Maize strip tillage machine with gruber (A) und Fräse (B) (Giulietta Buddeke)

Maize strip tillage (Switzerland)

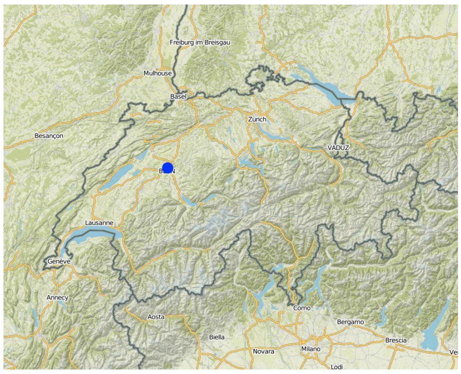
Streifenfrässaat

DESCRIPTION

Maize strip tillage is a technology used for corn cultivation. It cultivates only thoses stripes in which the seed is added to.

Maize strip tillage is a soil-conservation method used in crop production. First of all the grass in the area needs to be prepared by splattering round-up some 3-10 days prior seeding. Then the actual maize strip tillage machine carves a stripe and the seed are inserted within this 30 cm strip. At the same time fertilizer is added on these cultivated stripes. Between those cultivated stripes the mulch-grass stripes (45cm) are unmechanised and protect the soil by increasing its stability. The work is done within one working unit compared to the traditional technique whereas the farmer needs to drive for each working step separately.
There are some clear ecological advantages using this technology. Like in a minimum tillage system the stability of the soil is enhanced.
Due to these mulch-stripes the matrix of the soil is more complex and therefore the stability is better especially during harvest in September. The interviewed farmer said compaction would occur less and the risk of soil erosion is decreasing. Especially in hilly areas the technology is suitable since soil erosion is a problems when using a plough. Another advantage is the better soil structure due to the mulch stripes and the minimal tillage ensures that the soil is more stable.
A high level of knowledge about the natural environment is a required when adopting this technology. On one hand, the farmer must time the date for seeding adequately to the natural conditions (not too humid). On the other hand, the farmer has to apply Glyphosphat one to three times after the seeding in order to guarantee an optimal growth period for the corn.The interviewed farmer found it problematic to use this amount of Glyphosat and he was not sure about the effects in the water. The timing to start seeding with this technology may be later cause corn is sensitive towards rival plants, low temperatures and humidity. When adopting the technology the farmer needs to have a certain level of knowledge and experience in order to guarantee a sound harvest.
This technology is applied in the village Seedorf (Canton Bern) after the farmers made positive experiences and if they see the economic advantages too. Generally there is only one work step needed for the seeding which lowers the costs compared to the traditional technology with about a third. Furthermore the subsidies of the canton of Berne enables farmers to apply this technology for the first 5 years. In this cycle the areas are usually left with grass first, second cultivated with corn (using maize strip tillage), then sugar beets and after all two years of cereals (wheat and rye) before the cycle starts again.

LOCATION



Location: Bern, Seedorf, Switzerland

No. of Technology sites analysed:

Geo-reference of selected sites
- 7.464, 46.972

Spread of the Technology:

In a permanently protected area?:

Date of implementation:

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

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CLASSIFICATION OF THE TECHNOLOGY

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

Land use


Cropland
- Annual cropping: cereals - maize, cereals - rye, cereals - wheat (spring), root/tuber crops - sugar beet

Water supply
- [ ] rainfed
- [ ] mixed rainfed-irrigated
- [ ] full irrigation

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

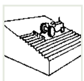
Degradation addressed


soil erosion by water - Wt: loss of topsoil/ surface erosion, Wg: gully erosion/ gullying

physical soil deterioration - Pc: compaction

biological degradation - Bc: reduction of vegetation cover

SLM group
- minimal soil disturbance
- cross-slope measure

SLM measures


agronomic measures - A1: Vegetation/ soil cover

TECHNICAL DRAWING

Technical specifications

Technical knowledge required for field staff / advisors: high

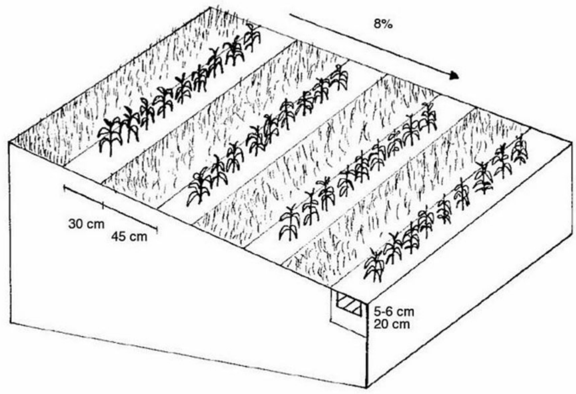
Technical knowledge required for land users: low

Main technical functions: improvement of topsoil structure (compaction), increase of infiltration

Secondary technical functions: improvement of ground cover, increase in organic matter

Manure / compost / residues
Material/ species: mulch stripes

Rotations / fallows
Remarks: a cultivation cycle of 5 year is needed



ESTABLISHMENT AND MAINTENANCE: ACTIVITIES, INPUTS AND COSTS

Calculation of inputs and costs

- Costs are calculated:
- Currency used for cost calculation: **n.a.**
- Exchange rate (to USD): 1 USD = n.a
- Average wage cost of hired labour per day: n.a

Most important factors affecting the costs

n.a.

