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Is Space R&D Truly Fostering A Better World For Our Future? (2)

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WHAT HORTICULTURE AND SPACE EXPLORATION CAN LEARN FROM EACH OTHER: THE
MISSION TO MARS INITIATIVE IN THE NETHERLANDS

Abstract

The horticulture sector in the Netherlands is a global leader due to technological advancements, high productivities, low resource usage, and knowledge of greenhouse construction. The Netherlands is the second largest exporter of vegetables in the world, and more than half of its land area is used for agriculture with some greenhouse complexes covering 175 acres. However, to retain this leading position, the sector has acknowledged that it needs to keep innovating. To further reduce waste and environmental impact, an innovative production strategy is being developed to support a circular economy: the circular greenhouse. LDE Greenport Hub, in collaboration with major horticulture industry partners (such as LTO Glaskracht), has initiated *Mission to Mars*, a programme to boost innovation and development of the circular greenhouse by adopting concepts and technologies from space. Space is inherently focused on circularity because of scarce resources. A good example is the MELiSSA concept of the European Space Agency in which human waste is broken down into nutrients for plants by a series of bioreactors. These plants consequently provide food and oxygen for the crew. The *Mission to Mars* programme started with a lecture series in the beginning of 2018 at the World Horti Center in Naaldwijk. In seven lectures different aspects of sustainability and circularity were explored together with researchers, students, growers and horticulturists. The lectures covered (1) energy, (2) water, (3) lighting and climate, (4) soil and substrate, (5) material and energy streams, (6) digitization and automation, and (7) urban and vertical farming. It quickly became clear that not only terrestrial horticulture could benefit from space technologies, but that human space exploration could equally benefit from the practical and technical knowledge of commercial growers for food production in space. A list of potential research topics was identified. These topics will be explored in a follow-up ESA Innovation Exchange, together with space technology partner ICE Cubes. The goal is to go beyond the circular greenhouse, and demonstrate how space itself can be an environment for plant biology innovation, and hence increase future food security on Earth.