Plantebeskyttelse i økologiske juletræer

SCIENCE AND TECHNOLOGY

Peter Hartvig

AARHUS
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Vigtigste skadegørere

- Renholdelse (ukrudt)
- Ædelgranlus

Indhold af indlæg

- Kort om økologiske regler for plantebeskyttelse
- ”Pluk” fra præsentationer om ikke-kemisk ukrudtsbekæmpelse, udarbejdet af Bo Melander

Muligheder for brug af plantebeskyttelsesmidler i økologisk planteproduktion

- Som udgangspunkt skal skadegørere forbygges ved bl.a. ”hensigtsmæssig valg af sorter og dyrkningsmetoder”
- Plantebeskyttelsesmidler må ikke anvendes forebyggende eller til rutinemæssig behandling
- Plantebeskyttelsesmidler må kun bruges ved en ”akut fare” for afgrøden
- Plantebeskyttelsesmidler (stofferne) skal være godkendt til økologi (”bilag 2”)
- Basisstoffer er tilladte

Godkendte midler til økologi (”bilag 2”)

Det er en forudsætning af midlerne er godkendt i Danmark og til den pågældende afgrøde.

For juletræer er det i første omgang midler mod skadedyr, der kan blive aktuelle at anvende i økologiske juletræer. Det kan eksempelsvis være:

- Ekstrakt udvundet fra *Azadirachta indica* = Neem Azal T/S
- Pyrethriner (Chrysanthemum cinerariaefolium) = Spruzit Neu
- Bacillus thuringiensis ssp.= Dipel, Turex mfl.
- Phlebiopsis gigantea VRA 1835 = Rotstop
- Svovl = Kumulus S
- Parafinolie, rapsolie

Basisstoffer

Stoffer, der ikke udgør en fare for mennesker, dyr og miljø, men som har en dokumenteret effekt på navngivne skadegørere.

Eksempler:

- Udtræk af padderok, udtræk af brændenælder
- Solsikkeolie
- Valle
- Læsket kalk
- Løgolie
- Øl

Topics

1. **Environmental modification**

2. Physical exclusion

3. Direct physical control
   - **Thermal**
   - Mechanical

Concepts in Integrated Pests Management (Norris *et al.*, 2003)

Environmental modification includes:

- Temperature
  - Heat
  - Cold (freezing)
- Water
  - Flooding
  - Desiccation
  - Irrigation
- Light

Concepts in Integrated Pests Management (Norris *et al.*, 2003)

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Solarization

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Light

Blocking light

- Synthetic mulches
- Natural mulches

Green Christmas

Green Christmas

Topics

1. Environmental modification

2. Physical exclusion

3. Direct physical control
   - Mechanical
   - Thermal

Concepts in Integrated Pests Management (Norris *et al.*, 2003)

Physical exclusion

- Barriers
  - Copper bands and dry powders
  - Floating row covers; bagging fruit
  - Vs vertebrates
    - Nets for birds
    - Fences for mammals
- Traps
  - Weed seed filters
  - Coloured sticky cards
  - Vertebrates

Concepts in Integrated Pests Management (Norris *et al.*, 2003)

Physical control methods
Bo Melander
Weed Scientist

30th October, 2018

Row covers to exclude insects

SOLIDUM PETIT IN PROFUNDIS · UNIVERSITAS ARHUSIENSIS ·

Topics

1. Environmental modification

2. Physical exclusion

3. **Direct physical control**
   - **Thermal**
   - Mechanical

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Thermal weed control

- Flaming
- Infrared radiation
- Hot water
- Steaming
- Hot air
- Electrocution
- Microwave radiation
- Ultraviolet radiation
- Laser cutting
- Freezing

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Thermal weed control

Easy to control

- *Tripleurospermum perforatum*
- *Chamomilla sp.*
- *Senecio vulgaris*
- *Persicaria sp.*
- *Polygonum aviculare*
- *Stellaria media*
- *Chenopodium album*

Difficult to control

- *Plantago major*
- *Artemisia vulgaris*
- *Taraxacum sp.*
- *Poa annua*
- *Sedum*

Very difficult to control

- *Urtica dioica*
- *Elymus repens*
- *Aegopodium podagraria*
- *Equisetum arvense*
- *Cirsium arvense*

David Hansson SLU (2007)

Flame weeders

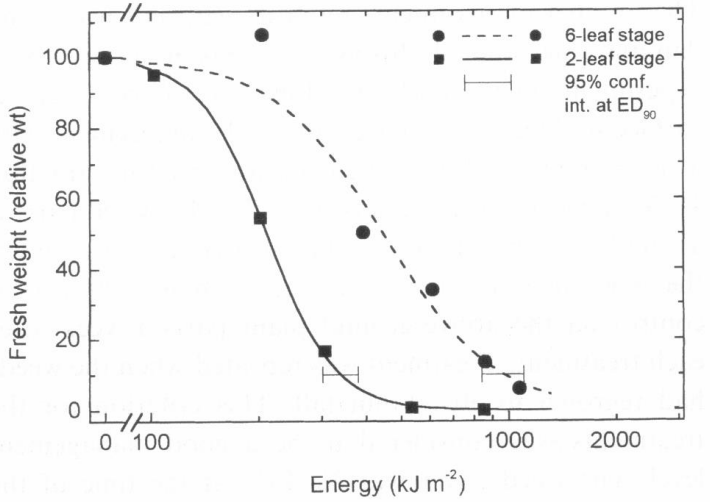
Hot water on aboveground vegetation

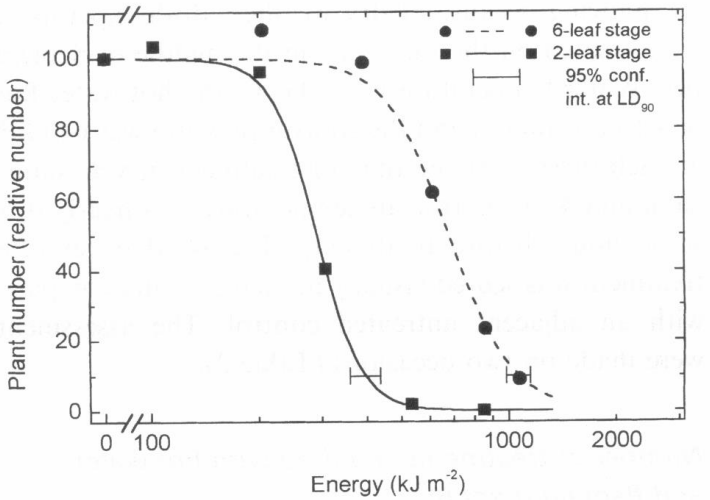
Compared to flaming

- No fire risk
- Better foliage penetration

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Hot water weed Control





Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Hot water applied with biodegradable foam

Reduces heat dissipation

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Steaming of vegetation

- Less water use
- Better leaf canopy penetration

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

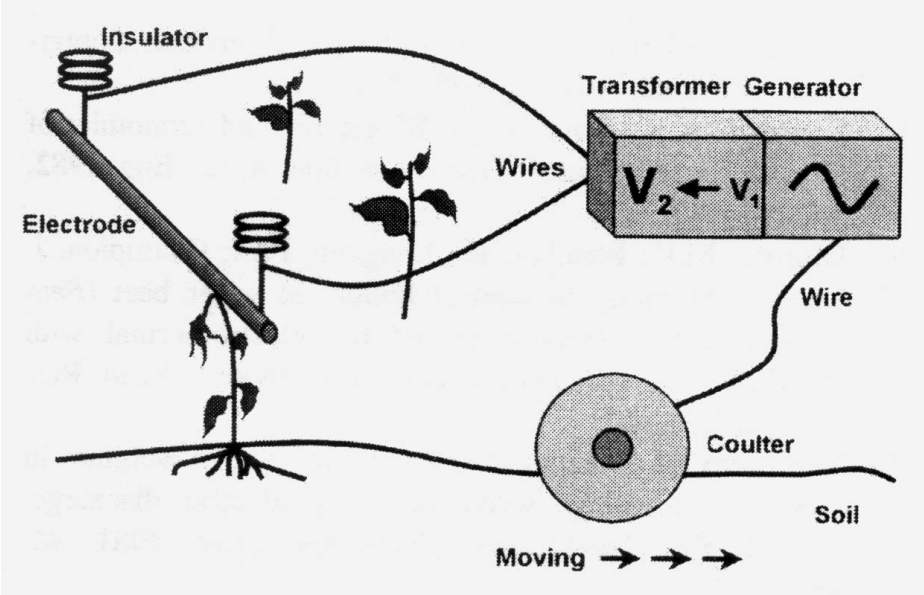
Current soil steaming techniques

- Extremely high energy consumption, 3000-5000 litre fuel oil ha^{-1}
- Low working capacity

