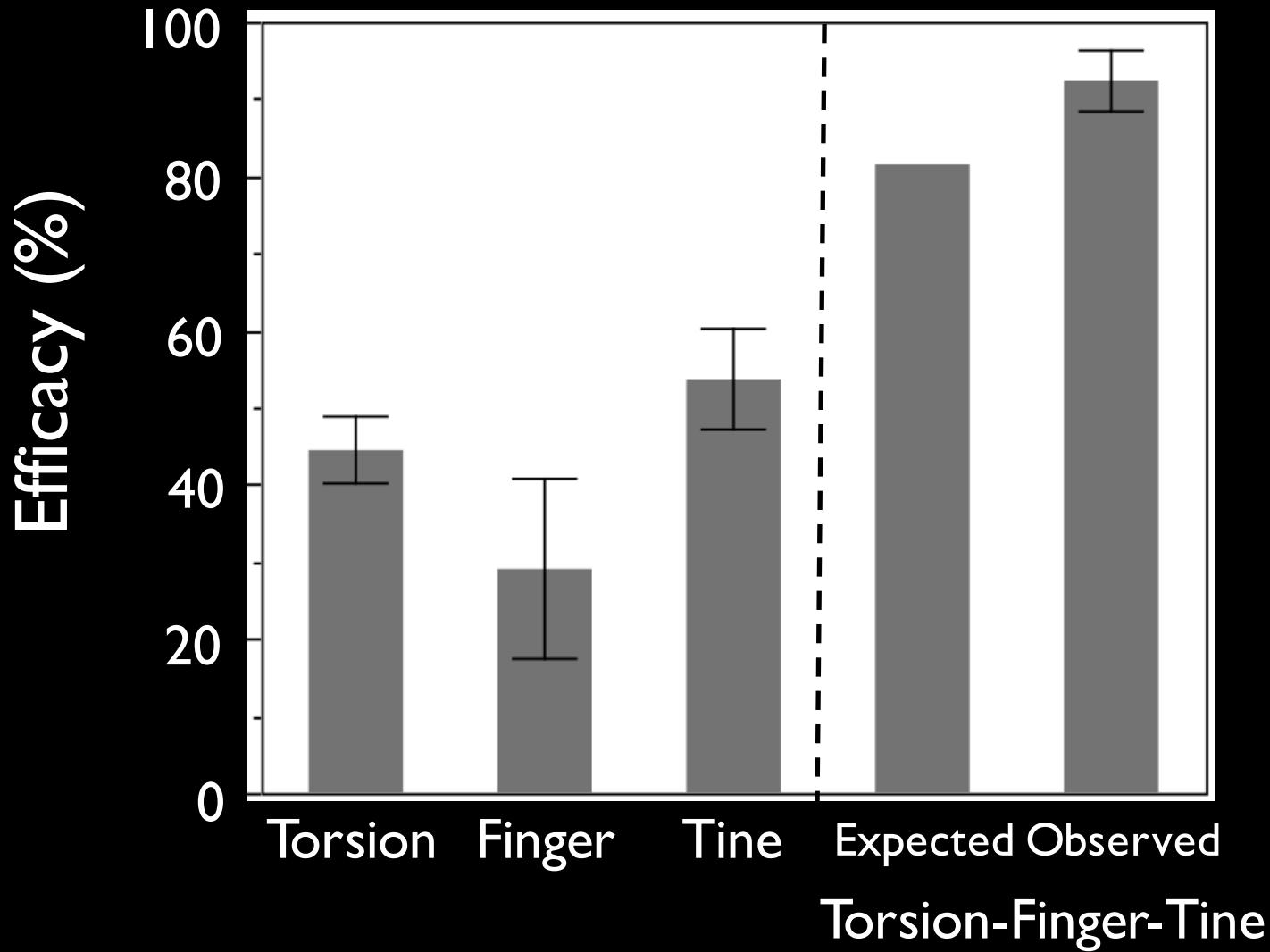
tine
finger

torsion

Stacking increased efficacy

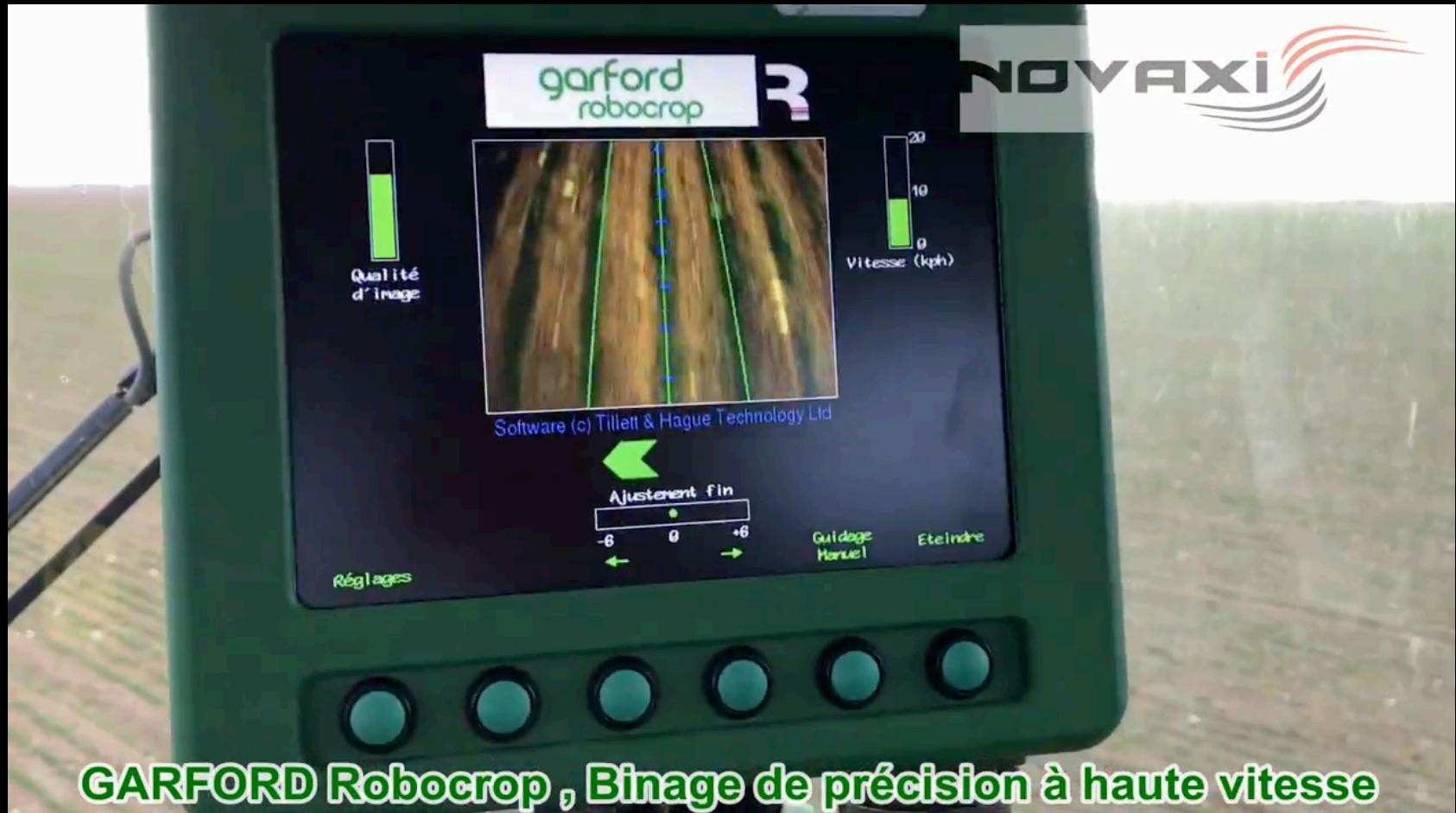


Evidence of synergy



Camera guidance

Greater precision and working rates



solutions

cultivate more

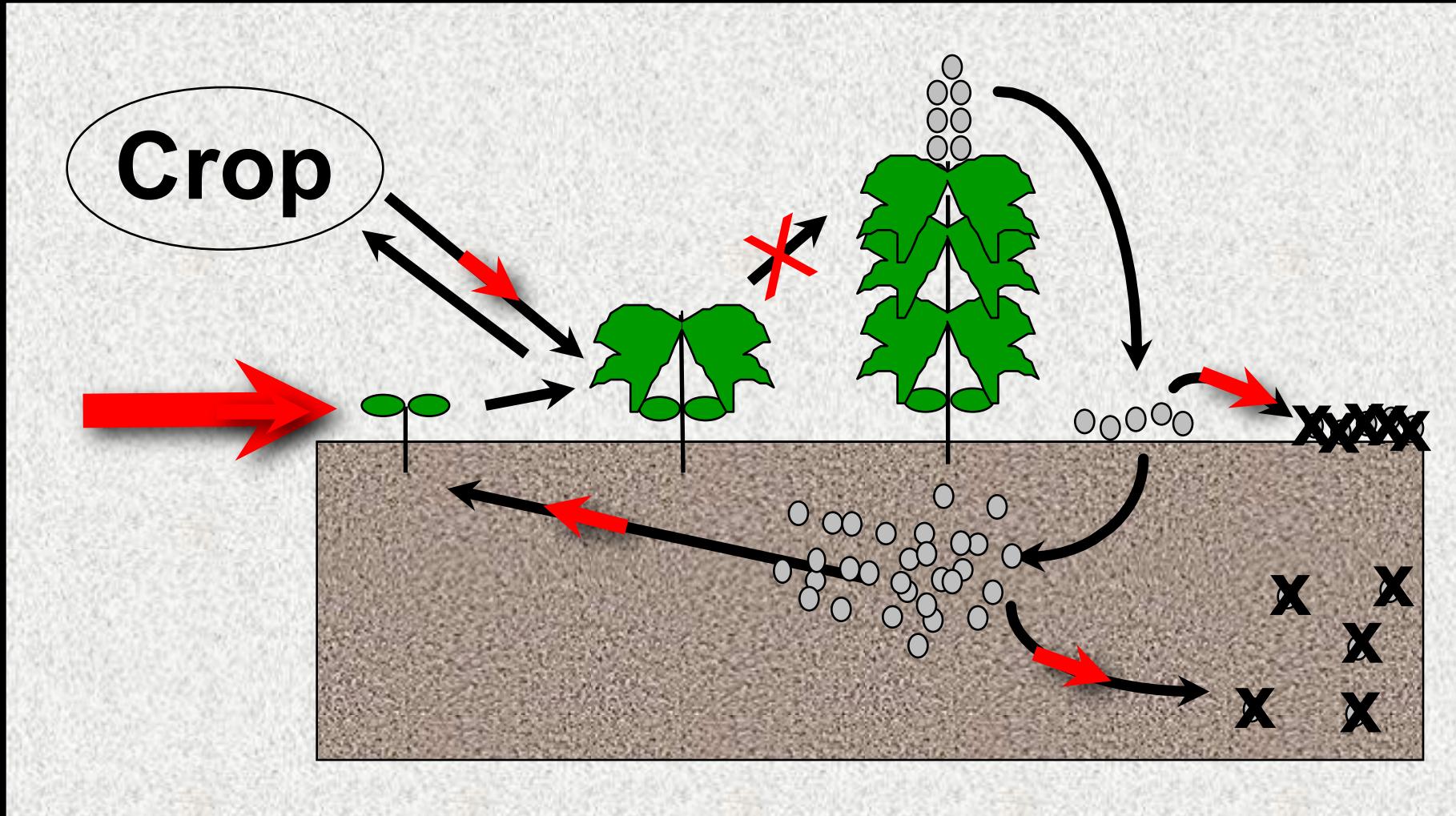
cultivate better

start with fewer weeds



maximize debits
minimize credits

“Many little hammers”



The hammers

