

Abstract: Enabling long-term space travel is a goal of both NASA EPSCoR's research priorities and NASA's strategic plan. The success of such missions will depend on regenerative and sustainable in-situ resource utilization methods. Incorporating plant growth into those systems allows for the long-term production of food and medicinal compounds. However, optimizing space-based growth substrates for successful plant production remains a major obstacle. This project is a cross-discipline and systematic analysis of ways to terraform simulated Martian regolith to stimulate biogeochemical cycling and create a substrate more favorable for plant production. We then test plant growth to maturity in the altered regolith simulants, assessing success with multivariate statistical analysis. This stepwise experimentation will provide terraforming insight at both the micro (biogeochemical substrates changes) and macro (ultimate plant success metrics) scales, directly supporting NASA's goals. Further, insights gained will have significant overlap in addressing challenges associated with arid and dryland agriculture, in support of NSHE and State of Nevada goals.