Band steaming before carrot sowing

- 9 rows, 3 rows per bed
- 14 cm band width and 5 cm soil depth
- 600 litre oil and 7000 litre water ha^{-1}
- 0.2 km h^{-1}, capacity 0.112 ha h^{-1}

Electrocution



Cirsium arvense

Electrocution

Energy consumption using thermal methods

1. Flame weeding (FLW) 2300 MJ ha^{-1}
2. Infrared radiation about the same
3. Electrocution higher / lower depending on the weed density
4. Hot water / steam 2 x FLW
5. UV radiation >4 x FLW
6. Freezing 3-6 x FLW
7. Band steaming 5-10 x FLW, longer lasting effect
8. Laser cutting >10 x FLW
9. Microwaves 40 x FLW

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

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30th October, 2018

MSc-course in Agrobiology: Crop pests-biology and control

Physical control methods – session 2

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Topics

1. Environmental modification

2. Physical exclusion

3. **Direct physical control**
   - Thermal
   - **- Mechanical**

Non-chemical weed management (Upadhyaya & Blackshaw (2007))

"Begreber", der bør kendes i forbindelse med ikke-kemisk ukrudtsbekæmpelse

- Interrow vs. Intrarow vs. full-width
- Tildækning vs. oprivning af ukrudt
- Selektivitet

Cultivating tillage (direct weed control in the crop)

- **Full-width**
- Inter-row cultivation
- Intra-row cultivation

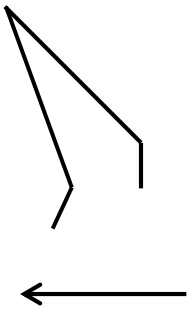
Non-chemical weed management (Upadhyaya & Blackshaw (2007))

Broadcast – the flex-tine harrow

The flex tine harrow – pre- and post emergence control

Aggressiveness

- Driving speed
- Tine angle
- Working depth



The principles of selectivity

Low technologies with no intelligence

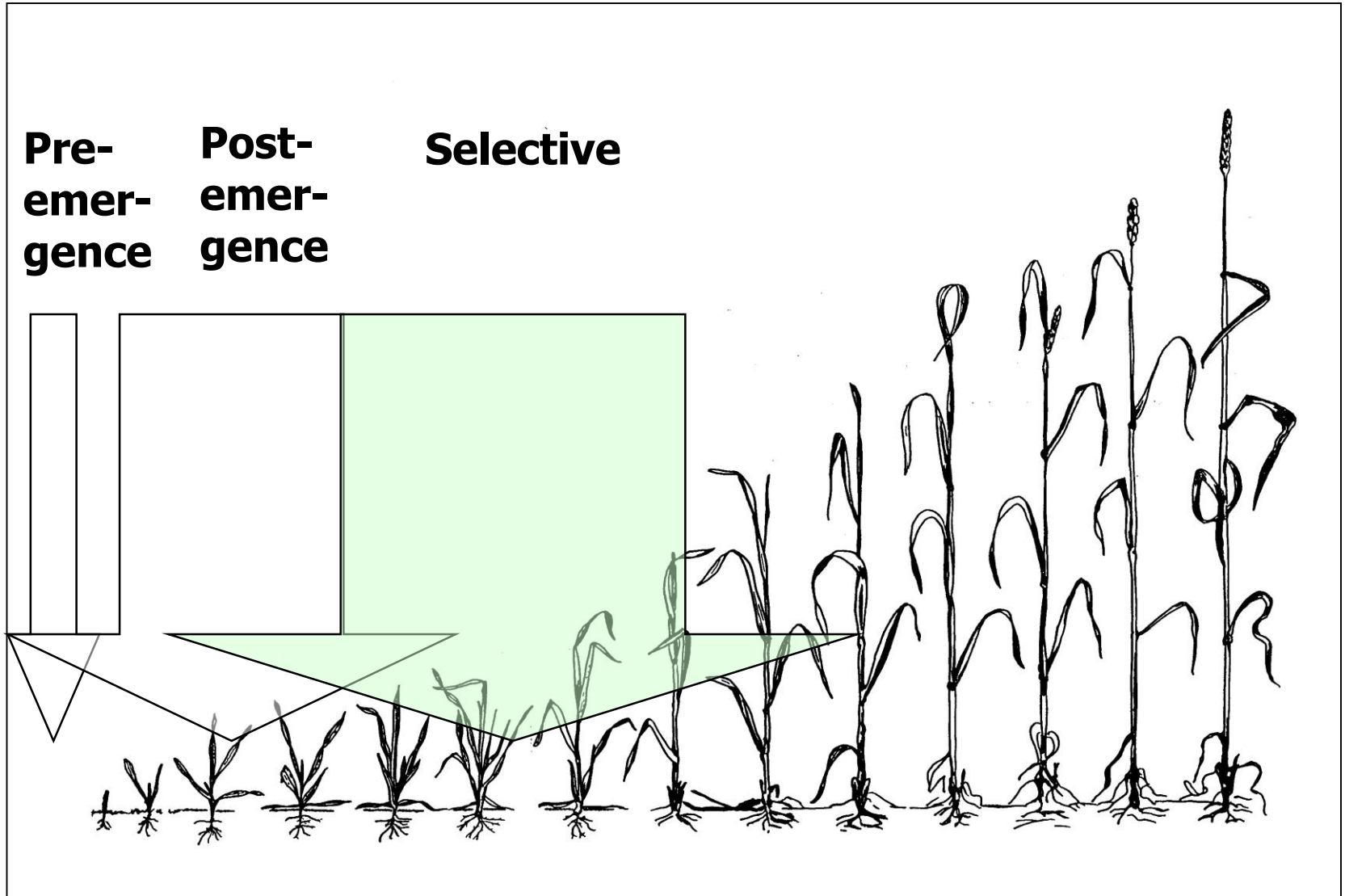
A. Conditions of high selectivity:

