

# Exploring minimum substrate depths for multifunctional flowering roof meadows in south Sweden.

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## Introduction:

Green roofs have moved from experimental installations to main stream practice on a large scale in the Scandinavian countries. The last years have seen an increased focus on developing quality criteria for the installation of all different components within a green roof build-up as well as installing more creative surfaces with higher ecosystem service value. Still, there is a lack of quantitative information on green roof performance directly relevant for the building industry. In general, the benefits of green roof installation can be seen as a common good payed for by private buildings companies as economic incentives or strict planning regulation is currently missing.

## Installation

There is a growing interest in the development of multifunctional flowering meadows for installation on green roofs in a Scandinavian climate. The main cost driving variable is weight and substrate depth, i.e. finding systems that perform at limited substrate depths is crucial for the adoption and installation of the systems. We have investigated green roof meadows installed with 3 different substrate depths (50, 75, 100, 125 mm) and using two different substrates.

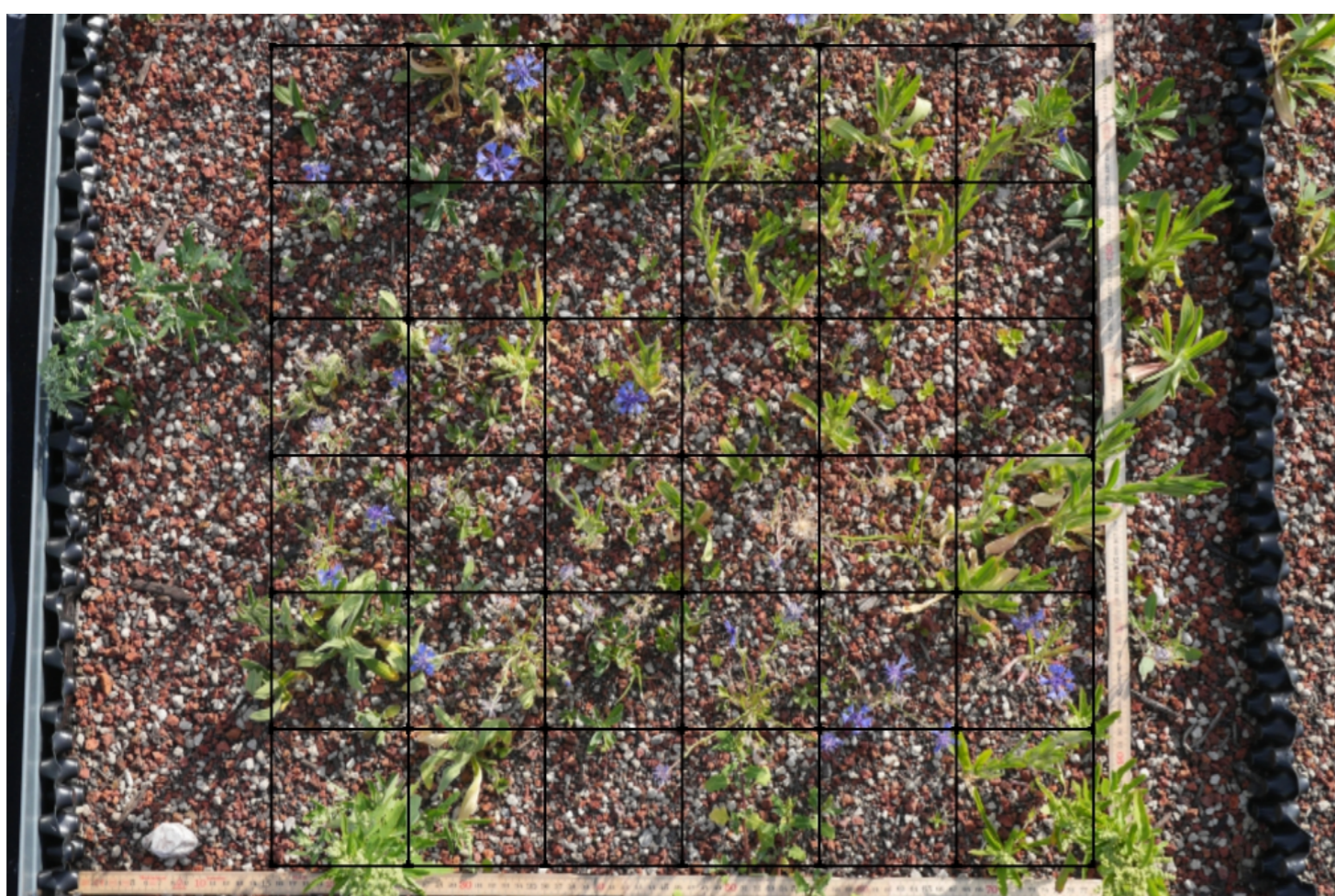


Figure 2: Plant cover was determined from digital images. Cover values were visually assessed.

## Results and discussion

The roofs were established using a native seed mix. The establishment of the seeded vegetation was dependent on substrate depth and type. Weather effects at the installation time have a large effect on the development of the vegetation, especially for the thinner substrate depths. There was also a clear shift in dominance between species groups depending on substrate depths with succulents thriving at limited depth. In general, long term herbaceous cover of good quality is probably not possible even in moderate climates such as Malmö on substrate depths below 75mm.

