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ARCHITECTURES FOR ACCOMMODATING LUNAR PLANT GROWTH DEMONSTRATIONS

Abstract

Successful farming is essential for sustained lunar settlement, but as yet there is no established plan for showing it to be a real prospect. Robotic precursor experiments on Earth, in the ISS and on the Moon have been proposed and one small lunar example is underway as an adjunct to a Google Lunar X Prize entry, but much more work is needed. In this paper we discuss and advocate the design of habitat elements that can be created to begin our learning about ways to support plant growth as a part of integrated lunar living systems. These early, partial systems may be habitable for humans on Earth but not in ISS or on the Moon. Instead, they will be designed for human-supervised robotic operation to answer specific questions about plant accommodations through instrumented observation. Preliminary examples of this technique are the European Modular Cultivation System (EMCS) and the Optimizing Root Zone Substrates (ORZS) units existing aboard ISS. By growing the most important plants in real, controlled, observed lunar conditions we will be able to evaluate not only the plants themselves but also some of the architectural demands of accommodating them. Vertical farming is appearing in some cities, notably Singapore. On the Moon, if a silo can be drilled it can serve to house a vertical plant growth experiment, minimizing the top surface area to be shielded by regolith and enabling a compact plant support and observation system.