

SLOVENIA

Climate change mitigation

Location

Artiče

Programming period

2014 – 2020

Priority

P4 – Ecosystems
management

Measure

M11 – Organic farming

Funding (EUR)

RDP support 28 947.00
EAFRD 23 157.60
National/Reg. 5 789.40

Project duration

2015 -2021

Project promoter

Černelič Biodynamic Farm

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Website

<https://biodinamicnakmetija-cernelic.si/>

Organic and biodynamic farms cooperate to jointly acquire conservation tillage equipment (subsoilers and no-till seeding machine) to enhance soil quality, reduce pollution and maximise their soil's capacity to act as a carbon sink.

Summary

The Černelič farm uses biodynamic methods of production. This includes crop rotation, fertilising with biodynamic compost made of domestic bovine manure and sowing mixed crops. These methods increase the proportion of organic matter in the soil and contribute to its ability to provide a sink for carbon. Conservation tillage with subsoilers farming is a technique that has appreciable advantages over ploughing.

The main advantage is the aeration of the soil, which causes less disturbance and increases the soil's microbial mass. During downpours, aerated soil allows for better infiltration, thereby reducing the amount of runoff and pooling. Additionally, aerated soil retains more water, improving the soil's moisture content to help prevent crop losses during droughts. Soil with good organic matter and humus layer is also capable of absorbing more nitrogen from the air.

Furthermore, deep ploughing leads to compaction, creating an impermeable layer in the subsoil. Conservation tillage with subsoilers farming, together with adequate crop rotation and mixed crops that promote good humus and reduce weeds, helps to promote the soil's carbon sink capacity. The project involves four farms all practising conservation tillage with subsoilers coming together to jointly purchase and share cultivation equipment to modernise their production systems and continue to produce high-quality food with the lowest environmental impact possible.



Results

The joint acquisition of conservation tillage equipment - subsoilers, helped to improve the soil's quality and capacity for carbon sequestration. Collaboration, networking and the exchange of knowledge helped local farmers to switch to organic and biodynamic farming methods to reduce the environmental impact of agriculture. The result was high quality sustainable food cultivated through methods producing significantly lower emissions.

Lessons and recommendations:

- ❑ Cooperation and knowledge exchange are invaluable in promoting the broader uptake of sustainable farming practices that produce high quality food and reduce environmental impacts from production.
- ❑ Soil management, and particularly conservation tillage with subsoilers that aim to enhance soil organic matter and good soil structure as much as possible, is vitally important in contributing to agriculture's mitigation potential through carbon sequestration.

Context

The Černelič farming operation began in 1994 with the purchase of a small 2.5 ha farm. Today, the farm comprises 40 ha (of which 6 ha are owned and 34 ha are leased) spanning ten villages (half in upland areas where grazing livestock help prevent overgrowth). In 1996, the farm stopped using chemicals for producing strawberries; this was the turning point in its move towards organic agriculture. Increasingly determined to make a change, the farm has been engaged in organic agriculture since 2003 and in biodynamic farming since early 2012. It obtained the Demeter Biodynamic Certification in 2014. Since 2015, 38.10 ha of the Černelič farm is covered by the M11 Organic Farming Support Measure. Under the same measure, some 30 units of organic livestock are raised in an area facing natural or other specific constraints (M13— Areas with Natural Constraints). More than 30 varieties of vegetables are grown on 0.7 ha and strawberries on 0.3 ha using organic and biodynamic methods.

Certain vegetables and strawberries are grown in greenhouses and there is a drip irrigation system in place for all crops. The farm fights disease and pests with herbal preparations made from healthy and resilient plants gathered on-farm and from the surrounding land. The main farmhouse of the Černelič farm and a small greenhouse for the propagation of seeds are heated by a state-of-the-art ground source heat pump laid over a surface of 800 m². The farm's livestock graze outdoors for eight months per year. During the winter months, they are only fed dry hay without grain in an open winter shed with a corral. This results in a healthy livestock and reduced fuel consumption. The livestock manure is composted using biodynamic preparations. This, along with proper conservation tillage with subsoilers and crop rotation, helps to invigorate the soil and increase its fertility over the years. All these activities are aimed at mitigating emissions, sequestering more carbon as well as promoting better adaptation to climate change.

The reason behind the decision to farm this way was to produce healthy food. Organic and biodynamic farming is the highest standard of food production globally. The Černelič farm produces healthy food without using any dangerous substances with the objective of being a role model and an inspiration to others. It appears the farm has been successful in accomplishing this goal: in 17 years of organic and biodynamic farming, Černelič has seen an increasing number of neighbouring farmers also adopting this method of cultivation.

Objectives

Černelič farm's main ambition over the years has been to produce good yields with the right attitude towards nature and soil management. It wanted to prove that it is possible to farm in this way, using the know-how learnt on-farm, from other similar farms in Slovenia and farms abroad. In coming together as a group of farms to acquire and use conservation tillage with subsoilers methods, the project aimed to:

- Produce high-quality food in the utmost natural and organic way.
- Promote environmental sustainability and carbon sequestration through the best soil management techniques available.
- Transfer knowledge to other interested farmers through conferences and workshops held both at Černelič farm and other venues.
- Provide examples of best practices to those who choose to follow this path, as this is the most reliable method of transferring knowledge.