High weed control with no or minimum crop injuries

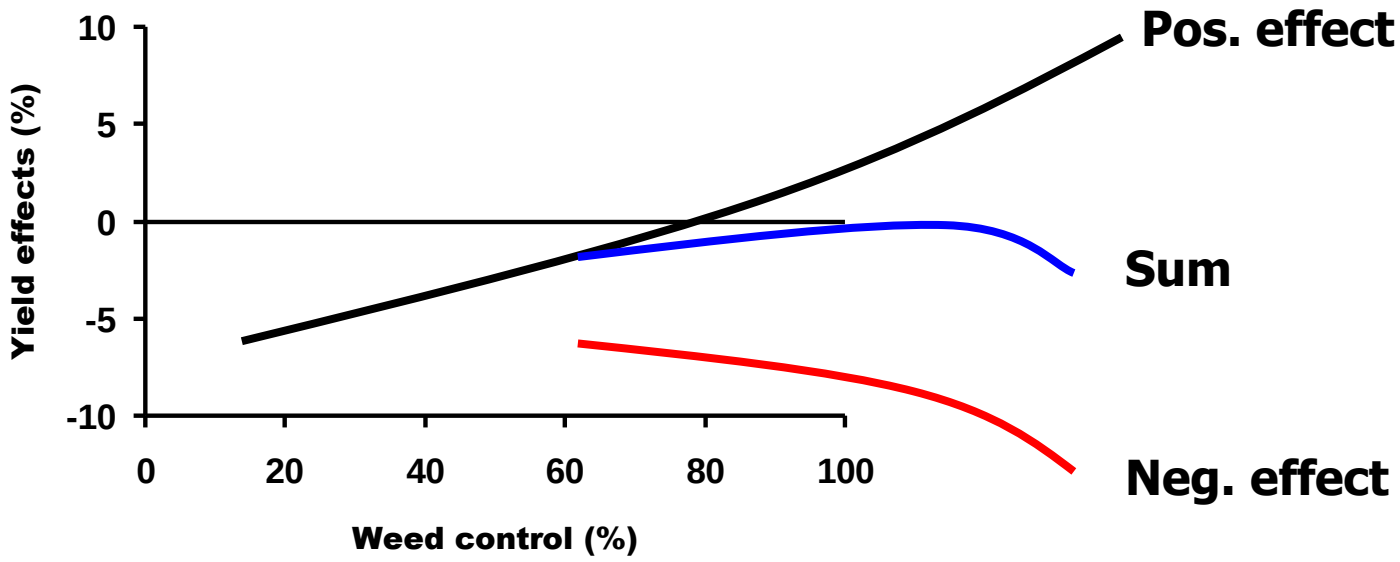
B. Conditions of low selectivity:

High weed control can be associated with severe crop injuries

Weed harrowing in spring cereals

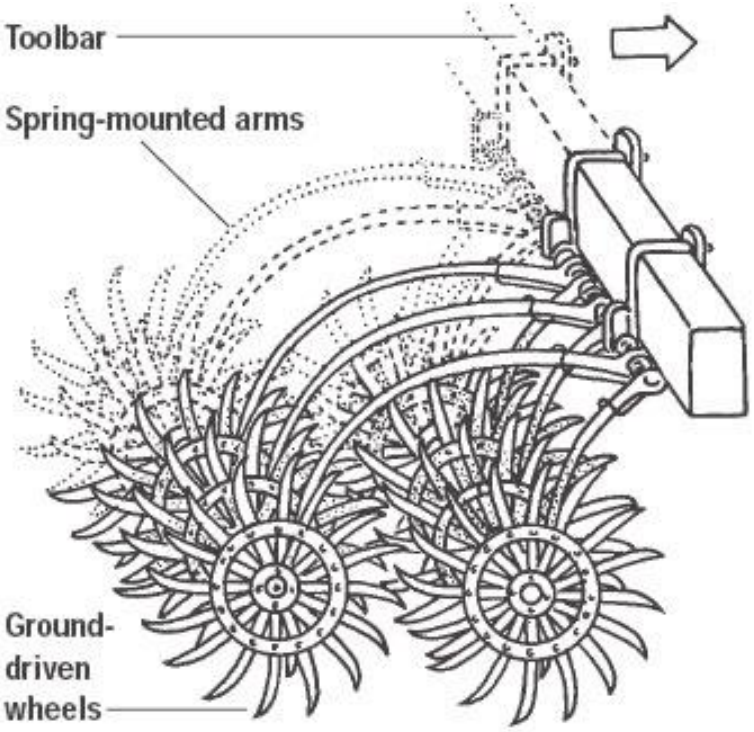


Post-emergence harrowing



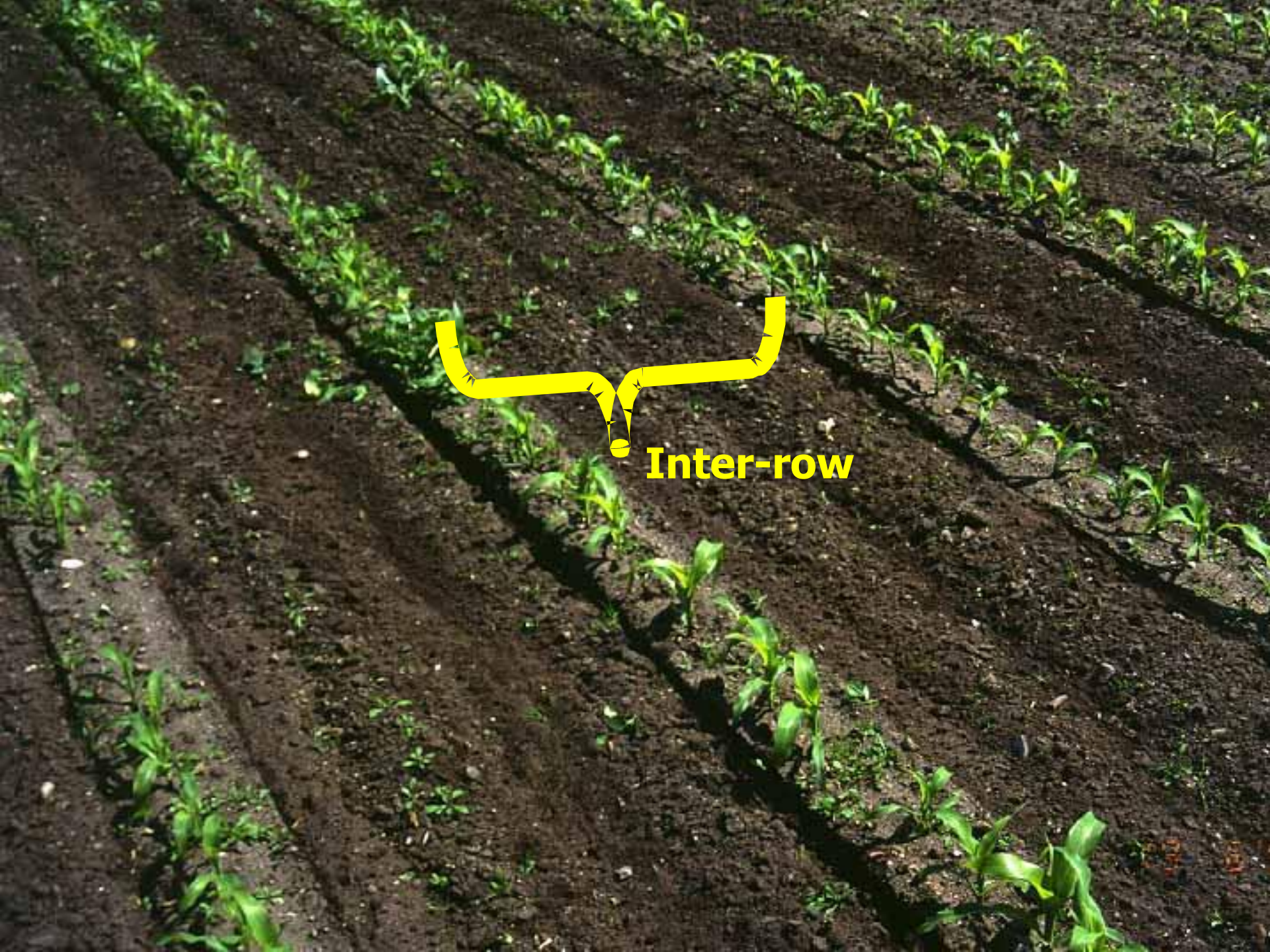
[Adapted from Rasmussen (1991), *Weed Research* **31**(6), 401-408]

