New Vegetable Production Systems in the Netherlands

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Contents

- Problem statement
- Research visions for designing new vegetable growing systems
- Research questions

- More long term research to solve these problems is starting

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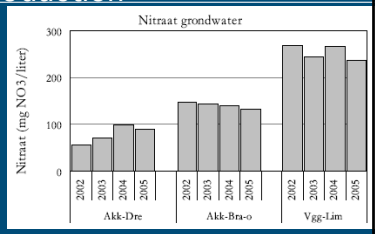
Problems in vegetable production

- Environment
  - Nutrient leaching
  - Pesticide emissions
- Market
  - Quality and uniformity
  - Certainty of delivery, year round
  - No residues of pesticides
- Grower
  - Weather uncertainty (rainfall/temperature)
  - Cropping periods in early and late season
  - Harvest during full growth
  - Crop value compared to costs inputs



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Measures to reduce nitrate leaching

- Reduced inputs → reduction in yields/income
- Decision support systems → extra costs
  - Guided fertilization
  - Warning systems
- Green manure crops → not possible by late harvest
- Removal of crop residues → extra costs
- Purification of drainage water → extra costs
- Extensification → reduction in income
- Organic agriculture → market is growing but small

→ Measures too expensive and/or too little effect
→ Redesign of vegetable production systems is necessary

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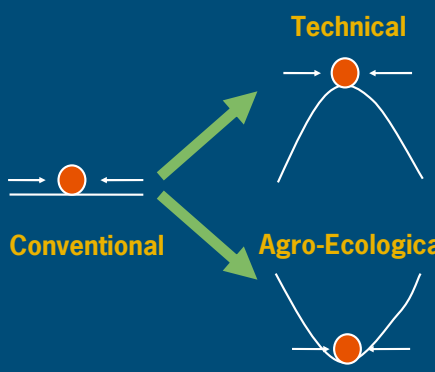
Two visions



- Maximum control
- Maximum yield
- Low diversity
- Monoculture
- Market oriented
- High value crops

- High diversity
- Resilient
- Stable yield
- High diversity
- Environmental oriented

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Different paradigms, leading motives

Technical	Agro-ecological
Uniformity	Diversity
Recipy	Concept
Reductionism	Holism
General	Situational
Control	Cooperation
Specialist	Universalist
Reaction	Precaution
Economy	Ecology
Global	Regional

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Technical vision

a. Fertigation and foil

b. Hydroponics

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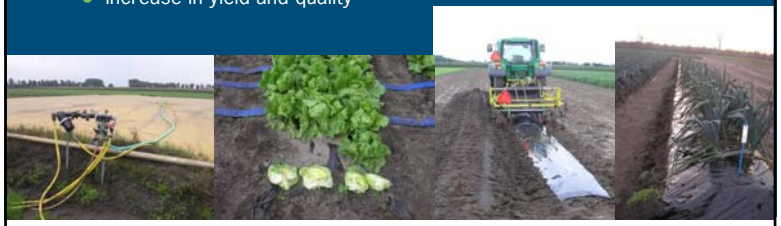
Fertigation and mulching with foil

- Advantages
  - Water and nutrient efficiency
  - Reduction of leaching risks
  - No weed control
  - Lower disease pressure
  - Increase in yield and quality
- Disadvantages
  - Higher costs
  - Higher labor need
  - Difficult to control soil nitrogen status



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Results experiments fertigation

	Strawberry +foil	Leek -foil
Meterik 1998-2000		
Reduction nitrogen fertilization	–15 – 35%	–13%
Lower residual soil nitrogen levels	–10 – 50%	–45%
Higher yields	+10 – 15%	0%
Net farm result	–10%	-

- Leek 2006-2007
  - 2006 Leek on little ridges with foil no effect
  - 2007 Leek on potato ridges no effect
  - 2007 Leek on asparagus ridges with foil yield little higher
- Potato Vredepeel 1999-2001
  - Yield effect caused by drip irrigation, not fertilization
  - No possibility to reduce nitrogen fertilization
  - No effect on residual soil nitrogen levels

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Hydroponics

- Advantages
  - Large control of emissions
  - Much higher yields
  - Minimal land use
  - Independent of soil quality
- Disadvantages
  - High costs
  - Inputs (materials)
  - High degree management skills

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Outdoor hydroponics in leaf crops 2007

(Matthijs Blind, Proeftuin Zwaagdijk)

Relative yield	Lollo rossa 1	Lollo rossa 2	Iceberg lettuce
NGS	104%	94%	102%
PTZ	88%	166%	82%
Hortiplan	97%	134%	103%

- Crop losses were low
- Important aspects
  - Water strategy
  - Type of pot (size, medium) important
  - Wind

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Agro-ecological vision

- Making use of ecology, nature and external influences instead of excluding it
- Diversity and prevention are keywords
- Examples
  - Organic agriculture
  - Conservation agriculture
  - Permaculture
  - Low input systems
  - Integrated agriculture

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Comparison organic & conventional agriculture

	Meterik		Westmaas		Nagele OBS	
	conv	org	conv	org	conv	org
Relative yield (%)	100	77	100	60	100	78
Pesticide use (kg/ha)	4.1	0	4.8	0	2.3	0
Leachable nitrogen (kg/ha)	120	77	49	36	32	43

Meterik = Vegetable, sandy soil
Westmaas = vegetable/arable, clay soil
Nagele OBS = arable/vegetable, clay soil

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Compared top organic to conventional shows:

- Lower yields (NL), sometimes comparable yields (Vegineco)
  - Most limiting production factors in vegetables are pests and diseases
- Mostly a better environmental performance
  - Biodiversity, organic matter, N-leaching, energy use (per/ha)
- Higher production costs (> labor and < yields)
- Less uniformity in the product and the production system
- Less specialization per farm

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Research questions

- Development of visions
  - Sustainability of different systems
    - People, planet, profit
  - Technical vision
    - Optimize systems for outdoor cropping and other crops
    - Simple cheap resilient high yielding systems
    - Fit in landscape, water quality and quantity
  - Agro-ecological vision
    - Knowledge about soil management, functional agro biodiversity
    - Diverse systems with low cost price
    - Prevention of pests and diseases
- Need for each others knowledge

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Thanks for your attention!

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