No Tillage Field Trials in lower Austria

Year of issue

2025

Summary

In the framework of a research programme, no tillage field trials have been installed in lower Austria. They showed a significant reduction of runoff, as well as a reduced loss of nutrients. In addition, reduced or no tillage leads to less loss of soil, and an increased content of organic carbon in the soil.

Photo Gallery



Location

48.331585, 16.060686

Project

NWRM

National ID

Austria_02

Sector

Agriculture

Installation Date

2003

Implementation status

Ongoing

Contact

Sabine Tutte, ACTeon

Overview

Location of the project

The pilot sites are both respectively in Tulln an der Donau and Mistelbach an der Zaya, two munipialities of lower Austria.

Country

Austria

NUTS2 Code

Niederösterreich

Sponge measures implemented in the case study

Minimum tillage

Cover crops

Mulching

Involved partners

Authority type	Authority name	Authority role	Comments
Other	Lower Austrian State Government	Other	Regulatory frame work as the law on soil protection and the environmental programme ÖPUL (subsidies)
—	local communities	Initiation of the measure	Supprot research on alternative soil treatment techniques since less erosion means less maintenance costs for drainage and sewage water systems
Farmers	local farmers	Implementation	Soil is their most valuable good. Protection of soil means cost savings for fertilizers and constant yield

Site Information

Climate Zone

Warm temperate dry

Precipitation

550.00 mm

Temperature (°C)

9.20 °C

Slope range

5-16%

Vegetation class

Agricultural fields, where corn, wheat, barley and sugar beet are grown.

Design and Implementation

Project scale

Micro

Project scale specifications

Limited to pilot sites on fields.

Project area

0,00600000005215406

Size

60.00

Size unit

m2

Basis of design

Testing fields for different soil treating techniques (no tillage, reduced tillage and conventional tillage).

Constraints

Green bridge of volunteer cereals is able to transfer pathogens, with less soil treatment there is a higher risk that there is a higher amount of mykotoxins.

Favourable preconditions

medium-heavy soils, few weeds

Financing

Total cost

119.00 €

Total cost information

These are the "costs for doing work". With direct seeding the farmer saves 37 €/t compared to conventional tillage. When mulchseeding is done in an cooperation savings are 19 €/t and mulchseeding with own machines leads to an saving of 10€/t.

Costs investment

14.00 €

Costs investment information

Biedermann made its economical monitoring for 100 ha agricultural holding with different crops: winter wheat, winter barley, winter canola, corn, sugar beet and cover plants. He calculated the "cost for doing work" that means: salary (12 €/h), variable costs for machines (fuel, maintenance), fixed cost for machines (interest, depletion, assurance) and means of production (fertilizer, herbicides). When tillage is reduced the farmer should consider selling some of his tractors and increase the operating grade of his machines. The seeding machine is very expensive and in the same time a key element. The farmer should consider to buy it either used, to outsource the seeding or to use it in cooperation with other farmers. As an example, the costs are given here for direct seeding of wheat with a corn yield of 6t/ha.

Costs capital

5.00 €

Costs capital information

Salary of the farmer

Costs land acquisition information

Normally no land needs to be purchased

Costs operation maintenance

33.75 €

Costs operation maintenance information

In his calculations, Biedermann considered an additional consumption of herbicides (18 € per ha) and fertilizers (15 kg N/ha í 1,05 €/kg) for direct seeding.

Costs operational

32.00 €

Costs operational information

Variable machine costs

Costs maintenance

68.00 €

Costs maintenance information

Means of production (including the additional consumption of herbicides and fertilizers).

Financing authorities

Authority name	Type of funding	Comments
Lower Austria	Sub-national funds	The research programme is financed by the state government of lower Austria.
Austria	National funds	Subsidies are financed by the federal government of Austria.

Policy and Governance

Policy description

Reducing tillage in order to decrease erosion, loss of nutrients and pesticides and increase the amount of humus.

Policy targets

Runoff control

Erosion Control

Improved Biodiversity

Part of a wider plan

No

Public consultation

No

Consultation activities

Activity stage	Activity type	Key issues
Other	Tillage demonstration events	alternative tillage machines were demonstrated to farmers, sensibilisation for erosion problems

Has contractual arrangements

No

Impacts and Monitoring

Monitoring System

Monitoring parameters

Quantity of soil eroded, runoff (seasonally), composition of the eroded material, runoff (N, herbicides...).

Impact Assessment Methodology

Performance impact assessment method

Laboratory

Performance impact estimation information

Three different testing fields: direct comparison of no tillage, reduced tillage and conventional tillage.

