

# Cecilia Palmborg

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**Cecilia Palmborg is an Associate Professor in soil sciences at SLU Umeå. Her research focuses on fertilizers in agriculture environments, mainly with an interest in organic fertilizer and Reed Canary Grass as biofuel. SITES recently asked Cecilia a few question about her SITES project carried out at Lönnstorp and Röbbäcksdalen stations.**

## **What is the project you are involved with at Lönnstorp and Röbbäcksdalen about?**

The title of the project is [GRASSREFINE](#) and it aims to find profitable perennial agricultural crops for biomass to energy and bioproducts. The study focuses on bioenergy and bioproducts and is funded by the Swedish Energy Agency.



My main motivation behind this project is to find effective ways to grow these materials and thereby finding sustainable alternatives to fossil fuels. In the project we developed systems to grow Reed

Canary Grass to be used as a fuel or fibre substrate. We used marginal land, areas that are not suitable for food production, for this system.

In a previous project we found that the yields doubled if the grass is harvested and fertilized twice a year compared to only once. The result is a green biomass product that can be used as substrate for biogas, ethanol and fibre raw material. We want to investigate how a system with two harvests per year can be used and how the quality of the biomass product is affected. Further, we investigated if it is possible to separate different parts of the biomass such as leaf and straw to get raw material better suited for different types of products.

## **How can the results be applied in society?**

The aim is that results can be used by biogas and ethanol manufacturing plants as the so called second generation of biofuels that do not compete with food production. However, there are still problems that need to be solved, such as how to establish crops on marginal land without having problems with weeds.

Another result that is of interest for society is that we did not use any synthetic fertilizers, but only digestate from biogas plants which worked very well. Some types of digestate have low commercial value, but if it can be sold as fertilizers for this purpose, the digestate will be more profitable. At Lönnstorp we used digestate from household waste and at Röbbäcksdalen from dairy waste such as whey.

## **Have you collaborated with other researchers or companies within your project?**

The project is a collaboration with the Department of Forest Biomaterials and Technology at SLU in Umeå. A pilot plant for fractioning biomass (separates leaf and straw) is used in collaboration with the company Airgrinder AB. We also have collaboration with farmers for the harvest.

## **What has been done at SITES stations?**

Field experiments using small experimental plots (3x10 meter) were conducted at the SITES stations Röbbäcksdalen and Lönnstorp. This was done using a replicated experimental design to get a good understanding of the variation. We have also conducted experiments at larger plots (up to half a hectare) to get more material for fractionation into one fraction suitable for bioenergy and another for fibre raw material.

## **What was your experience like working at the SITES stations?**

In the large plot experiment, SITES station staff assisted with fertilizing, but the harvest was done using entrepreneurs since SITES doesn't have equipment to harvest at such large of scale. Since the small plot experiments used standard field equipment, SITES staff were able to assist. The staff were very skilled, willing to try new things and find solutions to problems. It especially worked well with routine tasks. However, since the most intense periods in our project coincide with the most intense periods for harvest of other crops at the stations, we hired temporary staff to help as well. We had some problems related to harsh weather conditions which caused the project to be delayed. When the project started in 2018 it was dry and warm, and therefore the establishment of the crops did not work well. Hence, for the small plot experiments we had to repeat the establishment. This past winter, parts of the experiment also suffered from frost damage. The fields are located on marginal land in Röbbäcksdalen. These fields are poorly drained and therefore the water accumulates and freezes. In Lönnstorp we used old pastureland, which is full of gravel, and means less material that can hold water and hence drier conditions.

## **What is the added value in performing field trials at SITES stations?**

I think the added value is skilled and engaged station staff. Also, as a SITES station, they have means to develop new things and can invest in new equipment. For example, the machine we used to spread the digestate slurry was partly financed by SITES.

## **Have you used data from the stations long-term data series?**

I used mainly long-term weather data in this project. But in a previous project, [Climate-CAFE](#), I also used a long-term experiment with stored samples that I sent for analysis, to investigate how carbon content in soil changed over time depending on the crop used.

## **How do you think SITES stations and its coordination could be developed to be the optimal research infrastructure?**

I don't think there is such a thing as optimal experiment infrastructure but instead there is a need for continuous development depending on the research ongoing.

It would be great to develop the grass cultivation competence at the stations. The forest stations in SITES have access to forest areas spread over large areas. The agricultural stations are only two local research stations, but it would be valuable to extend SITES activities to other agricultural areas to have a wider range of soil conditions for grass cultivation.

There are several long-term experiments at Röbbäcksdalen. They started 40-50 years ago with research questions relevant at that time. These can be used to answer research questions also today, but there are also new research questions that need new long-term experiments. Examples are long-term effects of fertilizers recycled from society such as sewage sludge, digestate and biochar. There are already two experiments in Skåne and a small-scale experiment in Uppsala, but there is a need for this type of experiment also in Norrland. We have long winters and soil changes takes more time. Changes in carbon content in soil takes a long time before an effect is seen and therefore it would be good with long-term experiments using different fertilizers also in Röbbäcksdalen.

*Cecilia Palmborg was interviewed by Matilda Sjödin (Trossa) in April 2021.*