Practical Guideline
Life VineAdapt – Work package C3

Resource-efficient fertilisation methods

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Imprint and Contact

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Table on contents

1. Introduction

As part of the EU-funded Life VineAdapt project, work package C3 looked at ways to reduce greenhouse gas emissions in vineyards through resource-efficient fertilization techniques.

As part of the project, a pilot study was conducted to investigate fertilization methods that had not yet been tested in vineyards on this scale.

Over a period of four years, various fertilizers and fertilization techniques were examined and their influence on vine and soil health, reduction of greenhouse gas emissions, and socio-economic effects were analyzed. Practical trials were carried out on one site each in the Saale-Unstrut wine-growing region in Germany and in southern Styria in Austria.

At the Kloster-Pforta State Winery (Germany), mineral and organic fertilizers were compared. These were applied to different test areas, either over the entire surface or only in the area under the vines. At the Silberberg State Winery (Austria), the experiment was carried out without mineral fertilizers. On an organically farmed area, organic fertilizer was applied to the entire area as well as to the area under the vines with a 25% reduction in fertilizer quantity.

One of the objectives of the study was to examine whether 25% of the fertilizer quantity could be saved by applying fertilizer exclusively to the area under the vines. In order to be able to compare the measured values, no fertilization measures were carried out on a control area.

2. Goal

With greenhouse gas emissions rising worldwide every year, the aim is to identify types of fertilizer, fertilization methods, and techniques that can reduce emissions.

At the same time, there should be no negative impact on vine and soil health, while maintaining the quality and quantity of the grape harvest. Biodiversity and socio-economic effects were also taken into account during the projects.

3. Practice

In a practical trial, Germany compared the mineral fertilizer ENTEC, with a nitrogen content of 26%, and sheep's wool pellets, with a nitrogen content of 11%, as organic fertilizers.

Austria used StyriaFert Veggie Bio Organic Complete Fertilizer with a nitrogen content of 4% for its trials.

3.1 Practical implementation

In most areas, fertilizer is applied using a trailed fertilizer spreader. To avoid tracks, ensure that the areas are easily accessible. Soil that is too wet is unsuitable for mechanical access.

For the trial in Saale-Unstrut, an Amazone spreader with a row spreading device was used to apply the mineral fertilizer. As the settings vary depending on the tractor and fertilizer spreader and must be adjusted accordingly, this will not be discussed further here.

When applying the sheep wool pellets, a rotary harrow with an APV P20 MD seed drill attached was used in the first attempt. In order to get the sheep wool pellets into the understock area, the pipes of the seed drill were positioned so that they protruded into the understock area. The seed drill used is electrically powered. The rotary harrow was not switched on and ran over the ground.

Unfortunately, the sheep wool pellets could not be spread in this way. The pellets were too large, causing the pipes to become clogged. During the trial, the pellets were therefore spread by hand in the lower trunk area.

Manure spreaders with integrated conveyor belts are better suited for spreading pellets in the under-vine area. No such spreader was available in Saale-Unstrut for conducting the trials.

4. Project outcomes

4.1 Landesweingut Kloster-Pforta, Saale-Unstrut, Germany

Analysis of the trials in Saale-Unstrut revealed no significant difference in nitrogen content between mineral and organic fertilization in the soil. Both types of fertilization led to increased nitrogen content in the soil. In all trials, there was no significant difference between the parameters of grape quality and grape quantity. Similarly, nitrogen fertilization has no significant influence on sugar storage in the berries.

Sheep wool pellets cannot be worked into the soil in the under-vine area, or only with great effort. They lie on the ground and may hinder mechanical under-vine cultivation. The extent to which pellets interfere with vegetation growth in the under-vine area has not been investigated.

4.2 Steirisches Landesweingut Silberberg, Südsteiermark, Austria

Unlike in Germany, a clear effect of organic fertilization measures on berry weight and yield was observed in 2024. With fertilization, the average berry weight was 140 g in the lower vine area, 144 g across the entire area, and 122 g in the control area. Furthermore, the average number of grapes per repetition was 240 for full-area fertilization, followed by 195 in the control area and 182 in the lower vine area. No effects were observed for the parameters pH, sugar content, and acidity.

As in Saale-Unstrut, there were yield losses due to late frost in southern Styria in 2024. A good nitrogen supply has an effect on the following year. The result reflects only one year and is not necessarily conclusive.

5. Advantages of different types of fertilizer

5.1 Mineral fertilizer

One advantage of mineral fertilizer is that it releases its nutrients very quickly and makes them available to plants. This decomposition process begins within the first few hours after application and is complete after a few months.

Crops such as wheat or sugar beets benefit from this rapid decomposition of mineral fertilizer, as the nutrients are immediately available. Grapevines can also benefit if the mineral fertilizer is applied when needed. Vines have an increased need for nitrogen during flowering and then again later during the ripening process of the berries. The decomposition process of mineral fertilizer takes place without any influence being exerted over time. This means that grapevines may not be able to absorb the additional amount of nutrients and these may be lost in the soil through leaching.

A significant advantage of mineral fertilizers is their low cost. Both in terms of purchase and application, mineral fertilizers cost only a small fraction of organic fertilizers. It can therefore make economic sense to use mineral fertilizers.

5.2 Organic fertilizer

The use of organic fertilizer offers a wide range of benefits for the environment and contributes significantly to sustainability in vineyards. Organic fertilization is in harmony with biodiversity, promotes humus formation, and increases soil activity. At the same

time, it supports the regional circular economy and nutrient recycling—key aspects for maintaining healthy and resilient ecosystems in the long term.

Organic fertilizer or material does not decompose immediately. In some cases, nutrients are only released in the following year. How well the release process works with organic fertilizer depends on the soil structure and soil organisms.

The project showed that fertilizing with 75% of the total required amount in the understock area has similar effects to the conventional application of 100% over the entire area. This approach allows savings in the total amount of fertilizer without compromising the positive effects on the soil. However, these results are not certain and would need to be verified in further trials.

The environmental benefits—particularly in terms of humus formation and biodiversity—make the use of organic fertilizer an acceptable and forward-looking solution.

In conclusion, it can be said that the combination of organic fertilizer and selective fertilization in the understock area promotes sustainable vineyard management. This integrative approach represents a promising strategy for reducing the ecological footprint in agriculture while sustainably improving soil quality and biodiversity.

Adjusting the type and method of fertilization makes it possible to work in a resource-efficient manner, which is ecologically beneficial in the long term. Even though organic fertilizer is a greater economic cost factor in terms of purchase and application, it also represents an investment in our soils.