Socio-economic Impacts

Direct benefits

416

Direct benefits information

Biedermann calculated for corn possible savings of 416 €/ha, which means 43€/t. By reducing tillage, a farm can save up to 10 000 €. When tillage is completely abandoned, savings up to 24 000 € are possible. Reasons for this are: less working hours (5 €/t wheat for salary instead of 14), less fuel consumption (40 l/ha instead of 96), less fixed machine costs. The additional consumption of herbicides and fertilizers is easily compensated and included in the calculations.

Ecosystem impact, reduced energy use

90

Information on ecosystem impact, reduced energy use

90

Biophysical impacts: Hydrology

Information on increased water storage

Depending on the testing site, 16% more in Mistelbach, 56% more in Pixendorf and 95% more in Tulln (close to Pixendorf).

Biophysical impacts: Biodiversity

Improved biodiversity

Yes

Information on improved biodiversity

When no tillage is applied, the number of earthworms is multiplied by 5. The symbiosis between roots and rhizobiaceae is improved as well. Moreover, the plant roots are able to create a more complex horizontal and vertical network.

Increased permanent biomass

500

Information on increased permanent biomass

More earthworms

Biophysical impacts: Water & Soil Quality

Water quality overall improvements

Positive impact-WQ improvement

Information on water quality overall

When tillage is reduced or completely abandoned, the loss of nitrogen and sprayed herbicides decreases.

Water quality improvements - Nitrogen (N)

88.00

Water quality improvements - Nitrogen (N) - Unit

% reduction pf pollutant

Soil quality overall improvements

Positive impact-SQ improvement

Information on soil quality overall improvements

Due to reduced / no tillage, there is less soil loss, more organic carbon in the soil, less CO2 emission and more CH4 uptake in the soil.

Soil quality, overall soil pollution

50.00

Soil quality, overall soil pollution - Unit

% Reduction

Information on soil quality, overall soil pollution

CO2 emission

Information on soil quality, overall soil carbon

32 % more CH4 uptake in the soil.

Soil quality, overall soil nutrients

88.00

Soil quality, overall soil nutrients - Unit

% Reduction

Information on soil quality, overall soil nutrients

Soil loss

Soil quality, overall soil physical properties

84.00

Soil quality, overall soil physical properties - Unit

% Reduction

Information on soil quality, overall soil physical properties

Loss of organic carbon

Ecosystem erosion control

Yes

Ecosystem erosion control impact

88

Information on ecosystem erosion control

Per ha and year

Biophysical impacts: Others

Ecosystem impact climate regulation

Impact on GHGs (net emissions and storage) including soil carbon

Information on ecosystem impact climate regulation

Increase of soil carbon, less CO2 emissions.

Ecosystem impact Green House Gas (GHG) soil carbon

50

Information on ecosystem impact GHG soil carbon

CO2 emission from soil

Ecosystem impact other GHG

32.00

Information on ecosystem impact other GHG

More CH4 uptake

Lessons Learned

Key lessons

Significant reduction of runoff, loss of nutrients, soil and pesticides is possible.

Mulch and direct seeding practices are fully developped and work well in practice.

The economic benefits must not ignore erosion, nutrient and pesticide movement.

Volunteer plants can be a bridge for plant diseases.

Cover crops should be sown immediately after harvesting for building up a green manure.

Cost reduction is possible.

Barriers

Barrier type	Barrier role	Comments
Other	Secondary barrier	Not all crops show an increased yield with less soil treatment, such as sugar beet.
Other	Secondary barrier	Volunteer crops can act as a bridge for pathogens.
Other	Main barrier	Reduced tillage cannot be used on heavy soils

Drivers

Driver type	Driver role	Comments
Legal obligations	Main driver	The law of soil protection of Lower Austria encourages reduced tillage practices.
Organisation committed to it	Main driver	They are constantly searching for new soil treatment techniques and try to introduce them in agricultural practice.
Availability of subsidies	Main driver	Austrian Environmental Programme: Farmers receive the more subsidies the longer they have a green cover on the field. Moreover, mulchseeding and CO2 storage in soil are awarded as maximum soil protection measures.

Success factors

Success factor type	Success factor role	Comments
Attitude of decision makers	Main factor	Support and encouragement for soil protecting agriculture.
Attitude of the public	Main factor	Support of innovative techniques. Less erosion means less sediments in villages and drainage systems, and hence less costs for cleaning.

Success factor type	Success factor role	Comments
Attitude of relevant stakeholders	Main factor	Soil is their most valuable good. As a consequence, there is an interest to conserve soil and limit erosion.

Sources

Sources

Minimum Tillage Field Trials in Lower Austria

conserving soil treatment systems- trials in Lower Austria

Telephone -Interview with PhD Josef Rosner

Economic aspects of mulch and direct seeding- reduction of soil treatment, which changes in the operational result have to be expected?

Warum Mulch- und Direktsaat bei Ertrag und Erlös mithalten können