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Editor's Note **Open Access**

Editor's Note for the topical issue 'Agriculture in Space'

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Human space exploration is experiencing a renaissance of sorts, both in terms of mission objectives and society's general interest in human exploration of our solar system. The meteoric rise of private sector space exploration capabilities and continued success of marquee missions, such as New Horizons' exploration of Pluto and beyond, have reignited a passion for space exploration that had perhaps waned in recent times. Popular culture seems to have caught on as well with books and movies, such as the Martian, garnering significant public attention. Add to all this the recent milestone of ISS crew members eating crops grown on station (Veggie) and the stage is set for a resurgence in spaceflight crop research. Although somewhat coincidental, it is with this resurgence in mind as well as the need for a dedicated venue for spaceflight crop and cropping systems research that this topical issue has been conceived.

Human-led exploration of the solar system will ultimately lead to colonization; however, this cannot occur without the ability to provide the necessities of life on a regenerative basis, while maximizing the potential of *in situ* resources to meet crew needs. Resupply (food, air, water, etc.) is not a long term option and becomes less and less feasible as mission durations and distances increase (Fig. 1).

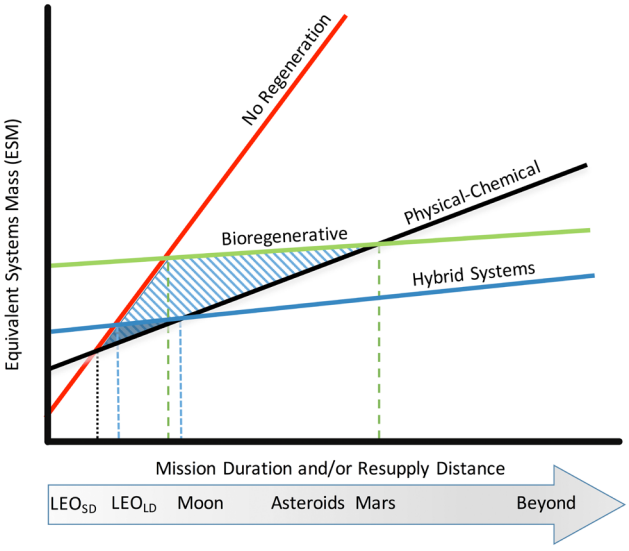

Figure 1: Cost comparison relative to mission duration and distance from Earth, in terms of equivalent systems mass, for four life-support modes.

Historically, there has been a somewhat artificial divide between physical-chemical (PC) and biological-based systems in terms of their consideration as the 'primary' life-support mode. This divide has been counterproductive but as technologies advance (biological/molecular/genetic/engineering/materials) and the interconnectedness and compatibility of these life-support systems evolves the divide becomes blurred and will ultimately disappear in favour of hybrid systems (Fig. 1). Plant scientists and life-support system engineers are working more closely to develop these hybrid systems that incorporate the most appropriate physical-chemical and biological subsystems to meet crew needs. This special issue highlights some of these emerging hybrid concepts and puts emphasis on the need to both modify physical systems to accommodate biology (e.g., plants) and the need to modify biology (genetic editing) to meet the constraints of spaceflight.

This special issue in anchored by papers that put 'agriculture in space' into context through an overview of the history and near future of crop research in space (Wheeler), a look at the current state of crop research on the International Space Station (Massa), and a commentary on the long standing but poorly understood [or at least poorly quantified] psychological benefits and impacts of human-plant associations in spaceflight and analog scenarios (Guy). Combined with a rich and diverse offering of research and design papers this special issue represents a long overdue dedicated venue for crop research in the context of spaceflight.

As the human race stretches beyond the confines and safety of Earth we must not forget our relationship with other organisms to which we rely on for life. Crops and other biological systems are not a luxury; they are a necessity as much in space as they are on Earth. Agriculture has supported the evolution of human civilization and *agriculture in space* will support the expansion of our civilization beyond Earth.

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