Overview of the organic farming fields (?)

Organic agriculture with vegetable and arable crops on sandy soils (Netherlands)

biologische landbouw met groente en akkerbouw gewassen op zandgronden

DESCRIPTION

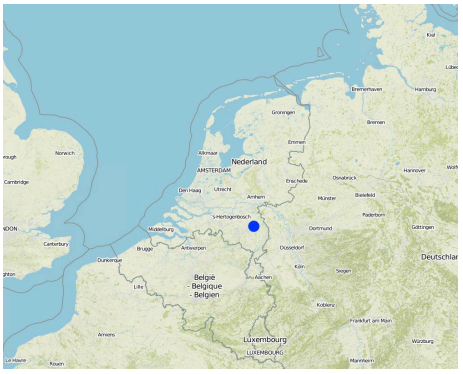
Certified Organic Agriculture (EU standards) with a combination of arable and vegetable crops on sandy soils in the Netherlands

The technology is applied in a vegetable/arable production system on sandy soils in the Netherlands, but could be applied in various production systems on various soils. There are not directly environmental constraints for the application of certified organic agriculture.

Main characteristics of certified organic production can be found in the standards for organic production in the EU (Council Regulation (EC) No 834/2007). Purpose of the technology is sustainable production in a broad sense. Concerning soil management, focus is on maintaining soil quality and preserving (soil) biodiversity. Major inputs are organic fertilizers. No synthetic fertilizers and no synthetic pesticides are used. In practice in the de Peel region where this technology is applied also the use of 'organic' pesticides is minimal.
The impacts of the technology are:
- a better soil quality in general,
- reduced nitrate emissions to groundwater,
- better water holding capacity,
- and more stable yield which are however on average 20% lower than conventional yield.

Yield reduction is mainly due to pests and diseases. The economic performance of the system is good (better than conventional production).
Land user like this technology because of the good economic result and because it call upon their craftmanship as a farmer. Then again, farmers dislike it because its complicated, and pests are sometimes hard to control and finally because of additional handlabour needed for weed control.

LOCATION



Location: located close to the village Vredepeel, De Peel, Netherlands

No. of Technology sites analysed: 2-10 sites

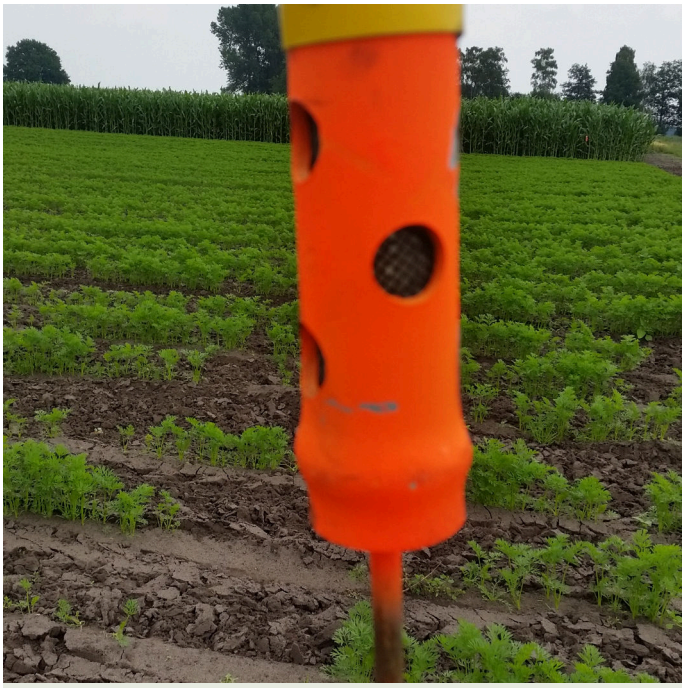
Geo-reference of selected sites
- 5.84965, 51.5432
- 5.8514, 51.5432

Spread of the Technology: evenly spread over an area (approx. 0.1-1 km2)

In a permanently protected area?:

Date of implementation: 1998

Type of introduction
- [x] through land users' innovation
- [ ] as part of a traditional system (> 50 years)
- [x] during experiments/ research
- [x] through projects/ external interventions



Natural control of the carrot fly, with smelly onion oil. (Harry Verstegen)

Application of compost on the field (?)

