Spreading of the bokashi (Wico Dieleman)

Soil improvement in orchards through use of bokashi (fermented clippings) (Netherlands)

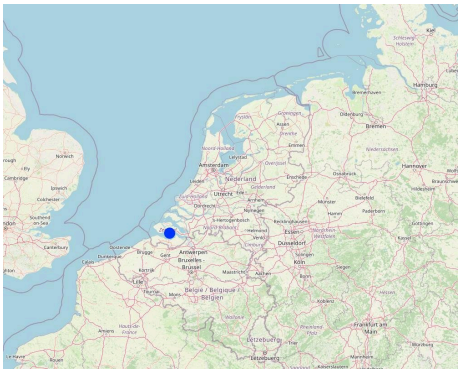
Bodemverbetering in fruitteelt met behulp van bokashi

DESCRIPTION

Bokashi is a soil amendment formed by fermenting clippings of vegetation. It helps to increase soil organic matter content in fruit orchards.

Bokashi is a soil amendment formed from fermentation of vegetative clippings. It has a high organic matter content. Furthermore, due to the fermentation process, bokashi is practically free of weed seeds. The high organic matter content feeds soil organisms and results in the increase of soil organic matter, and in turn this supports the growth of micro-organisms, improves water holding capacity and increases soil fertility. Bokashi is applied once a year underneath the fruit trees in autumn after the harvest by a mechanical spreader. Here 16 tonnes of bokashi was applied on 1ha. Results have shown that fruit trees grow better in the resulting healthier soil, but spreading the bokashi is labour intensive. This technology has been applied on a parcel of land in Zeeland in the south of the Netherlands.

LOCATION



Location: Kamperland, Zeeland, Netherlands

No. of Technology sites analysed: single site

Geo-reference of selected sites
- 3.8183, 51.43884

Spread of the Technology: evenly spread over an area (approx. < 0.1 km2 (10 ha))

In a permanently protected area?: Nee

Date of implementation: 2020

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

Spreading of the bokashi underneath the fruit trees (Wico Dieleman)

Spreading of the bokashi (Wico Dieleman)

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
- [x] mitigate climate change and its impacts
- [ ] create beneficial economic impact
- [ ] create beneficial social impact

Land use

Land use mixed within the same land unit: Nee

Forest/ woodlands Tree types (deciduous): n.a.
Products and services: Fruits and nuts

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

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

SLM group

- improved ground/ vegetation cover
- integrated soil fertility management
- integrated pest and disease management (incl. organic agriculture)

SLM measures

agronomic measures - A2: Organic matter/ soil fertility

TECHNICAL DRAWING

Technical specifications

ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated: per Technology area (size and area unit: **1ha**; conversion factor to one hectare: **1 ha = 1ha = 2.47 acres**)
- Currency used for cost calculation: **EUR**
- Exchange rate (to USD): 1 USD = 0.95 EUR
- Average wage cost of hired labour per day: 250

Most important factors affecting the costs

Access to suitable machinery to reduce the labour costs.

Establishment activities

1. Spreading compost (Timing/ frequency: August)
2. Cultivating the land (Timing/ frequency: August)
3. Sowing catch crop (Timing/ frequency: August)

Establishment inputs and costs (per 1ha)

Specify input	Unit	Quantity	Costs per Unit (EUR)	Total costs per input (EUR)	% of costs borne by land users

Labour					
Labour	ha	6.0	35.0	210.0	100.0
Equipment					
Machinery	ha	1.0	50.0	50.0	100.0
Fertilizers and biocides					
Bokashi purchase	ha	25.0	12.5	312.5	100.0
Total costs for establishment of the Technology				**572.5**	
Total costs for establishment of the Technology in USD				*602.63*	

Maintenance activities
n.a.

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: 800.0

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

Soil texture (topsoil)
- [ ] coarse/ light (sandy)
- [x] 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
- [ ] high (>3%)
- [x] 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: both ground and surface water

Is salinity a problem?
- [x] Ja
- [ ] Nee

Occurrence of flooding
- [ ] Ja
- [x] Nee

Species diversity
- [ ] high
- [x] medium
- [ ] low

Habitat diversity
- [ ] high
- [ ] medium
- [x] low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

Market orientation
- [ ] subsistence (self-supply)
- [ ] mixed (subsistence/ commercial)
- [x] commercial/ market

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

Relative level of wealth
- [ ] very poor
- [ ] poor
- [x] average
- [ ] rich
- [ ] very rich

Level of mechanization
- [ ] manual work
- [ ] animal traction
- [x] mechanized/ motorized

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

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

Gender
- [ ] women
- [x] men

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

Area used per household
- [ ] < 0.5 ha

Scale
- [ ] small-scale

Land ownership
- [ ] state

Land use rights
- [ ] open access (unorganized)

- [ ] 0.5-1 ha
- [ ] 1-2 ha
- [ ] 2-5 ha
- [ ] 5-15 ha
- [ ] 15-50 ha
- [x] 50-100 ha
- [ ] 100-500 ha
- [ ] 500-1,000 ha
- [ ] 1,000-10,000 ha
- [ ] > 10,000 ha

- [x] medium-scale
- [ ] large-scale

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

- [ ] communal (organized)
- [ ] leased
- [x] individual
- [x] Partnership

Water use rights

- [ ] open access (unorganized)
- [ ] 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

Mulch effect improved crop growth

Socio-cultural impacts

Ecological impacts

soil moisture: decreased — increased

Mulch keeps better soil moisture

soil loss: increased — decreased

More material reduced soil loss

nutrient cycling/ recharge: decreased — increased

Mulch provides more organic matter for nutrient cycling activity

soil organic matter/ below ground C: decreased — increased

Mulch provides soil organic matter to soil profile

Off-site impacts

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

Gradual climate change

seasonal rainfall decrease: not well at all — very well — Season: summer

ADOPTION AND ADAPTATION

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

- [x] 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?

- [ ] Ja
- [x] Nee

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

- Soil moisture retention improvements
- Soil organic matter improvements
- Soil life increased significantly after applying bokashi to the soil. There was no eutrophication

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

- Reduced weed burden in compost with fermentation

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

- Time intensive to spread compost NA
- Limited availability of bokashi currently Knowledge exchange to support more uptake of bokashi production

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

REFERENCES

Compiler
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Resource persons
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Full description in the WOCAT database
https://qcat.wocat.net/af/wocat/technologies/view/technologies_6820/

Linked SLM data
n.a.

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