Broadcast - rotary hoe



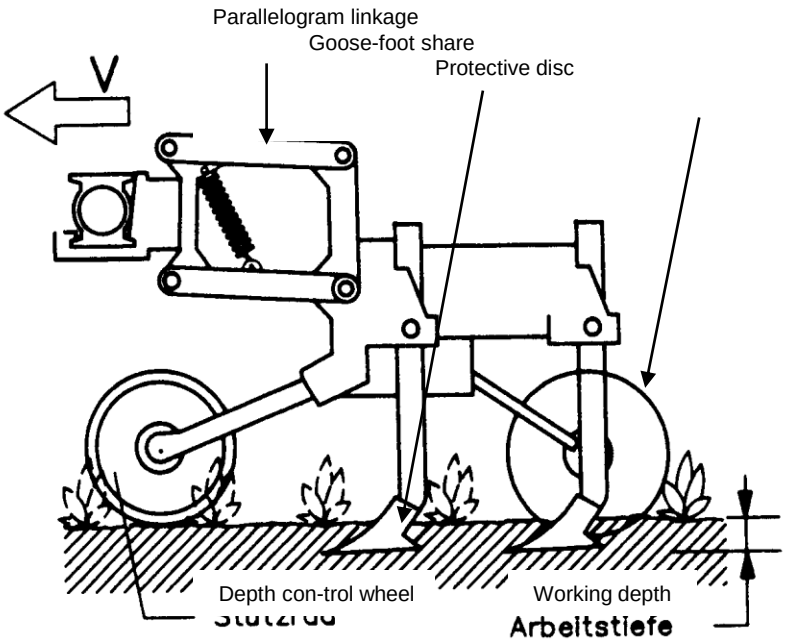
Cultivating tillage

- Full-width
- **Inter-row cultivation**
- Intra-row cultivation

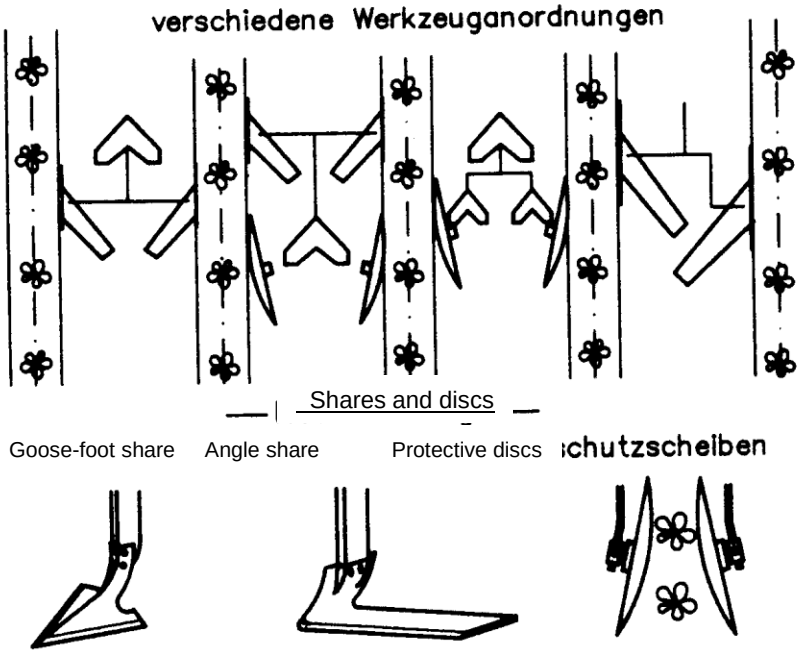

Inter-row

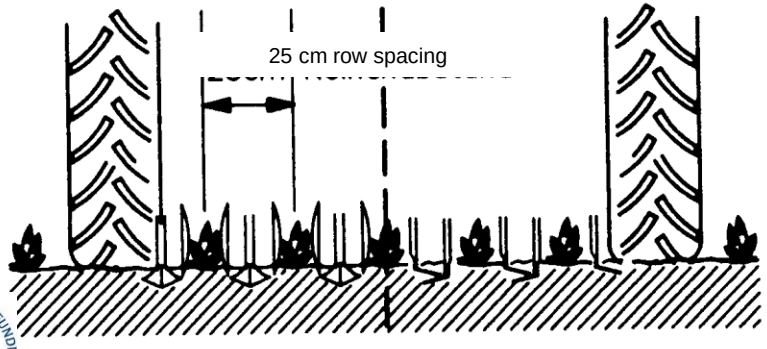
The conventional hoe

Hoeing unit cultivating one inter-row



Different types of shares and their placement on the hoe





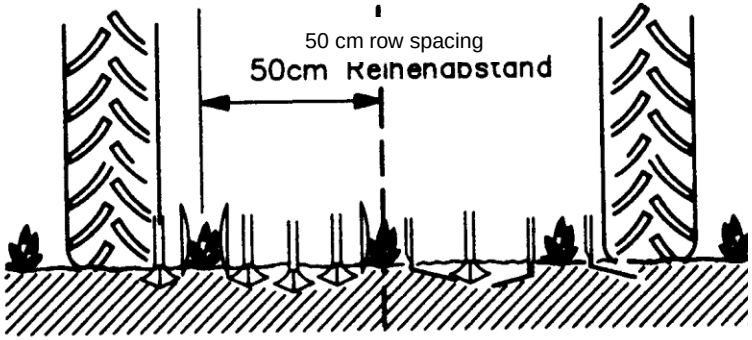


Figure 7. Principles of the conventional hoe. (Adapted from Weber (1997))

Rolling cultivators for inter-row cultivation in maize

Concepts in Integrated Pests Management (Norris *et al.*, 2003)

Steering options

Precision guided inter-row cultivation

GPS + camera vision guidance

(Robert Olsson, Nordic Beet Research, NBR, 2013)

6 cm untilled strip - 10-12 km/h - OK

(4 – 6 – 8 – 12 cm)

(Robert Olsson, Nordic Beet Research, NBR, 2013)

Inter-row hoeing in cereals with camera steering

Optimisation of:

- Row distance
- Seeding rate
- Supression of intra-row weeds

Cultivating tillage

- Full-width
- Inter-row cultivation
- **Intra-row cultivation**

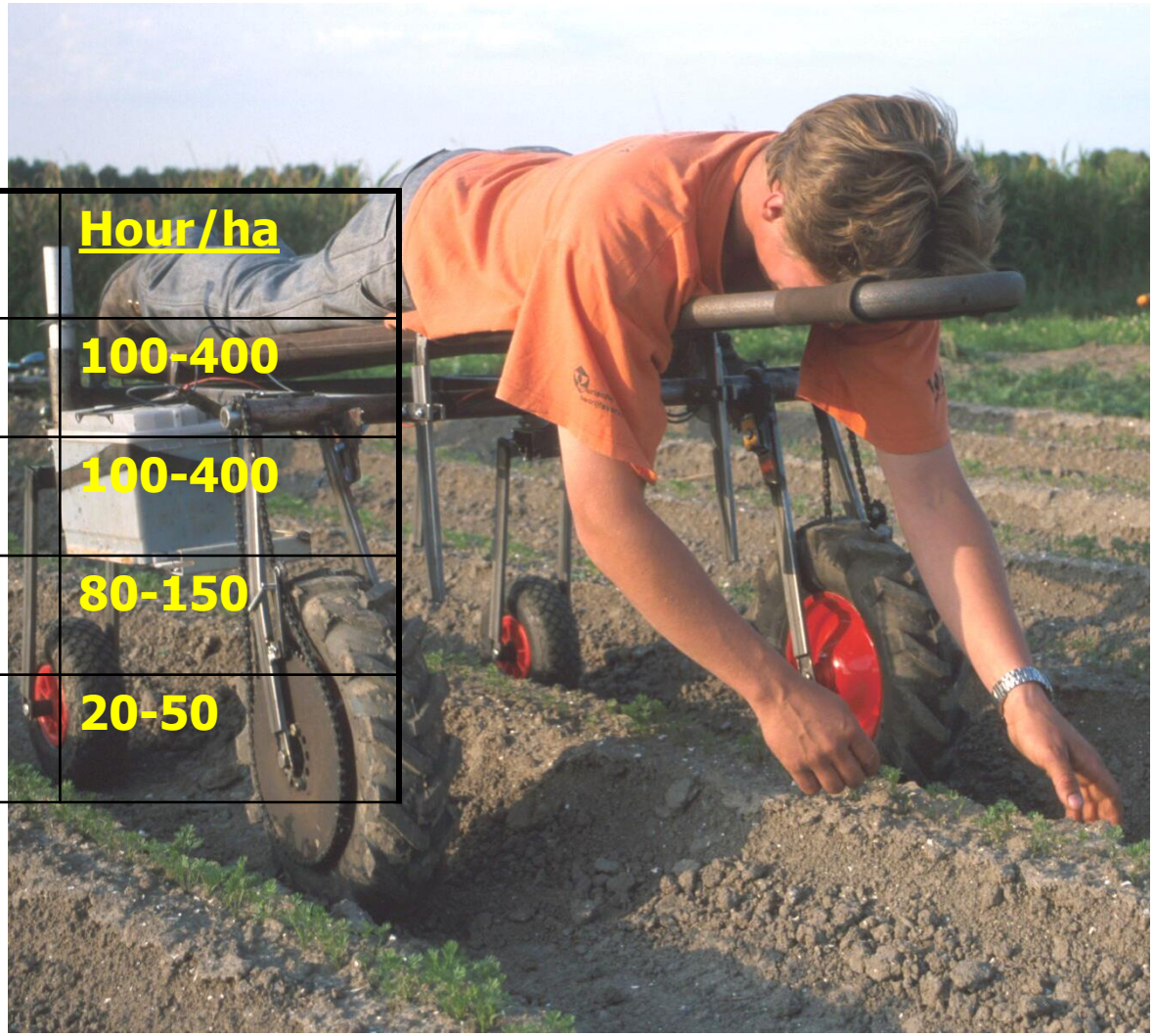
Non-chemical weed management (Upadhyaya & Blackshaw (2007))


