

Installation of hedgerows in areas prone to desertification using drought adapted deep rooted plants

In the framework of the EU LIFE-AGROASSIS project, the Department of Forests of the Republic of Cyprus and KES Research Centre developed an innovative protocol to plant resilient hedgerows to combat desertification.



The EU Life project Agroassis targeted the driest areas in Cyprus to develop resilient hedgerows.

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Deep roots training tubes at the Forest Department of the Republic of Cyprus.

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/// Context ///

Planting resilient hedgerows in burnt and/or degraded agricultural land is a path proposed by the EU LIFE-AGROASSIS project to combat desertification, coordinated by the Agricultural Research Institute of Cyprus. Within the project the Department of Forests of the Republic of Cyprus in collaboration with KES Research Centre (KESRC) developed a planting system named Deep Root Training Tubes (DRTT). This system's aim is to produce deep rooted seedlings resistant to water stress in the nursery with reduced care requirements in arid environments after planting.

To enhance community engagement and raise awareness about environmental protection from climate change, the project partner Laona Foundation actively recruits and coordinates volunteers from companies and organisations, who following a training in the specialised planting method, contribute enormously to the installation of hedgerows. Hundreds of volunteers from 20 enterprises, academic institutions and other organisations participated in this year's planting events, organised by the Laona Foundation in collaboration with the office of the Cypriot Commissioner for the Environment and the initiative '300.000 Trees in Limassol'.

/// Solution for a Resilient Future ///

From the 24 plant species initially proposed in the project, it was discovered that the existing possibility of producing propagating material exists for 18 plant species for which the production of seedlings has already started. The availability of seedlings is determined by the amount of seed production of the previous year, derived from wild plants of Cyprus which are utilized by the Department of Forests. The 18 species of plants selected, divided into 3 groups according to their biotype are the following:

Tree species: *Pistacia atlantica*, *Ceratonia siliqua*, *Olea europaea sylvestris*, *Prunus dulcis*, *Cupressus sempervirens*.

Shrub species: *Pistacia terebinthus*, *Pistacia lentiscus*, *Crataegus azarolus*, *Laurus nobilis*, *Arbutus andrachne*, *Quercus coccifera calliprinos*, *Ziziphus lotus*, *Bosea cypria*.

Herbaceous plants: *Thymbra capitata*, *Asparagus stipularis*,

Rosmarinus officinalis, *Capparis spinosa canescens*, *Origanum majorana*.

Most of the selected plant species have the potential to develop a deep root system as species adapted to drought. These species can be used to improve the environment in desert and semi-desert areas with severe water shortages and areas that have been severely damaged by fires. They also have the potential to support pollinators providing critical ecosystem services.

Considering the Deep Root Training Tube system, to permit deep root growth in seedlings, 60 cm deep tubes are used, compared to the classic pots-bags. Training lasts 90 days according to the protocol designed. The aim is to develop a much longer root system in tubes than in pots, as well as more robust shoots and roots. Thus, seedlings will already be adapted from the nursery to drought conditions with the

aim of saving on irrigation water, while permitting successful establishment in barren and arid lands.

The PVC tubes with dimensions (60 cm per 10 cm) have a volume of 5 litres in topsoil and include soil amendments (Attapulgit – for water retention – and a beneficial microbe complex-Micosat-F-Olivo). The DRTT system consists of two hemispherical sections assembled together with removable tape and has a waterproof removable bottom cover, permitting water only to escape through the top of the tube. The plants are irrigated under a special protocol in order to gradually bring them to water stress conditions. The picture below shows the development of roots in the DRTT system (a,b,c) compared to traditional pots (d,e).



Comparison of roots development between Deep Roots Training Tubes and traditional pots.
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It was decided that the best time for root growth tubes to receive plants should be after the start of the dry season (e.g. June 2023). In this way, extensive rainfall is avoided that could lead to a possible excess of the amount of optimum water inside the containers, as would be the case during the wet climatic season. It also ensures sufficient solar radiation to thermally stress the tubes by allowing water in the surface soil layers within the tube to evaporate. The above practice is critical in reducing upper root system growth and permits root growth deeper into the tube where moisture is protected from solar evaporation. Planting on site needs a specific drilling machine as shown in the picture below.



Drilling machine needed for planting deep rooted plants.
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/// Always Moving Forward ///

In the first year of the LIFE AGROASSIS project, 2000 deep rooted plants have been produced and planted on field. In the next 2 years, 4000 deep rooted plants will be planted each year. A nursery and planting protocol have been designed by the Department of Forests of the Republic of Cyprus and KES Research Centre (KESRC) and the evaluation of onsite results will be shared.

Resilient to drought, hedgerows are a must in combating desertification and for adapting to climate change for agroecosystems of Mediterranean drylands. Adequate supporting mechanisms are still needed to support land owners and farmers in planting resilient hedgerows, taking

in account that the planting of deep rooted plants incurs an extra-cost. However, the long term benefits outweigh the cost, when considering the improvement in soil conditions, microclimate, pollinator services, as well as in secondary crop production. Moreover, installing new hedgerows and retaining them is critical for carbon capture and storage, while potentially supporting farmer income through carbon farming. Therefore, the need for promoting the installation of hedgerows using native and drought adapted plants through the Common Agricultural Policy (CAP) is important and can provide multiple benefits for current agriculture and for the generations to come.

Further information

- The project is running up to end of 2026. More information of the EU LIFE AGROASSIS project available on the project's webpage.
- LIFE – AgrOasis: Regenerative approaches for building climate change resilience in EU agricultural regions prone to desertification: www.lifeagroassis.eu (Accessed 17 May 2024)

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