CLASSIFICATION OF THE TECHNOLOGY

Main purpose

- [ ] improve production
- [x] reduce, prevent, restore land degradation
- [ ] conserve ecosystem
- [ ] protect a watershed/ downstream areas – in combination with other Technologies
- [x] preserve/ improve biodiversity
- [ ] reduce risk of disasters
- [x] adapt to climate change/ extremes and its impacts
- [ ] mitigate climate change and its impacts
- [x] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Cropland

- Annual cropping: cereals - barley, cereals - maize, legumes and pulses - peas, root/tuber crops - potatoes, root/tuber crops - sugar beet, vegetables - root vegetables (carrots, onions, beet, other)

Number of growing seasons per year: 1

Water supply

- [ ] rainfed
- [x] mixed rainfed-irrigated
- [ ] full irrigation

Purpose related to land degradation

- [x] prevent land degradation
- [ ] reduce land degradation
- [ ] restore/ rehabilitate severely degraded land
- [ ] adapt to land degradation
- [ ] not applicable

Degradation addressed

soil erosion by wind - Et: loss of topsoil

chemical soil deterioration - Cn: fertility decline and reduced organic matter content (not caused by erosion)

physical soil deterioration - Pc: compaction

biological degradation - Bs: quality and species composition/ diversity decline, Bl: loss of soil life

water degradation - Hq: decline of groundwater quality

SLM group

- rotational systems (crop rotation, fallows, shifting cultivation)
- integrated soil fertility management
- integrated pest and disease management (incl. organic agriculture)

SLM measures

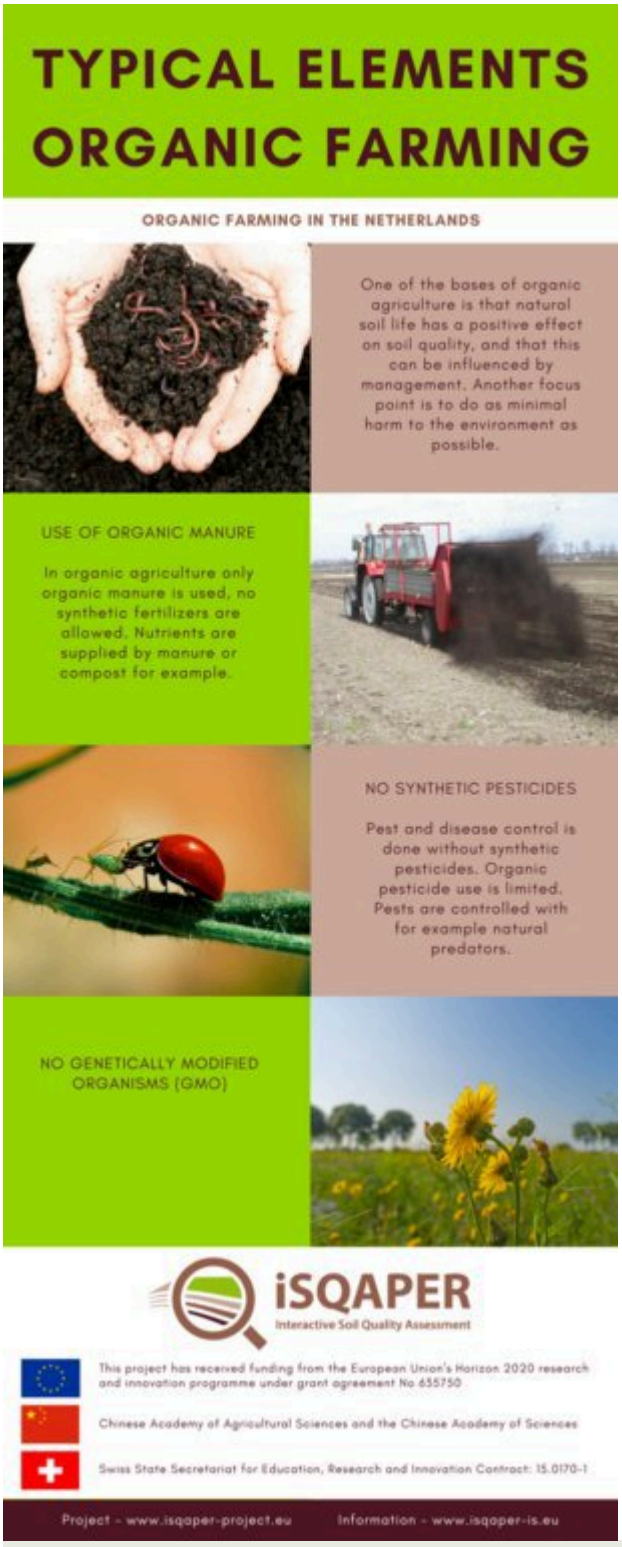
agronomic measures - A1: Vegetation/ soil cover, A2: Organic matter/ soil fertility, A5: Seed management, improved varieties