Intra-row

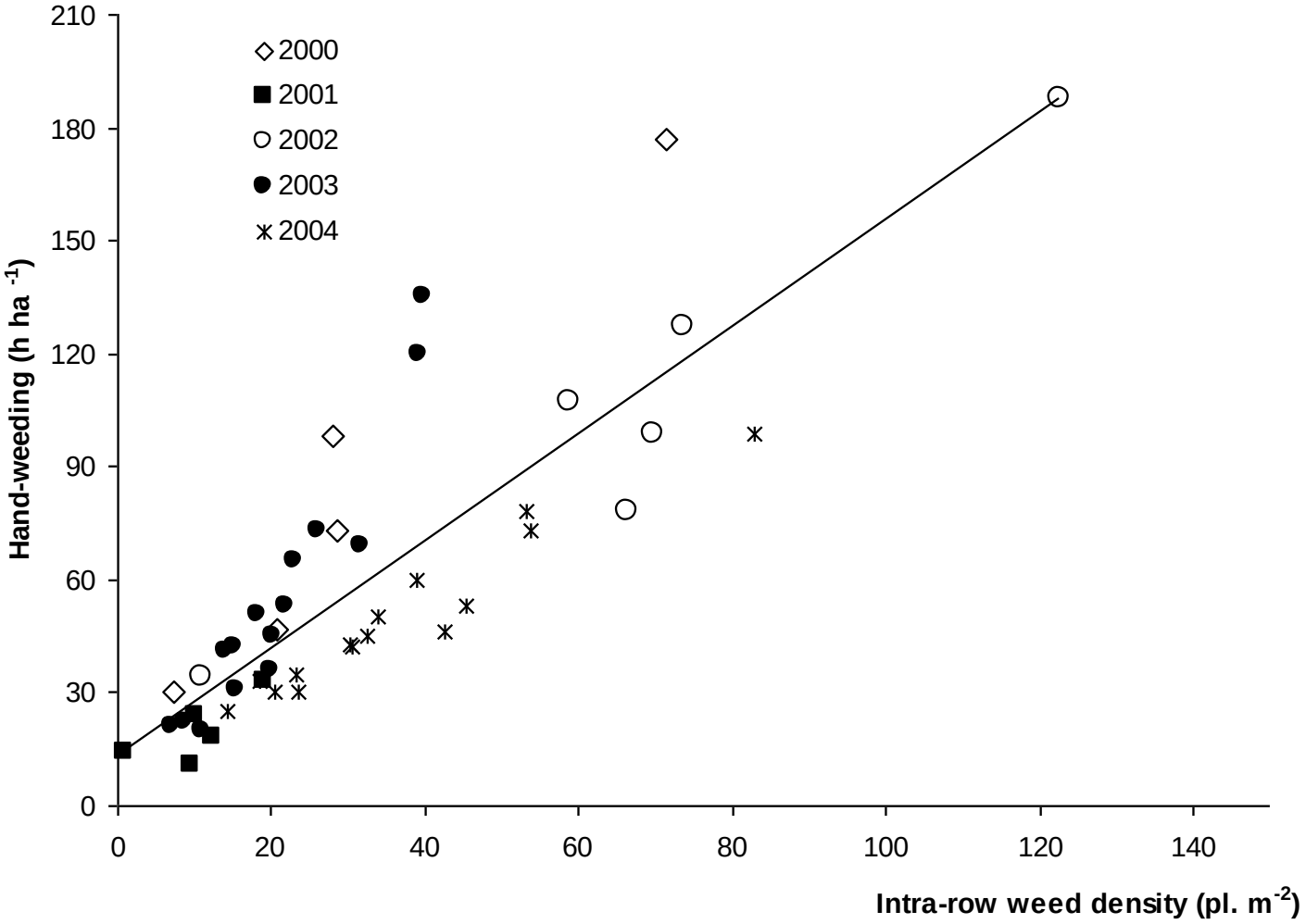
Hand weeding intra-row weeds

Time consumption for hand weeding

Crop		Hour/ha
Onion	sown	100-400
Carrot	sown	100-400
Sugarbeet	sown	80-150
Transplants		20-50



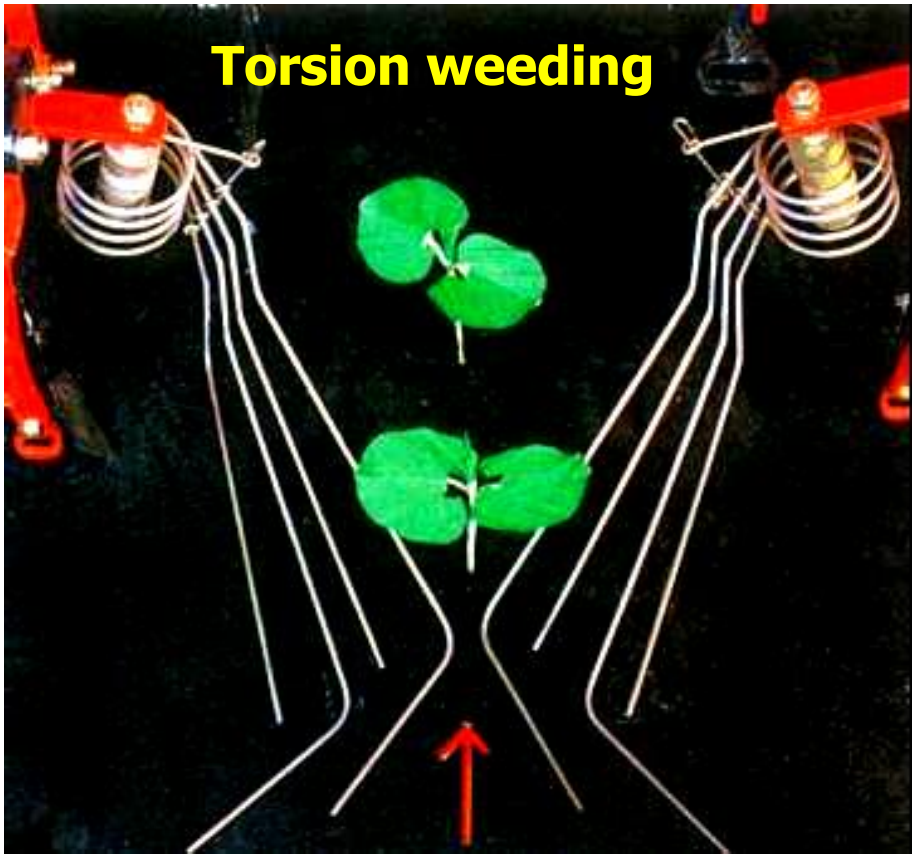
Hand-weeding in direct-sown onion



[From Van der Weide (2008). Weed Research 48, 215-224]

