

## New Technologies for Enabling Food Production Beyond LEO

NASA has identified the need for robust and sustainable 'Pick-and-Eat' systems for supplementing crew diets with fresh leafy green crops in near term LEO, cislunar, and lunar missions. Spaceflight plant growth systems have been primarily designed for conducting space biology studies, but these systems are not optimal for sustained food production.

Improved water and nutrient delivery subsystems that do not use bulky and non-reusable media are needed for decreasing the mass of the food production system. Autonomous technologies for monitoring plant health and food safety are needed for ensuring that the food produced is suitable supplementing crew diets with fresh, nutritious salad crops. Improved plant imaging techniques used for high-throughput phenotyping can be leveraged for monitoring plant health. Near-realtime measurements of the microbial ecology of food production systems are needed for assessing food safety. Furthermore, newly identified plant species and cultivars with improved growth habits and contents of antioxidants, vitamins, and minerals when grown in spaceflight environmental conditions are needed.

These improvements in food production technologies will enable the design of sustainable life support systems for manned exploration missions beyond Low Earth Orbit.