Crop/weed competition

- Species/cultivar
- Seed size/quality
- Transplanting
- Seeding density
- Row spacing
- Resource placement
- Nutrient source

Weed seedling control

- Cultivation
- Flaming
- Hand weeding
- Mulching

Weed seed control

1. Preempt seed rain
2. Germination
3. Solarization/tarping
4. Seed predation

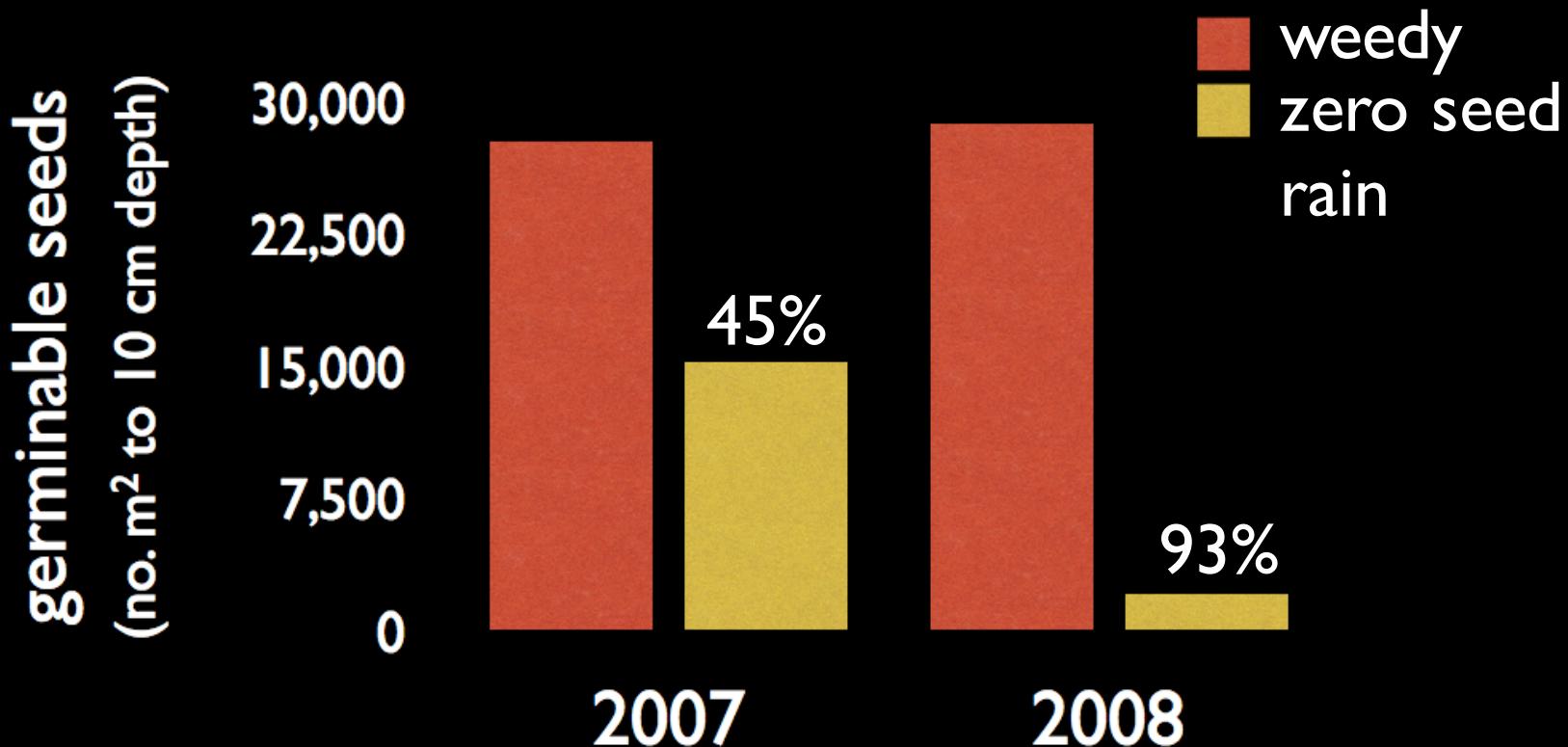
A photograph of a green plant, likely a species of Amaranth, set against a solid black background. The plant features large, broad leaves at the base and a prominent, upright inflorescence. This inflorescence is a long, narrow spike composed of many small, individual flowers or fruits, which are tightly packed and have a distinct green color. The overall shape of the plant is elongated and reaches towards the top of the frame.