management measures - M2: Change of management/ intensity level

TECHNICAL DRAWING

Technical specifications

The most important aspects of organic agriculture are: application of only organic manure and no application of synthetic pesticides, with the idea that soil quality and environment can be positively effected by this.



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ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **50 hectares**)
- Currency used for cost calculation: **euro**
- Exchange rate (to USD): 1 USD = 0.87 euro
- Average wage cost of hired labour per day: 160

Most important factors affecting the costs

handlabour for weed control

Establishment activities

1. Change machinery (mainly for weed control) (Timing/ frequency: before during conversion period)
2. stop using synthetic pesticides and nutrient (Timing/ frequency: beforer conversion period)
3. choose conversion period crops (Timing/ frequency: 2 years before start certified organic production)
4. start conversion period (2 years) (Timing/ frequency: 2 years before start certified organic production)
5. design and adapt crop choice and rotation (Timing/ frequency: before and during conversion period)

Establishment inputs and costs (per 50 hectares)

Specify input	Unit	Quantity	Costs per Unit (euro)	Total costs per input (euro)	% of costs borne by land users
Equipment					
investments in mechanical weed control machinery	piece	1.0	50000.0	50000.0	100.0
Total costs for establishment of the Technology				**50'000.0**	
Total costs for establishment of the Technology in USD				*57'471.26*	

Maintenance activities

1. mechanical weed control instead of herbicides (Timing/ frequency: each cropping season)
2. Handlabour for weed control (Timing/ frequency: each cropping season)
3. Spread of organic fertilisers instead of synthetic nutrients (Timing/ frequency: each cropping season)

Maintenance inputs and costs (per 50 hectares)

Specify input	Unit	Quantity	Costs per Unit (euro)	Total costs per input (euro)	% of costs borne by land users
Labour					
Additional handlabour mostly for weeding	hours	250.0	160.0	40000.0	100.0
Additional labour for mechanical weed control	hours	75.0	160.0	12000.0	100.0
Equipment					
yearly costs of weed control mechanisation	euro	1.0	5000.0	5000.0	100.0
Total costs for maintenance of the Technology				**57'000.0**	
Total costs for maintenance of the Technology in USD				*65'517.24*	

NATURAL ENVIRONMENT

Average annual rainfall

- [ ] < 250 mm
- [ ] 251-500 mm
- [ ] 501-750 mm
- [x] 751-1,000 mm
- [ ] 1,001-1,500 mm
- [ ] 1,501-2,000 mm
- [ ] 2,001-3,000 mm
- [ ] 3,001-4,000 mm
- [ ] > 4,000 mm