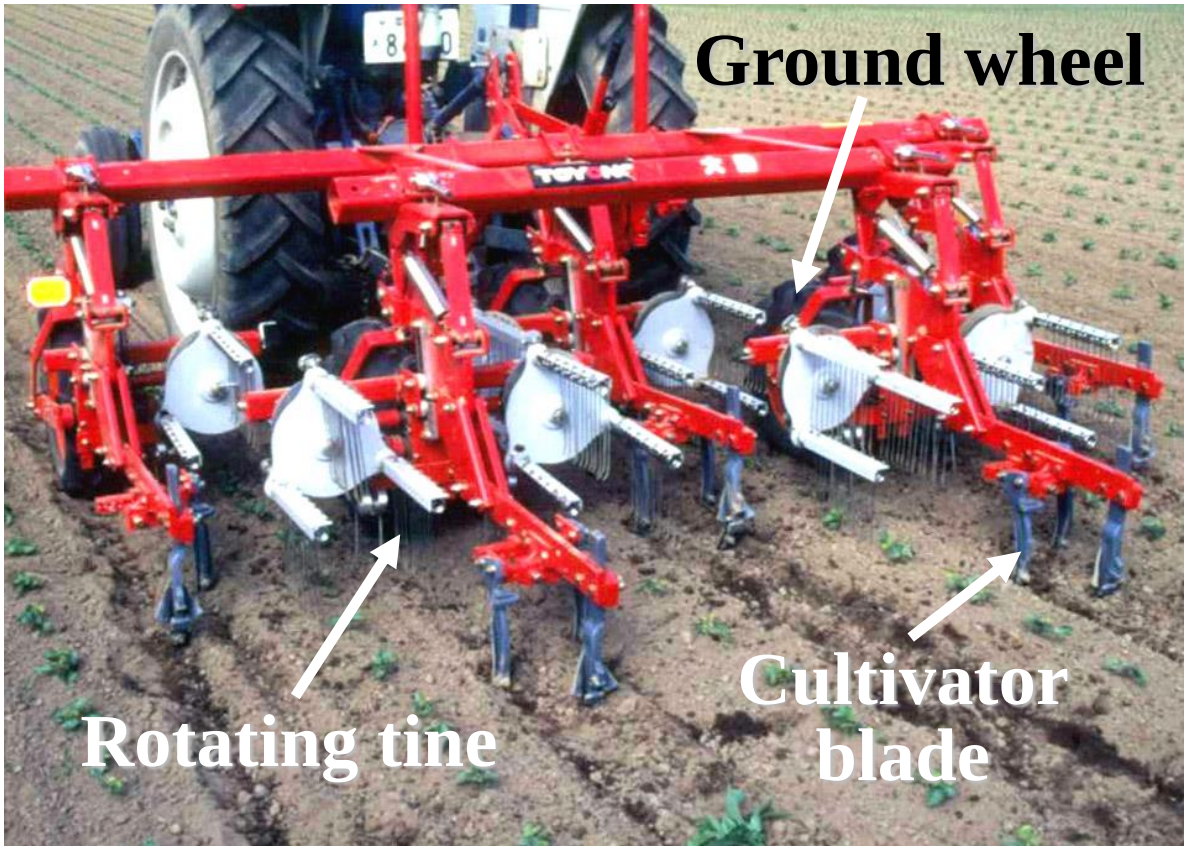
Tools for intra-row weeding

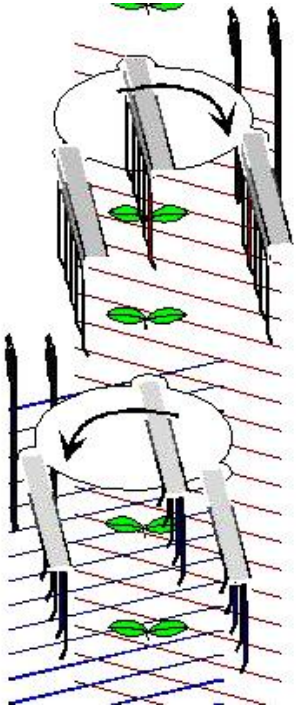
- Low technology
- Poor selectivity



Finger-weeding

Rotary tine weeder





Rotating tine

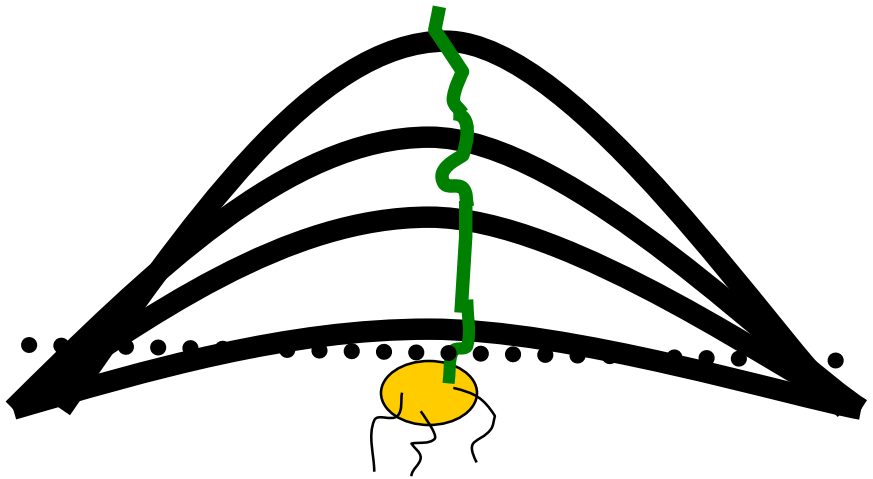
Rotary tine weeder

Ridging

Potatoes

Maize

Gradually ridging