preempt seed
rain

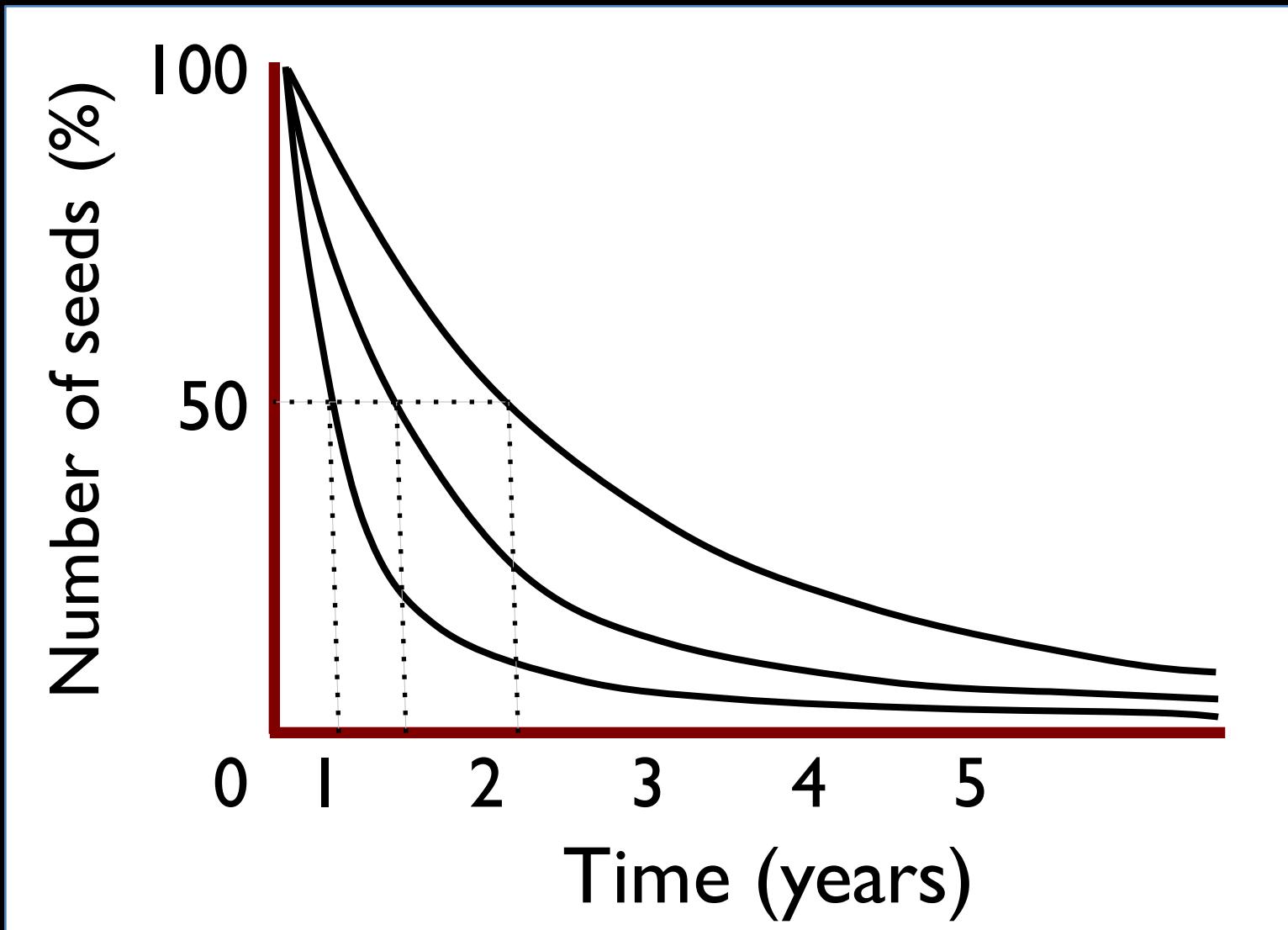


Zero seed rain

On-farm trials



Weed seed persistence