Agro-climatic zone

- [ ] humid
- [x] sub-humid
- [ ] semi-arid
- [ ] arid

Specifications on climate

Average annual rainfall in mm: 850.0

Name of the meteorological station: Volkel the Netherlands

Slope

- [x] flat (0-2%)
- [ ] gentle (3-5%)
- [ ] moderate (6-10%)
- [ ] rolling (11-15%)
- [ ] hilly (16-30%)
- [ ] steep (31-60%)
- [ ] very steep (>60%)

Landforms

- [x] plateau/plains
- [ ] ridges
- [ ] mountain slopes
- [ ] hill slopes
- [ ] footslopes
- [ ] valley floors

Altitude

- [x] 0-100 m a.s.l.
- [ ] 101-500 m a.s.l.
- [ ] 501-1,000 m a.s.l.
- [ ] 1,001-1,500 m a.s.l.
- [ ] 1,501-2,000 m a.s.l.
- [ ] 2,001-2,500 m a.s.l.
- [ ] 2,501-3,000 m a.s.l.
- [ ] 3,001-4,000 m a.s.l.
- [ ] > 4,000 m a.s.l.

Technology is applied in

- [ ] convex situations
- [ ] concave situations
- [x] not relevant

Soil depth

- [ ] very shallow (0-20 cm)
- [x] shallow (21-50 cm)
- [ ] moderately deep (51-80 cm)
- [ ] deep (81-120 cm)
- [ ] very deep (> 120 cm)

Soil texture (topsoil)

- [x] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Soil texture (> 20 cm below surface)

- [x] coarse/ light (sandy)
- [ ] medium (loamy, silty)
- [ ] fine/ heavy (clay)

Topsoil organic matter content

- [x] high (>3%)
- [ ] medium (1-3%)
- [ ] low (<1%)

Groundwater table

- [ ] on surface
- [x] < 5 m
- [ ] 5-50 m
- [ ] > 50 m

Availability of surface water

- [ ] excess
- [x] good
- [ ] medium
- [ ] poor/ none

Water quality (untreated)

- [ ] good drinking water
- [ ] poor drinking water (treatment required)
- [x] for agricultural use only (irrigation)
- [ ] unusable

Water quality refers to:

Is salinity a problem?

- [ ] Yes
- [x] No

Occurrence of flooding

- [ ] Yes
- [x] No

Species diversity

- [ ] high
- [x] medium
- [ ] low

Habitat diversity

- [ ] high
- [x] medium
- [ ] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation

- [ ] subsistence (self-supply)

Off-farm income

- [x] less than 10% of all income
- [ ] 10-50% of all income

Relative level of wealth

- [ ] very poor
- [ ] poor

Level of mechanization

- [ ] manual work
- [ ] animal traction

- [ ] mixed (subsistence/ commercial)
- [x] commercial/ market

- [ ] > 50% of all income

- [ ] average
- [x] rich
- [ ] very rich

- [x] mechanized/ motorized

Sedentary or nomadic
- [x] Sedentary
- [ ] Semi-nomadic
- [ ] Nomadic

Individuals or groups
- [x] individual/ household
- [ ] groups/ community
- [ ] cooperative
- [ ] employee (company, government)

Gender
- [ ] women
- [x] men

Age
- [ ] children
- [ ] youth
- [x] middle-aged
- [ ] elderly

Area used per household
- [ ] < 0.5 ha
- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [x] 15-50 ha
- [x] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

Scale
- [ ] small-scale
- [x] medium-scale
- [ ] large-scale

Land ownership
- [ ] state
- [ ] company
- [ ] communal/ village
- [ ] group
- [x] individual, not titled
- [ ] individual, titled

Land use rights
- [ ] open access (unorganized)
- [ ] communal (organized)
- [ ] leased
- [x] individual

Water use rights
- [ ] open access (unorganized)
- [x] communal (organized)
- [ ] leased
- [ ] individual

Access to services and infrastructure

health	poor ✓ good	
education	poor ✓ good	
technical assistance	poor ✓ good	
employment (e.g. off-farm)	poor ✓ good	
markets	poor ✓ good	
energy	poor ✓ good	
roads and transport	poor ✓ good	
drinking water and sanitation	poor ✓ good	
financial services	poor ✓ good	