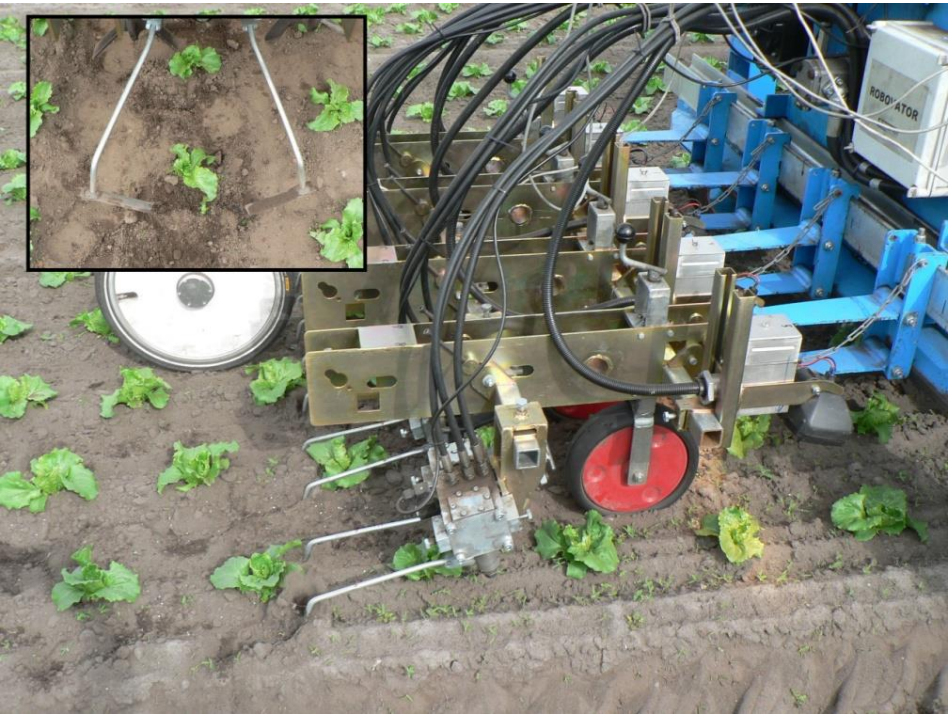
Transplanting and selectivity

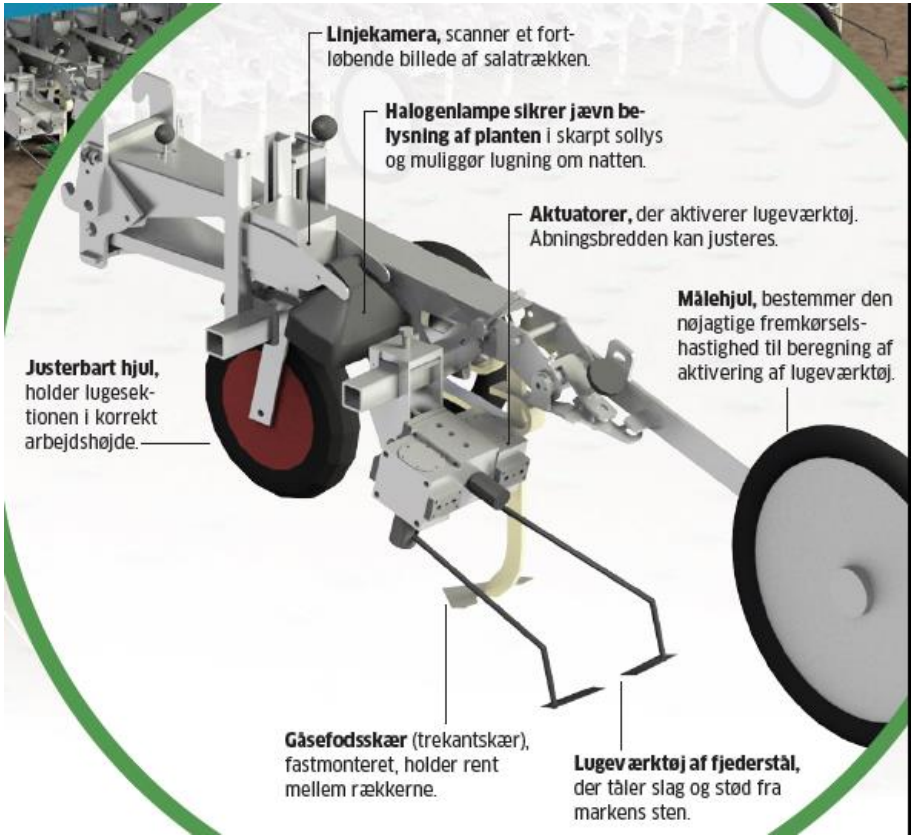
Improved selectivity provided that

- **Crop plants are well anchored**
- **Weed control prior to transplanting**

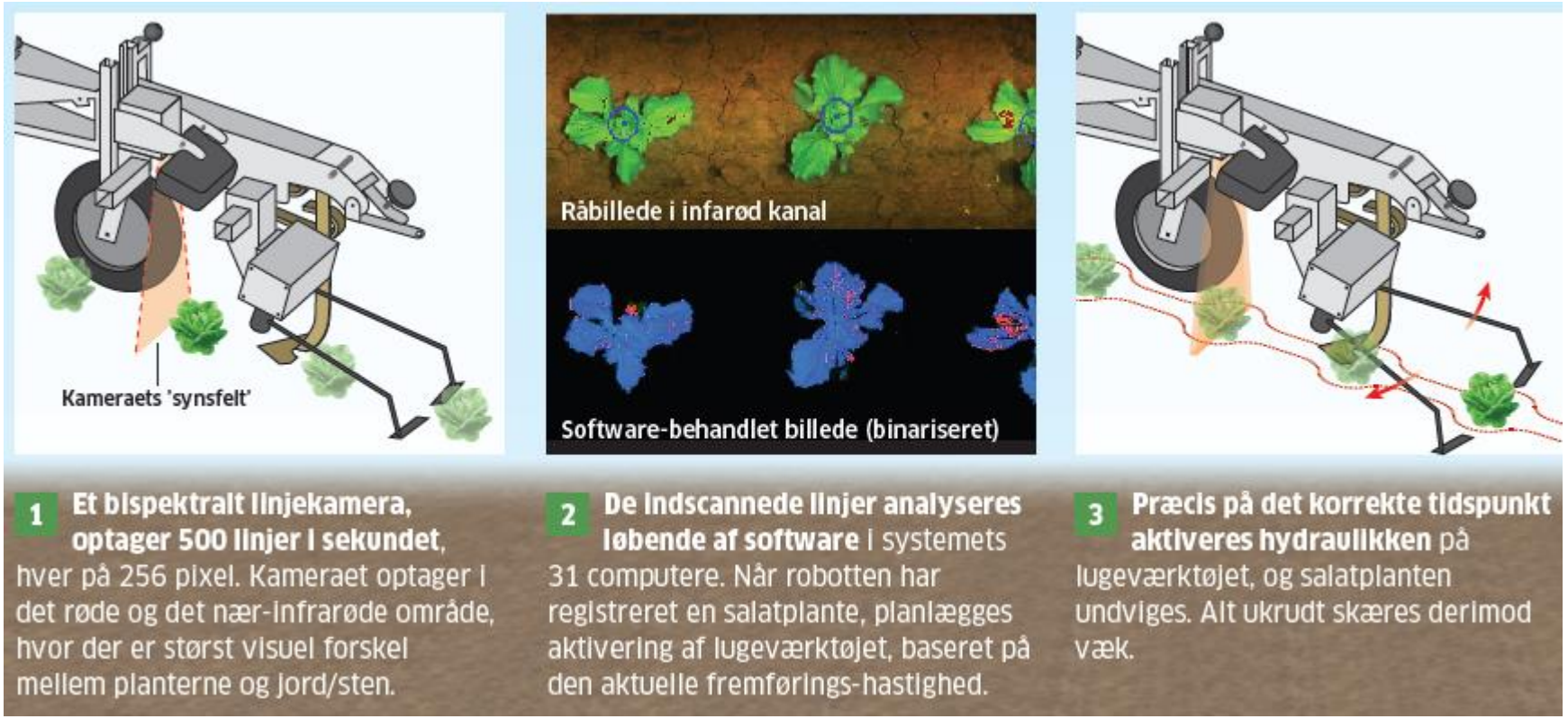
Selectivity for intra-row weeding with intelligence