Short-season crops preempt seed rain





encourage seed
germination

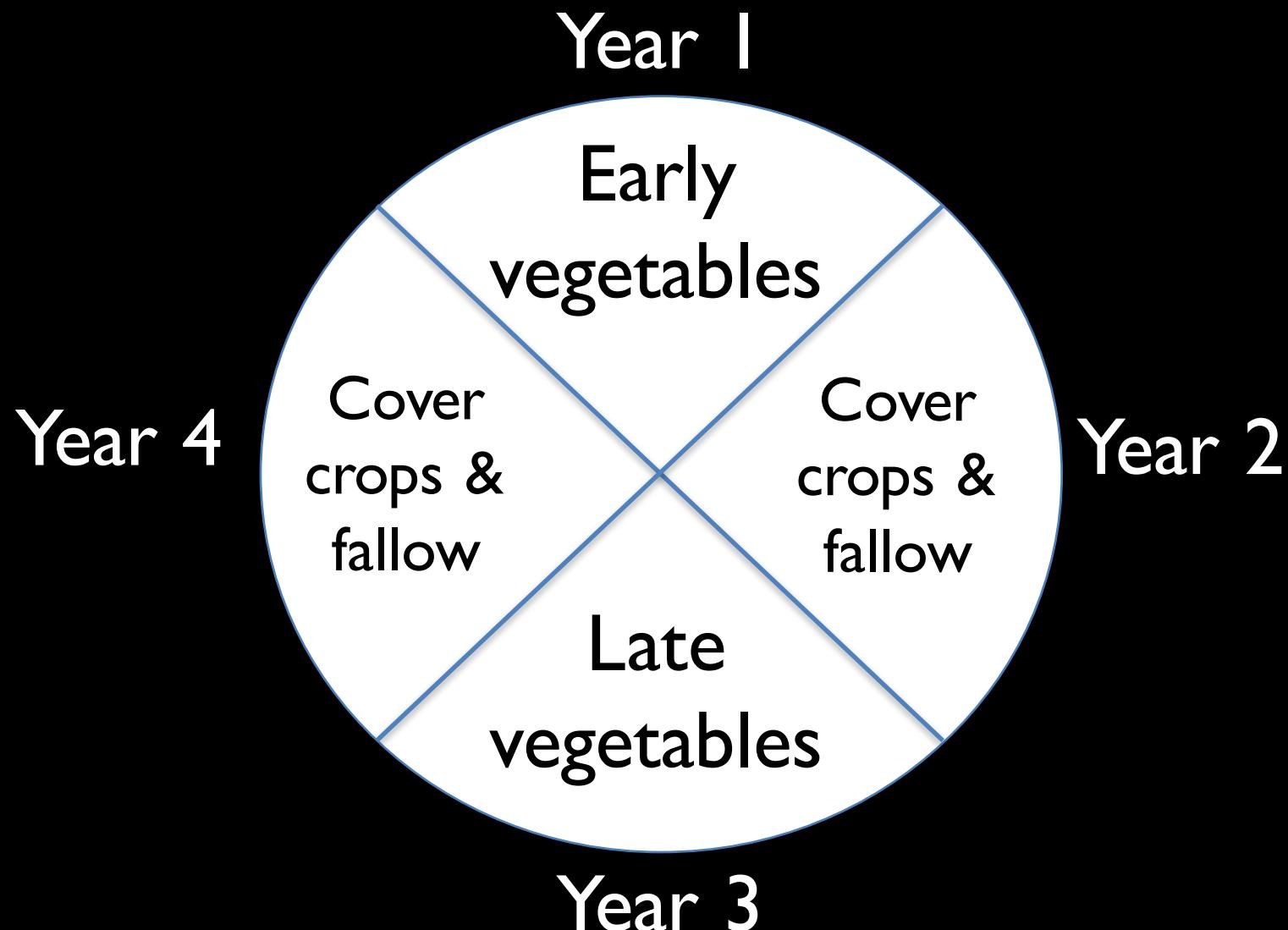
“Weed the soil not the crop”