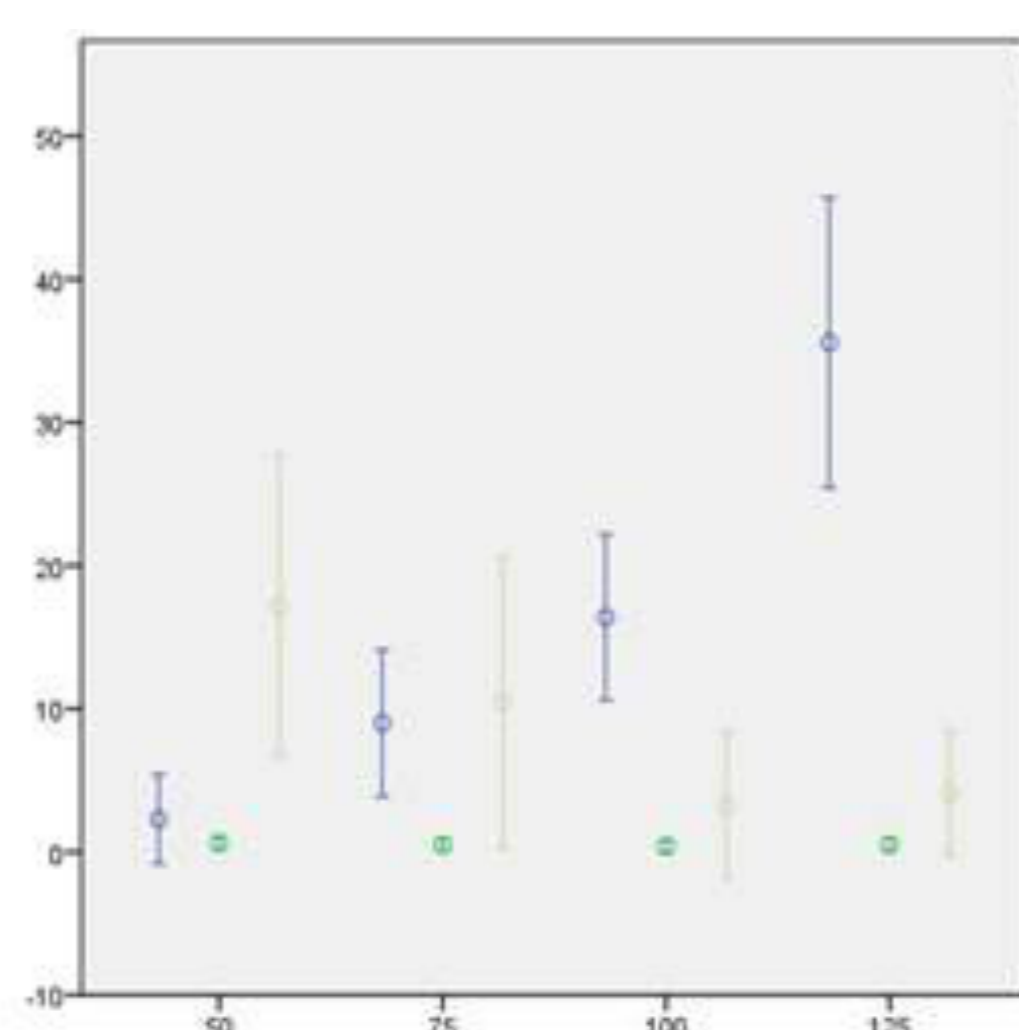


Figure 3: Average cover of Herbs (blue), weeds (green) and succulents (grey)

## Augustenborg botanical roof garden

One of the largest research and test facilities on green roof technology is located in the Augustenborg area in Malmö, Sweden. The facility is in total 9500 m<sup>2</sup> displaying a wide variety of roof build ups, solar panels and vertical greenery. The Augustenborg area and the botanical roof garden is now the centre for the development of an open innovation and testbed arena aimed at generating company and society relevant key metrics for the performance of green infrastructure components.



Figure 1: The testplots were installed at the botanical roof garden in Augustenborg, Malmö (Lat. 55°34'36.9"N Lon. 13°1'37.9"E). © Eniro.

## Continued research

The Swedish green roof market is currently undergoing a change towards an increased focus on biodiversity and more diverse installations. There is also an increasing interest in more complex installations and installations with proven performance. General guidelines and support handbooks for the professional community has been developed during the last years hand have now been published. The project was supported by Vinnova and an online version of the handbook can be accessed through [www.gronatakhandboken.se](http://www.gronatakhandboken.se)

A new project is currently being launched trying to further the implementation of green infrastructure through generating performance measurements for different types of roof, wall and ground based systems. This project is designed as a testbed for urban green infrastructure where interested companies are invited to showcase and test their products in respect to various ecosystem services and technical criteria. The project Testbädd för grönblå urbana lösningar is financed by Vinnova and will run until 2021 (<http://www2.vinnova.se/sv/Resultat/Projekt/Effekta/2012-03291/Testbadd-for-gronbla-urbana-losningar/>).