Activities

The farm's motto is to produce healthy food with the lowest carbon footprint possible. Thus, it is deeply committed to operating in accordance with conservation tillage with subsoilers techniques and promoting optimal soil quality. This project was financed under measure M4.1 – Support for Investments in Agricultural Holdings following Černelič's successful participation in the public tendering process. Together with three other farms, Černelič successfully co-financed the purchase of agricultural machinery used for the cultivation of all their individual farming plots. The machinery purchased included subsoilers rotary turners, a mulcher, a shredder and other implements.

There has been extensive collaboration and networking within the project and beyond. The owner/operator of Černelič farm was the Chairman of the Society of Organic Farmers of the Dolenjska, Posavje and Bel krajina regions from 2010 to 2014. In 2011, a biodynamic association called Ajda Posavje was established in Posavje under which the Černelič farm was the first to obtain the Demeter Certification. Since then, four other farms have received the certification, and three more are currently in the process of obtaining it. The biodynamic association has been extremely successful and Černelič farm's owner/operator has been its president since 2015.

Between 2011 and 2019, 40-50 events (workshops and conferences) were organised, the largest being a lecture by Pasquale Falzarano from the Agrilantina biodynamic farm in Italy, which was held in Sevnica in January 2017 and attended by 220 participants.

Since 2011, Černelič farm has been a driving force behind the annual Organic Fair in Brežice with 20 stands from different farms. In November 2019 alone, five conferences on organic and biodynamic farming topics were held, all with lecturers from abroad. The Černelič farm regularly hosts workshops, school field trips and excursions and lectures on organic and biodynamic farming are delivered in various parts of Slovenia.

Main Results

The expected results from the joint equipment acquisition by Černelič and the other farms are:

- Optimisation of primary production, and the potential to increase the added value of the produce through processing;
- Specialisation and modernisation of agricultural production;
- Quality enhancement of agricultural products;
- Improved working conditions on the farm;
- Improved production capacities of the farmland; and
- Reduced pollution from tillage, in the form of GHG emissions, soil erosion and runoff.

In terms of climate mitigation, fuel consumption is significantly lower in a conservation tillage with subsoilers system than in a ploughing system. The farm's yearly total mean fuel consumption is 55 litres/ha. By comparison, the typical consumption in a conventional ploughing operation per hectare of arable land is around 200 litres/ha (source: Financial Administration of the Republic of Slovenia).

As an example of the soil improvements resulting from these techniques, in 2018 the Brežice hydropower plant invited the farm to regenerate the soil of a surface degraded by the plant's construction. In April 2018, the plot was tilled with a subsoiler and sprayed with preparation 500 (made from cow manure). It was sprayed

again after three weeks and sown with a biodiverse mixture bought in Germany (26 plant varieties by the Camena company). In early September the plot was mulched and sprayed with an organic fertiliser made of manure according to the Maria Thun method. After a fortnight the plot was again sprayed with preparation 500 and sown with a winter mixture (Wintergrun - six varieties of green manure crops). In spring 2019, the Černelič farm repeated the procedure by sowing a summer mix (the same as the previous spring). In September the plot was mulched, sprayed and a Lucerne mixture was sown. Today, the soil is healthy and cultivated as a grassland that will be mowed for the first time in 2020. Thus, organic and biodynamic farming techniques yield positive results for the soil, crops and the wider environment, even in areas where the chances of success were poor (regeneration of degraded areas).

Key lessons

The biodynamic association, Ajda Posavje, shares its know-how of those farming techniques and the environmental benefits of producing in this way throughout Slovenia. The association also cooperates with similar bodies including the Chamber of Agriculture and Forestry of Slovenia, and schools, such as the Agricultural School GRM Novo Mesto, where Černelič's endeavours inspired a study course on food quality. The cucumber test, for example, which demonstrates that organic and biodynamic farming produce healthier and higher-quality food with a longer shelf life even attracted the interest of Dr Otto Jens Anderson, a renowned scientist from Copenhagen.

Our positive approach to climate change was also noticed by Umanotera, the Slovenian Foundation for Sustainable Development. Two years ago, in a project carried out in partnership with the European Commission, the European Parliament and the Slovenian Government ([Video](#)), the Černelič farm was featured as one of the 20 best practice cases in Slovenia for reducing carbon dioxide emissions.

Other RDP support received in EUR

	Total	EAFRD	National / Region	Private
M04 – Investments in physical assets	12 759.38	4 784.77	1 594.92	6 379.69
M13 – Areas with constraints**	3 777.64	3 022.11	755.53	
M14 – Animal welfare**	2 808.84	2 247.07	561.77	

** Received from 2015 to 2018



Additional sources of information

n/a

*This project has been categorised under 'Climate change mitigation' by the nominating National Rural Network