Establishment activities

1. Buying a 120 PS tractor (Timing/ frequency: None)
2. Buying a machine for maize strip tillage (Timing/ frequency: None)
3. buying a sowing machine (Timing/ frequency: None)

Establishment inputs and costs

Specify input	Unit	Quantity	Costs per Unit (n.a.)	Total costs per input (n.a.)	% of costs borne by land users
Equipment					
120 PS tractor	Farm	1.0	126000.0	126000.0	100.0
Machine for maize strip tillage	Farm	1.0	165000.0	165000.0	100.0
Sowing machine	Farm	1.0	12600.0	12600.0	100.0
Total costs for establishment of the Technology				**303'600.0**	
Total costs for establishment of the Technology in USD				*303'600.0*	

Maintenance activities

1. Adding some round-up on the field one week before technology is applied (Timing/ frequency: 1)
2. Applying technology maize strip tillage (Timing/ frequency: 1)
3. Adding herbicide on the mulch stripes (Timing/ frequency: 1-3)
4. Harvest of corn (Timing/ frequency: 1)

NATURAL ENVIRONMENT

Average annual rainfall

- < 250 mm
- 251-500 mm
- 501-750 mm
- 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
- sub-humid
- semi-arid
- arid

Specifications on climate

n.a.

Slope

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

Landforms

- plateau/plains
- ridges
- mountain slopes
- hill slopes
- footslopes
- valley floors

Altitude

- 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
- not relevant

Soil depth

- very shallow (0-20 cm)
- shallow (21-50 cm)
- moderately deep (51-80 cm)

Soil texture (topsoil)

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

Soil texture (> 20 cm below surface)

- coarse/ light (sandy)
- medium (loamy, silty)

Topsoil organic matter content

- high (>3%)
- medium (1-3%)
- low (<1%)

- deep (81-120 cm)
- very deep (> 120 cm)
- fine/ heavy (clay)

Groundwater table
- on surface
- < 5 m
- 5-50 m
- > 50 m

Availability of surface water
- excess
- good
- medium
- poor/ none

Water quality (untreated)
- good drinking water
- poor drinking water (treatment required)
- for agricultural use only (irrigation)
- unusable

Is salinity a problem?
- Ja
- Nee

Occurrence of flooding
- Ja
- Nee

Species diversity
- high
- medium
- low

Habitat diversity
- high
- medium
- low

CHARACTERISTICS OF LAND USERS APPLYING THE TECHNOLOGY

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

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

Relative level of wealth
- very poor
- poor
- average
- rich
- very rich

Level of mechanization
- manual work
- animal traction
- mechanized/ motorized

Sedentary or nomadic
- Sedentary
- Semi-nomadic
- Nomadic

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

Gender
- women
- men

Age
- children
- youth
- middle-aged
- elderly

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

Scale
- small-scale
- medium-scale
- large-scale

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

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

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

Access to services and infrastructure

IMPACTS

Socio-economic impacts

Socio-cultural impacts

Ecological impacts

Off-site impacts

COST-BENEFIT ANALYSIS

Benefits compared with establishment costs

Benefits compared with maintenance costs

CLIMATE CHANGE

-

ADOPTION AND ADAPTATION

Percentage of land users in the area who have adopted the Technology
- single cases/ experimental
- 1-10%
- 11-50%

Of all those who have adopted the Technology, how many have done so without receiving material incentives?
- 0-10%
- 11-50%
- 51-90%

> 50%	91-100%

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

- Ja
- 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

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

- Prevention of erosion

  How can they be sustained / enhanced? Maintain green cover.
- Improvement of soil quality (fertility, organic matter, moisture retention, soil structure)

  How can they be sustained / enhanced? Ensure that cover vegetation doesn't compete with the vines; improve soil properties by applying mentioned agronomic measures.
- Contribution to a better balanced and more stable ecosystem (with living space for a wider range of organisms)

  How can they be sustained / enhanced? Specific management of cover crops (alternating treatment of inter-rows; find solutions to replace application of herbicide).
- In the long-term economically beneficial because of cutting costs of restoration of soils and fertility loss after heavy erosion events.
- Possibilities of farm income increase through marketing wine under the 'vinatura' label, certifying ecologically produced wine.

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

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

- General competition of water and nutrients depending on climate, soil depth and species of cover vegetation Eliminate/reduce competitive effect of cover vegetation by cutting/mulching vegetation or ripping/ploughing soil.
- Application of herbicides around vines because of undesirable vegetation in proximity of vine Find alternative solutions, or minimise application of herbicides.

REFERENCES

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Full description in the WOCAT database

https://qcat.wocat.net/af/wocat/technologies/view/technologies_1009/

Linked SLM data

n.a.

Documentation was faciliated by

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- Bangerter-Gisleren - Switzerland
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- Schneider Agrar-service - Switzerland

Project

- n.a.

Key references

- Güdel N . Boden- und Wasserkonservierung in Schweizer Rebbergen. Ein Beispiel im Rahmen von WOCAT. Unpublisheddiploma thesis.. 2003.: Centre for Development and Environment (CDE), University of Berne