

Case ID:M23-086L^

Published: 8/18/2023

Inventors

Ferran Garcia-Pichel

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Soil Inoculants for Restoration of Degraded Arid Soils

Large swaths of arid land are under severe, increasing anthropogenic stress, with degrading or already degraded soils. Regeneration of biocrusts, photosynthetic communities which act as the natural biological cover of arid soils and increase nutrients into them, has promise for dryland restoration and sustainability. However, unaided recovery of biocrust is slow, and existing strategies for biocrust restoration are high effort and low capacity, which limit applications to small spatial scales. Strategies to restore arid lands, which are compatible or optimally synergistic with current land use practices and management, are urgently needed.

Professor Ferran Garcia-Pichel, at Arizona State University, has developed soil inoculants that can be used in existing photovoltaic (PV) panel installations to create novel ad hoc biocrust nurseries. PV panel installations offer milder microclimate with partial shade, less extreme temperatures and diminished evapotranspiration rates, marginal lands that are already in use, and enough land for large scale implementation without the need for dedicated infrastructure. Further, soil stabilization by biocrust could prevent or diminish dust deposition on PV panels, which may increase PV power and voltage output as well as reduce shading and cleaning costs. This approach was tested in a 3-year long pilot experiment in a semi-urban solar farm and showed with positive results.

This “crustivoltaic” approach provides a feasible, scalable and sustainable solution that offers attractive socioeconomical incentives.

Potential Applications

- Restoration of biocrust

Benefits and Advantages

- PV installations are more conducive to the natural development of biocrusts

than comparable areas

- Cover and areal biomass achieved under the influence of raised PV panels at least doubled those found in exposed neighboring soils
- By the end of the second year in the pilot, significant recovery had occurred in all plots and differences according to original inoculation treatment were obvious
- The inoculants are resilient to extreme weather and climate vagaries
- The burden of this crustivoltaic approach on PV farm operation is minimal, but promotes net increases in electrical output by reducing dust deposition
- Could result in carbon sequestration credits, since biocrusts are photosynthetic systems that draw down CO₂ from the atmosphere
 - At current carbon credit prices of \$32 per ton, using the crustivoltaics approach could provide monetization on the order of 300 ha⁻¹
- Useful and impactful at regional scales
- Utilizes existing infrastructure

For more information about this opportunity, please see

[Heredia-Velasquez et al - Nature Sustainability - 2023](#)

For more information about the inventor(s) and their research, please see

[Dr. Garcia-Pichel's departmental webpage](#)

[Dr. Garcia-Pichel's Institute Profile webpage](#)