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Very specific conditions are needed for a tiny seed to grow into a mighty tree. Providing these conditions helps to preserve biodiversity, as plants produced from cuttings are essentially clones. EU-funded researchers have developed an innovative propagation unit where plantlets can thrive, along with tailor-made growth protocols for many species.

Inside the semi-automatic growing chamber: seedlings and a robotic arm with a stereo-optical sensor. © Terzaghi M.

The Zephyr [2]project has developed a new, zero-impact growth chamber for forest plants: a sustainable controlled environment where tender shoots can thrive under the watchful “eyes” of a robotic nursery assistant. Key components of the new system include a rotating set of trays under an array of LED lamps, a robotic arm equipped with a camera, and wireless microsensors that keep tabs on the plants.

The project is due to end in November 2015, and the partners are currently putting the final touches to their system. Standard growth chambers based on their prototype could be available within a year, says project manager Carlo Polidori, and customised units designed to meet specific requirements will also be on offer.

New growth, firmly rooted in research

Many of the partners in the Zephyr consortium are SMEs that had already collaborated in earlier EU-funded projects, shaping some of the components on which the proposed system relies. Further crucial parts, such as the stereoscopic camera, were developed elsewhere, and Zephyr contributed the microsensors.

“The real innovation in Zephyr is putting all these things together to produce a very competitive,

highly automated unit," says Polidori. In contrast to other growth chambers used in silviculture, Zephyr's prototype uses neither pesticides and nor fertilisers, he notes.

It is also greener, requiring far less water, soil, energy and space, he adds. Moisture is recycled, plants are grown in individual pots containing the optimal amount of substrate, and instead of the 10 overhead lamps required by comparable systems, it relies on a mere 3, which are powered by solar panels. The combination of wireless microsensors and camera inspection means that conditions in the chamber can be monitored remotely.

M**ore bark for the buck**

One of the Zephyr growth chamber's particular strengths is that it provides uniform conditions, Polidori notes. In the current, "static" chambers, treelings remain in the same spot for large stretches of time, and some are thus nearer to key components, such as lamps, than others.

In the prototype unit, all seedlings in a batch benefit from the same amounts of light, moisture and warmth, he adds. Seedlings are placed on revolving trays, taking turns in the best spots. The system thus produces plantlets of consistent quality, with the strong roots they will need to survive out in the wild.

And, better yet, it can produce them just in time, Polidori adds. Seedlings can thus be made available at the very beginning of the planting season, giving them plenty of time to get established before the days get short and cold.

In addition to the actual chamber, Zephyr has produced growth protocols for a wide variety of species. This guidance notably details the type of soil required for individual species, obviating the need for fertilisers, Polidori explains. The partners also use specific spectra to boost plant growth.

It's a compelling system, but it's not yet out of the woods. As a next step, the partners intend to develop the prototype into a reasonably priced standard module, which according to Polidori could be coming to a forest near you by late 2016. The prototype, he explains, contains particularly sophisticated versions of some components, meeting research needs that aren't relevant to production environments. Customised units including such parts will, however, be available to clients with specific requirements.

As a further advance, the partners are considering an innovative business model for the commercialisation of their system. Known as a "distributed company", this arrangement will enable the entities involved to cooperate without setting up a new company, Polidori notes. Zephyr may thus break new ground not just for plant propagation, but also for the marketing of knowledge-based products and services, stimulating growth in more ways than one.

Inside the semi-automatic growing chamber: seedlings and a robotic arm with a stereo-optical sensor.

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See also:
CORDIS [3]
Project:
Zero-impact innovative technology in forest plant production
Project Acronym:
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