Anne and Eric Nordell, Trout Run Pennsylvania



source: www.neon.cornell.edu

Rotational cover cropping



Weed seedbanks



Dixmont, ME

Durham, ME

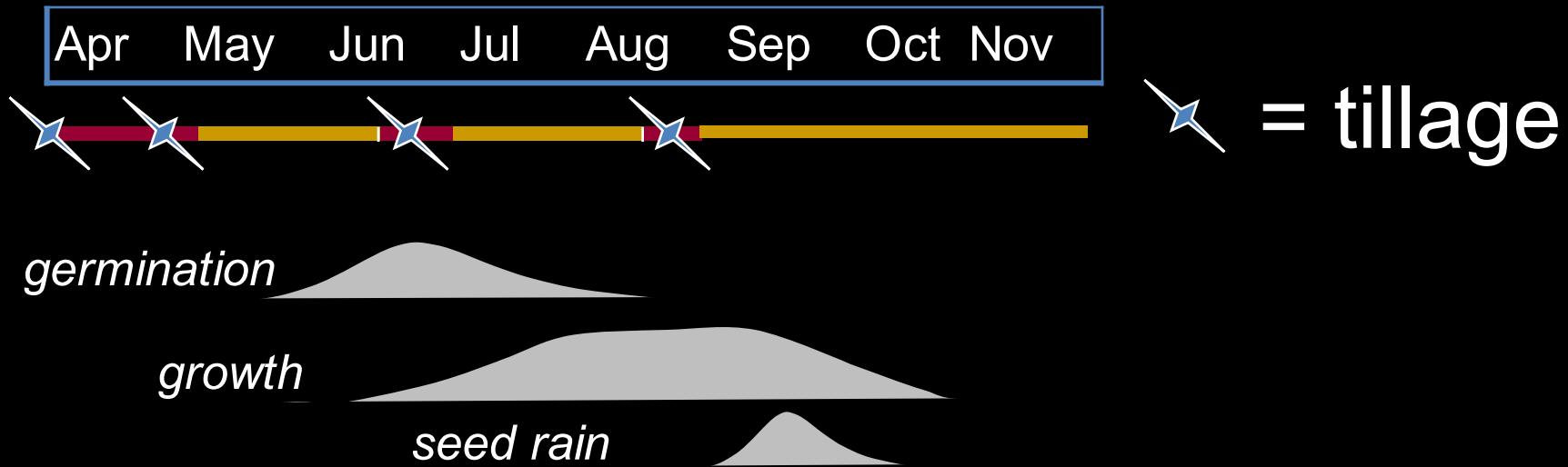
Trout Run, PA

9-975
WADORN

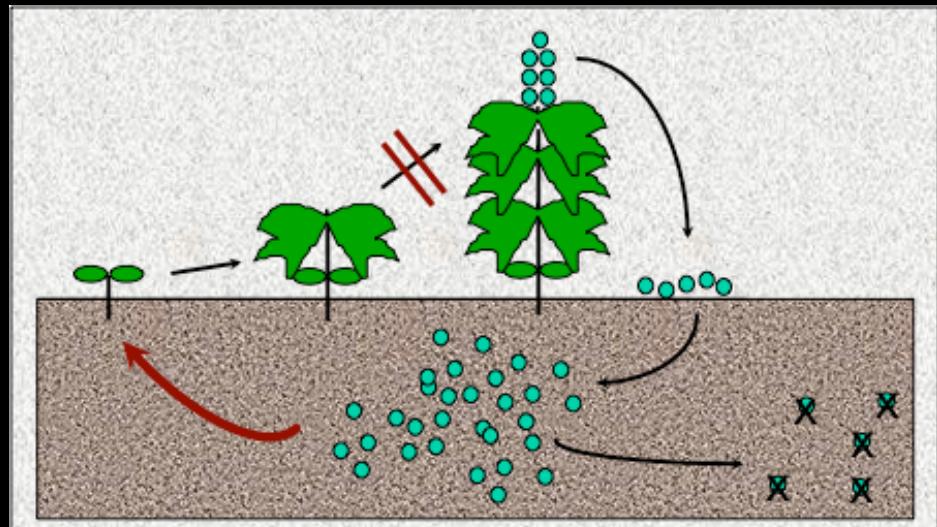


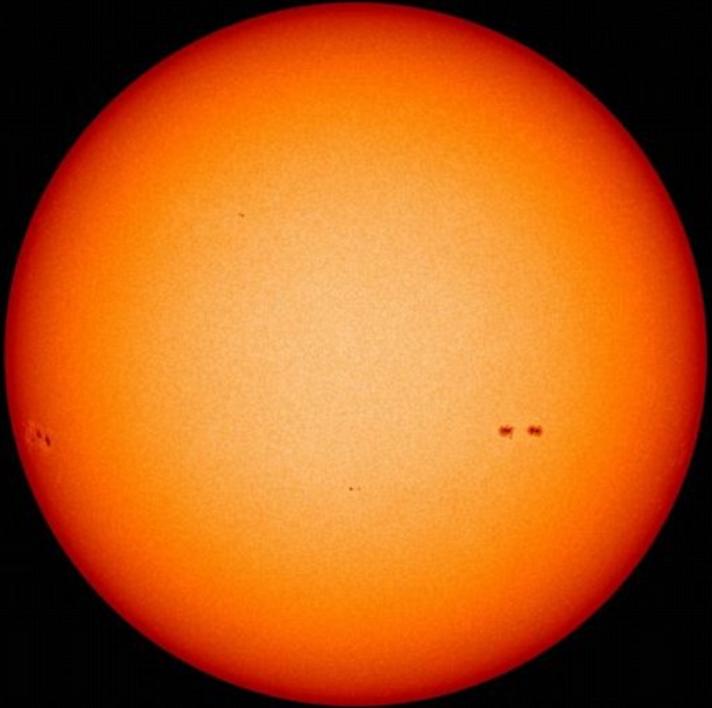


Disturbance and timing are key



Encouraging germination
Preempting seed rain





solarize to
create a stale
seedbed

Solarization



