In this experiment, we evaluated the effectiveness of a device called a ‘Dyker’, which local farmers trialled during two cropping seasons. The Dyker consists of a set of wheels with inclined shovels. It is attached to the rear end of a potato planting machine and digs holes every 80 cm into the bottom of the furrows between potato ridges. The holes are intended to improve water infiltration and help retain water near the plants, while minimising surface runoff and soil erosion, and preventing waterlogging in depressions.

The project actively involved stakeholders, such as farmers, local authorities, water and soil scientists, agricultural advisors, the cantonal soil protection agency, farm contractors, and representatives of the Federal Office for Agriculture, and the Federal Office for the Environment. They all contributed to discussions and assessments of different pre-existing and potential measures to reduce soil erosion. We found that the potential measures all had positive effects and most of them are already applied in the study site region, and enough research is available. The Dyker was selected for testing as it was found to be the most innovative measure in terms of novelty.

The Dyker in use with a Grimme GL 420 potato planter
Dye tracer experiments showed that in treated furrows, water infiltrates the compacted subsoil below the ploughed horizon, while in untreated furrows hardly any water infiltrates deeper than 20 cm below the surface.

More surface runoff in untreated furrows led to higher rates of soil erosion. In a steep section of a field, the average cross-sectional area of untreated furrows increased by almost 45% until the potato plant reached maximum vegetation cover while the changes during the same period were much smaller for treated furrows (24%).

In addition, a series of drone photographs showed that less surface runoff also reduces the amount of stagnant water in depressions: while in treated furrows rainwater was evenly retained in small holes and infiltrated the soil locally, in untreated furrows it drained to the lowest point of the plot. In depressions, collected water caused saturation excess and anaerobic conditions, and resulted in crop failure.

**KEY FINDINGS**

- The application and positive effect of the Dyker on conventionally farmed potato fields in the study area is undisputed
- The Dyker enables rainfall infiltration into subsoil horizons below the ploughed horizon
- Higher infiltration rates and deep infiltration in treated furrows lead to a better spatial and temporal distribution of soil moisture, reducing water oversaturation and water scarcity for growing row crops
- We observed a reduction in soil erosion in treated furrows on slopes of up to 15% and precipitation events of up to 40 mm/day
- These findings can help farmers to reduce soil erosion and waterlogging, agricultural equipment companies to improve micro-dam techniques, and policymakers to adapt policies to prevent soil degradation in the cultivation of row-crops.

**STAKEHOLDER INVOLVEMENT AND FEEDBACK**

The results of the field test were discussed with farmers, researchers and representatives of the Federal Offices for Agriculture, and for the Environment during a stakeholder workshop. In addition, two public events were organised where the Dyker as well as the field results were presented to a broad audience (70-80 persons at each event) and there was considerable interest.

Because the positive effects of the Dyker are undisputed and the contractor applies it without any additional costs for the farmers, there is considerable interest from conventional potato farmers in the region. However, the use of the Dyker is limited to a few crops (those grown on ridges, such as potatoes or carrots), and currently the device is not easily accessible for most farmers because only a few contractors own the device. Under current legislation, the Dyker is not eligible for financial support in the form of direct payments, which is a barrier for rapid spread and uptake.

**FACT SHEET AUTHORS**

Tatenda Lemann, Felicitas Bachmann

Further information about the case study:
http://recare-hub.eu/case-studies/frienisberg

**CONTACT INFORMATION**

Project dissemination: [www.recare-hub.eu](http://www.recare-hub.eu)
Case study leader: Tatenda Lemann tatenda.lemann@cde.unibe.ch
Project coordinator: Prof. Dr. Coen Ritsema, coen.ritsema@wur.nl

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**PHOTOS**

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