Robotic weeding in transplants - *Robovator*





Robotic weeding in transplants - *Robovator*

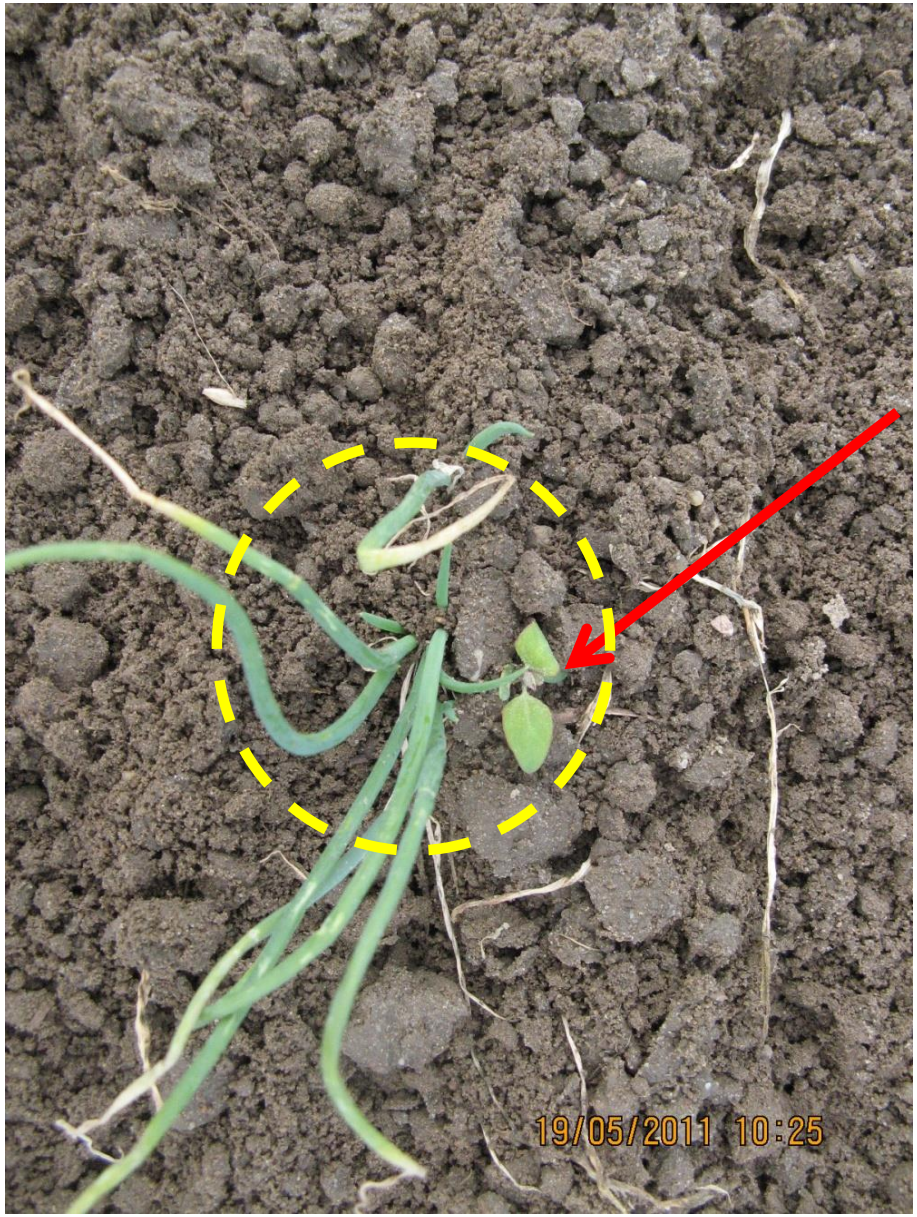


1 **Et bispektralt linjekamera, optager 500 linjer i sekundet**, hver på 256 pixel. Kameraet optager i det røde og det nær-infrarøde område, hvor der er størst visuel forskel mellem planterne og jord/sten.

2 **De indscannede linjer analyseres løbende af software** i systemets 31 computere. Når robotten har registreret en salatplante, planlægges aktivering af lugeværktøjet, baseret på den aktuelle fremførings-hastighed.

3 **Præcis på det korrekte tidspunkt aktiveres hydraulikken** på lugeværktøjet, og salatplanten undviges. Alt ukrudt skæres derimod væk.

Videoclip with *Robovator*


19/05/2011 10:25

Videoclip with *Robovator* – thermal device

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Organic fruit, berries and vegetables production 2 November, 2018

Tools for minimising intra-row weeds – seesion 2

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Features of low-tech intra-row weeders

Advantages

- Low investment
- Simple technology
- High work rates
- Effective against small sized weeds
- Both tractor-born and hand-born versions

Disadvantages

- Risk of crop injuries
  - Harrow, torsion weeder > finger
- Requires experience and knowledge
- Adjustments and settings can be difficult
- Extra person for steering
- No complete weed control
- Energy consumption – thermal methods
- Fire hazards – thermal methods

Humus Planet rækkerenser

Foto: Connie Krogh Damgaard AU (øv.) og Maren Korsgaard

Elkær rækkerenser

Foto: Connie Krogh Damgaard AU

Foto: Maren Korsgaard

Ladurner: Rotary brush

Foto: Henning Bæk Hansen

Foto: Annemarie Bisgaard

Conversion to organic production: be aware of superficial roots

Mechanical control: begin after harvest and stop early spring.

Spacing
2.4 m in the row

Spacing
0.3 m in the row

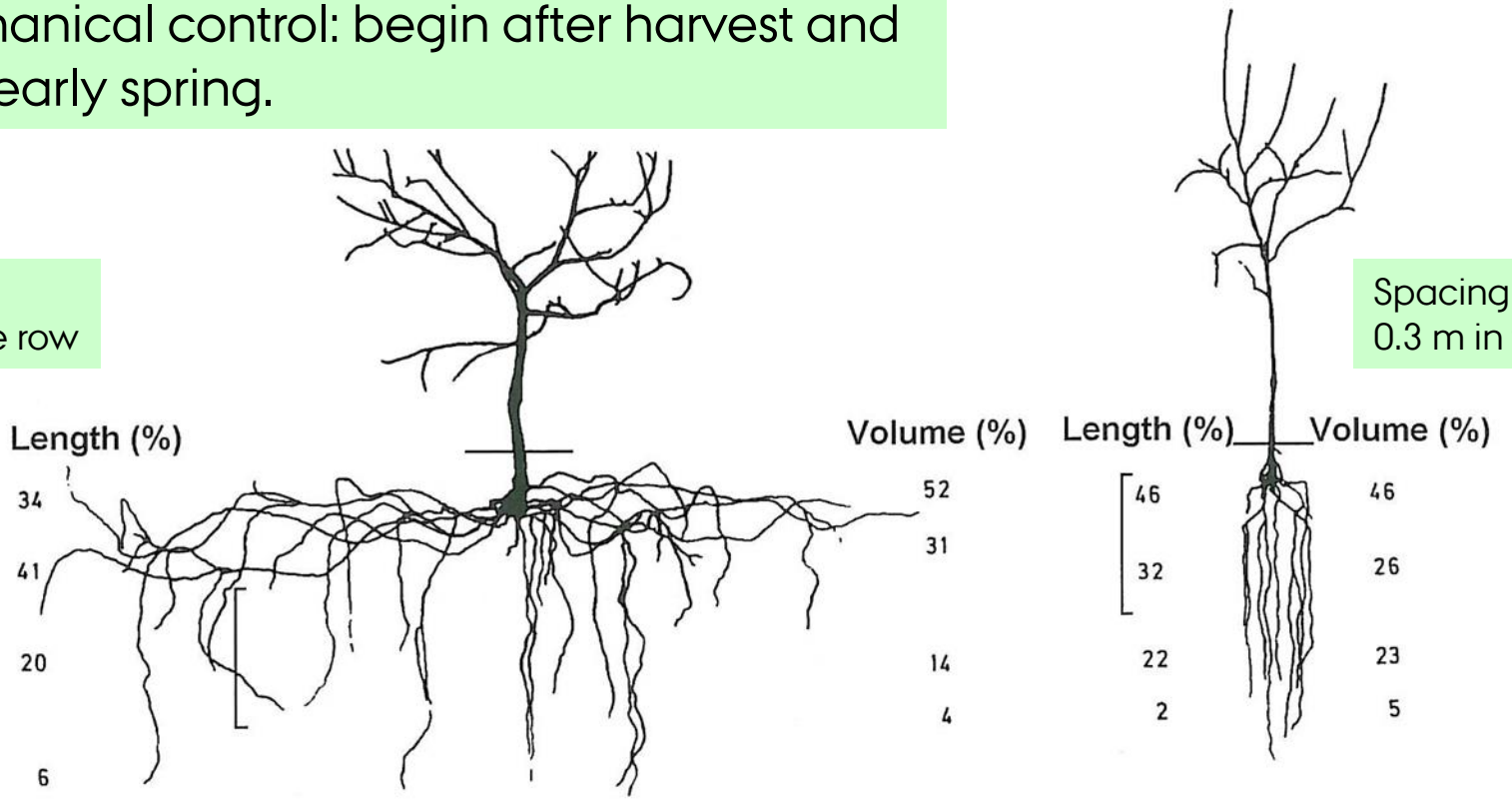

Figure 10.3 Root distribution on five-year-old apple trees of 'Golden Delicious'/M.9 at spacings of 2.4 x 2.4m (left) and 0.3 x 0.3m (right) and the percentage distribution of root length and root volume with depth. The vertical bracket represents 0.5m (from Atkinson and Wilson, 9).