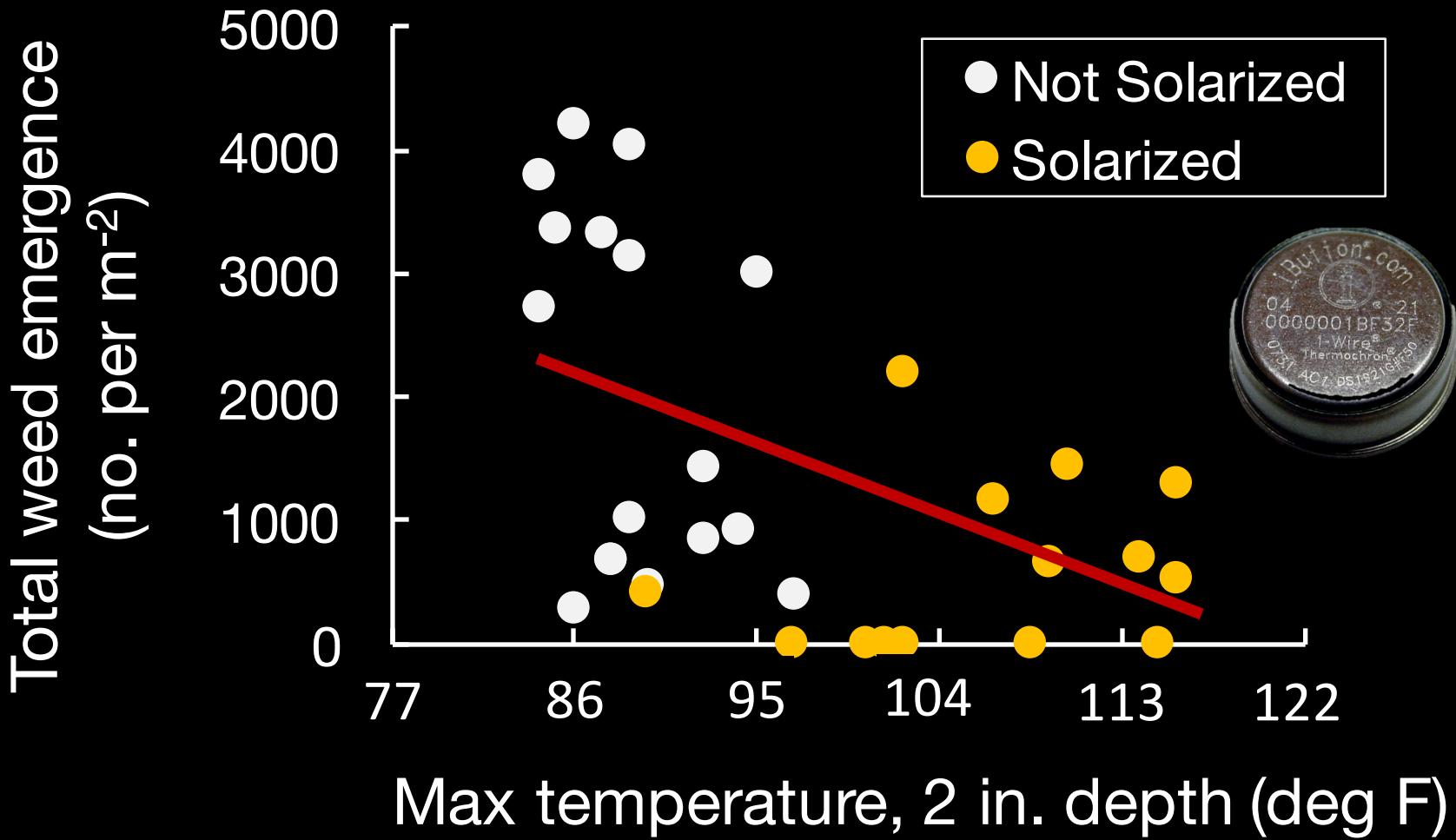
Annabessacook Farm, 2015

Solarization



Sonja Birthisel, Ph.D. student, UMaine Rogers Farm, 2015

Soil temperature

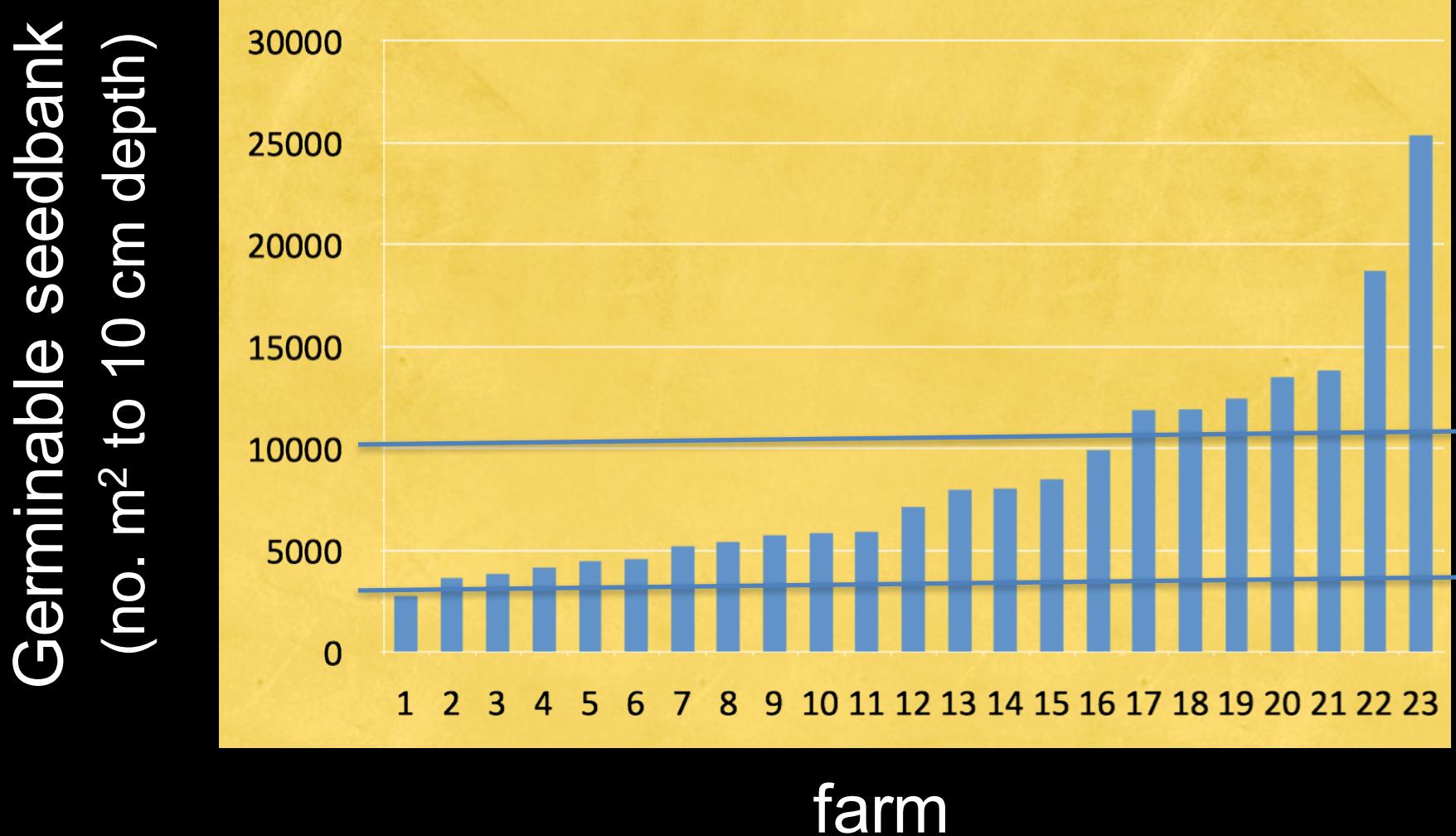


Mental Models

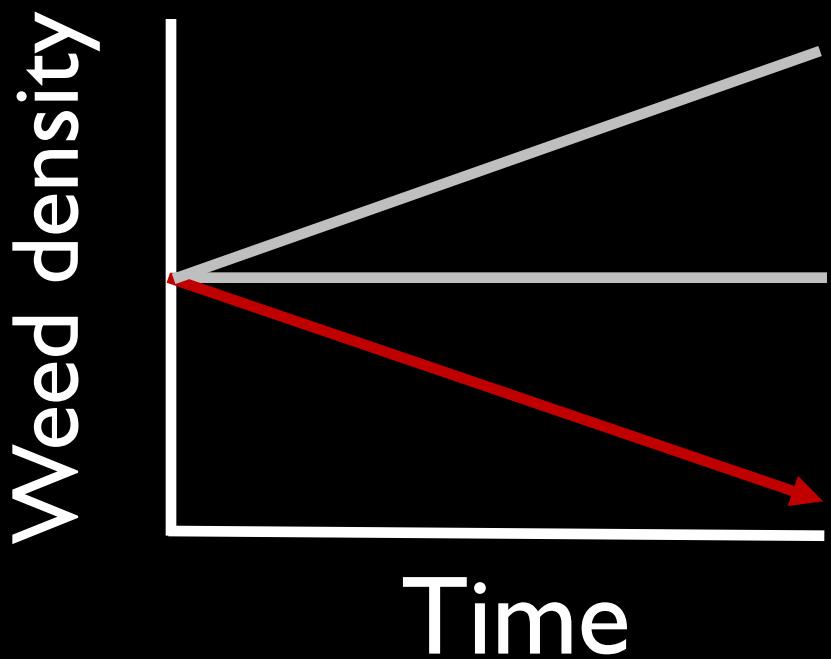


Weed seedbanks

New England organic farms, 2010

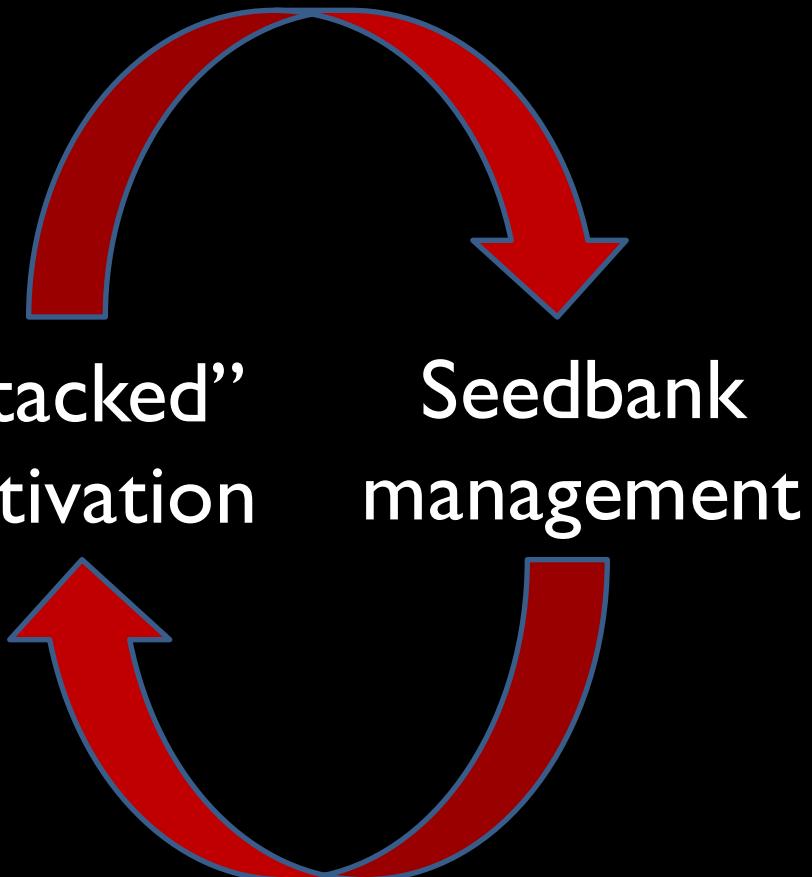


Positive feedback loop



“Stacked”
cultivation

Seedbank
management



Many little bots...



Tertill™

Acknowledgements



NESARE: “Managing seed rain.”

MAFES: “Solarization.”

Eric and Anne Nordell, Beech Hill Farm

Mark Guzzi, Peacemeal Farm

Jean-Paul Courtens, Roxbury Farm

OARI: “Farmer designed systems to reduce tillage in organic vegetables.”

OARI: “Mental models and participatory research to redesign extension programming.”



Sonja Birthisel



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umaine.edu/weedecology



[zeroseedrain](#)