IMPACTS

Socio-economic impacts

Crop production

decreased ✓ increased

Up till now, crop production is generally lower in organic agricultural systems compared to conventional systems.

product diversity

decreased ✓ increased

Diversity is enhanced because of more organic matter application, no synthetic pesticide use, and no use of GMOs

expenses on agricultural inputs

increased ✓ decreased

organic planting material and manure are more expensive

farm income

decreased ✓ increased

Organic products can be sold at a higher price if they are certified

workload

increased ✓ decreased

More (hand)weeding is needed because of no pesticide use

Socio-cultural impacts

Ecological impacts

harvesting/ collection of water (runoff, dew, snow, etc)

reduced ✓ improved

Due to better soil structure the water holding capacity of the soil increases, but also the natural drainage of the soil improves

soil moisture

decreased ✓ increased

Due to higher organic matter (manure) inputs the water holding capacity of the soil improves

soil cover

reduced ✓ improved

In general, soils used in organic agriculture are covered more months in a year, due to more usage of cover crops in winter season for example

nutrient cycling/ recharge

decreased ✓ increased

More attention is paid to the nutrientcycles, cover crops are used to maintain nutrients for the next season

soil organic matter/ below ground C

decreased ✓ increased

More organic matter is applied, slowly this will lead to a

		higher content in the soil
plant diversity	decreased ✓ increased	No use of pesticides gives the opportunity for a diverse range of plants to develop
beneficial species (predators, earthworms, pollinators)	decreased ✓ increased	Pesticides can also harm the beneficial species, no pesticides = more benificial species
habitat diversity	decreased ✓ increased	The whole agricultural system gets more diverse due to more organic inputs and less pesticide inputs
pest/ disease control	decreased ✓ increased	It is harder to control pests and diseases when synthetic pesticides are not allowed. There is no organic cure for all pests and diseases (yet)
drought impacts	increased ✓ decreased	Due to better soil structure the soil is less vulnerable for drought events

Off-site impacts

groundwater/ river pollution	increased ✓ reduced	less nitrate leaching

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Short-term returns	very negative ✓ very positive	
Long-term returns	very negative ✓ very positive	

Benefits compared with maintenance costs

Short-term returns	very negative ✓ very positive	
Long-term returns	very negative ✓ very positive	

CLIMATE CHANGE

Climate-related extremes (disasters)

drought: not well at all ✓ very well

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology

- ☐ single cases/ experimental
- ☑ 1-10%
- ☐ 11-50%
- ☐ > 50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?

- ☐ 0-10%
- ☐ 11-50%
- ☐ 51-90%
- ☑ 91-100%

Has the Technology been modified recently to adapt to changing conditions?

- ☐ Yes
- ☑ No

To which changing conditions?

- ☐ climatic change/ extremes
- ☐ changing markets
- ☐ labour availability (e.g. due to migration)

CONCLUSIONS AND LESSONS LEARNT

Strengths: land user's view

- higher income
- better soil quality
- more challenging

Strengths: compiler's or other key resource person's view

- more sustainable
- more resilient
- lower nitrate leaching

Weaknesses/ disadvantages/ risks: land user's viewhow to overcome

- more handlabour for weeding improving mechanical weeding techniques, more craftmanship
- more losses due to pests and diseases resistant varieties. Robust plants and robust crops. Enhancement natural enemies. more crop diversity
- more work in marketing the products better market organisation, cooperation

Weaknesses/ disadvantages/ risks: compiler's or other key resource person's viewhow to overcome

- high dependency on abundant (partly conventional) animal husbandry in the region mixed farms or close cooperation

between organic animal farms and arable farms
- risk of dependency on biopesticides more resilient production systems, resistant varieties, enhancement natural enemies. Robust plants

REFERENCES

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Full description in the WOCAT database
https://qcat.wocat.net/en/wocat/technologies/view/technologies_2978/

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n.a.

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