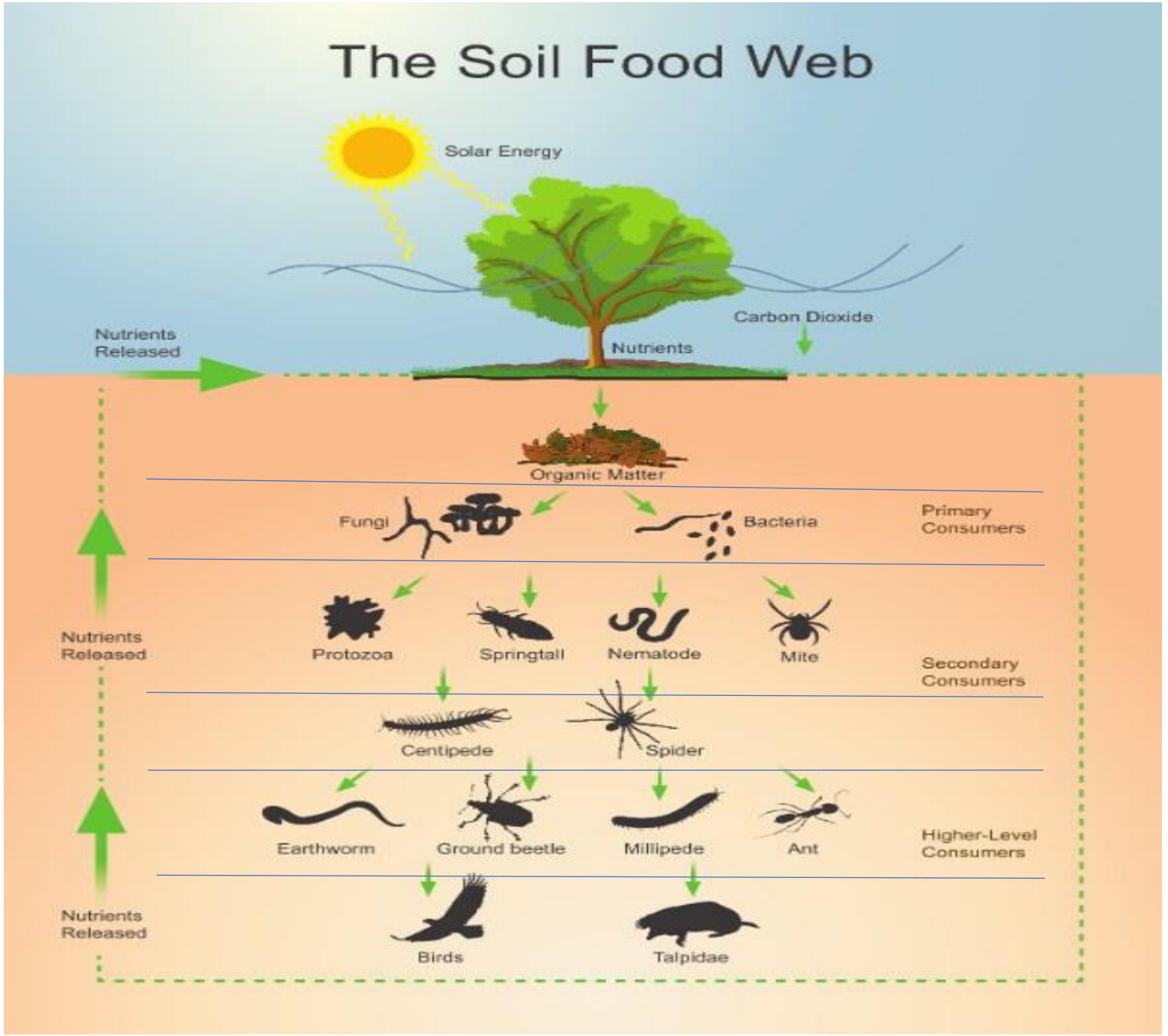
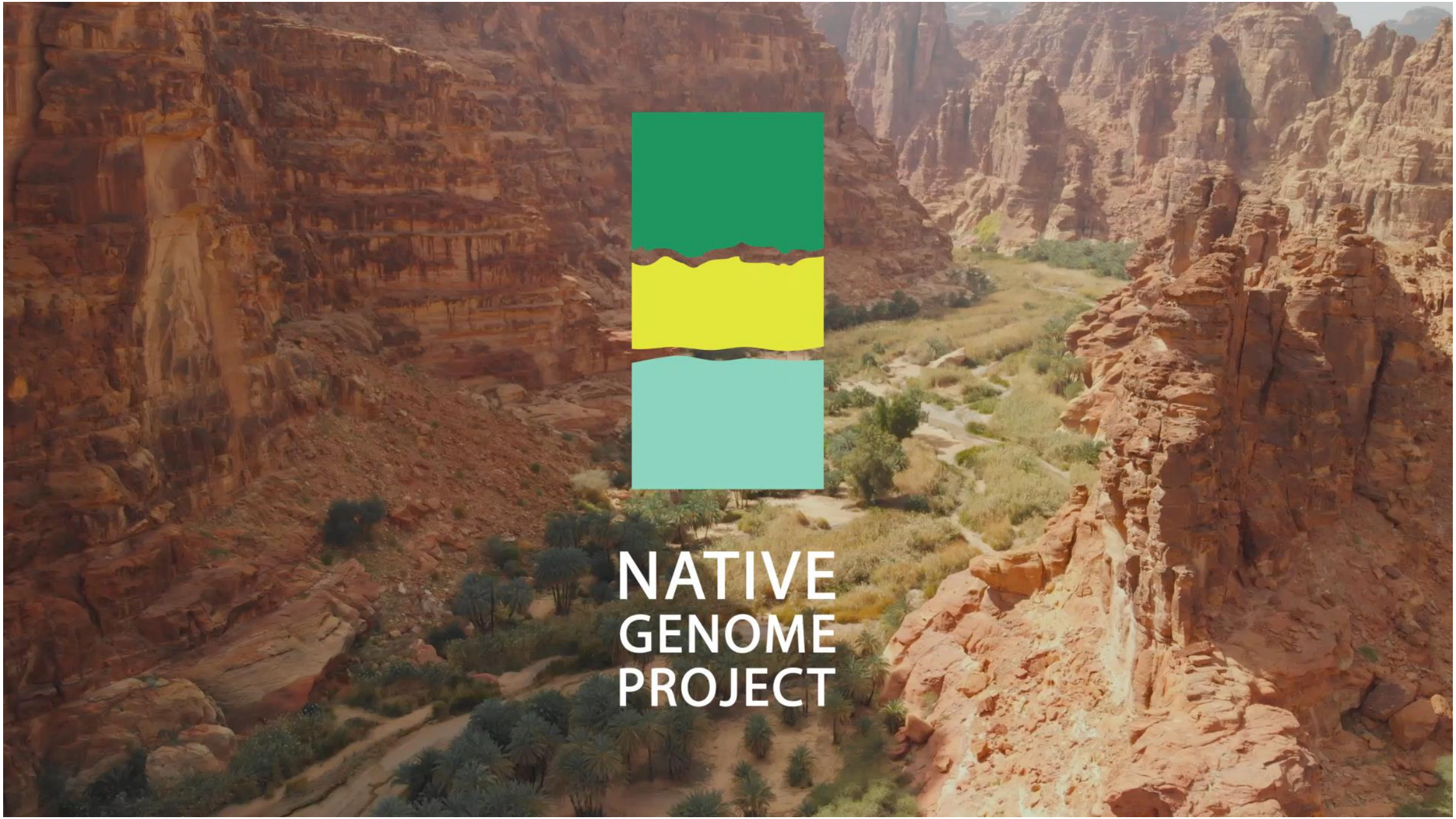
Harnessing the power of deserts to make plants resistant to drought, heat and flooding

Heribert Hirt

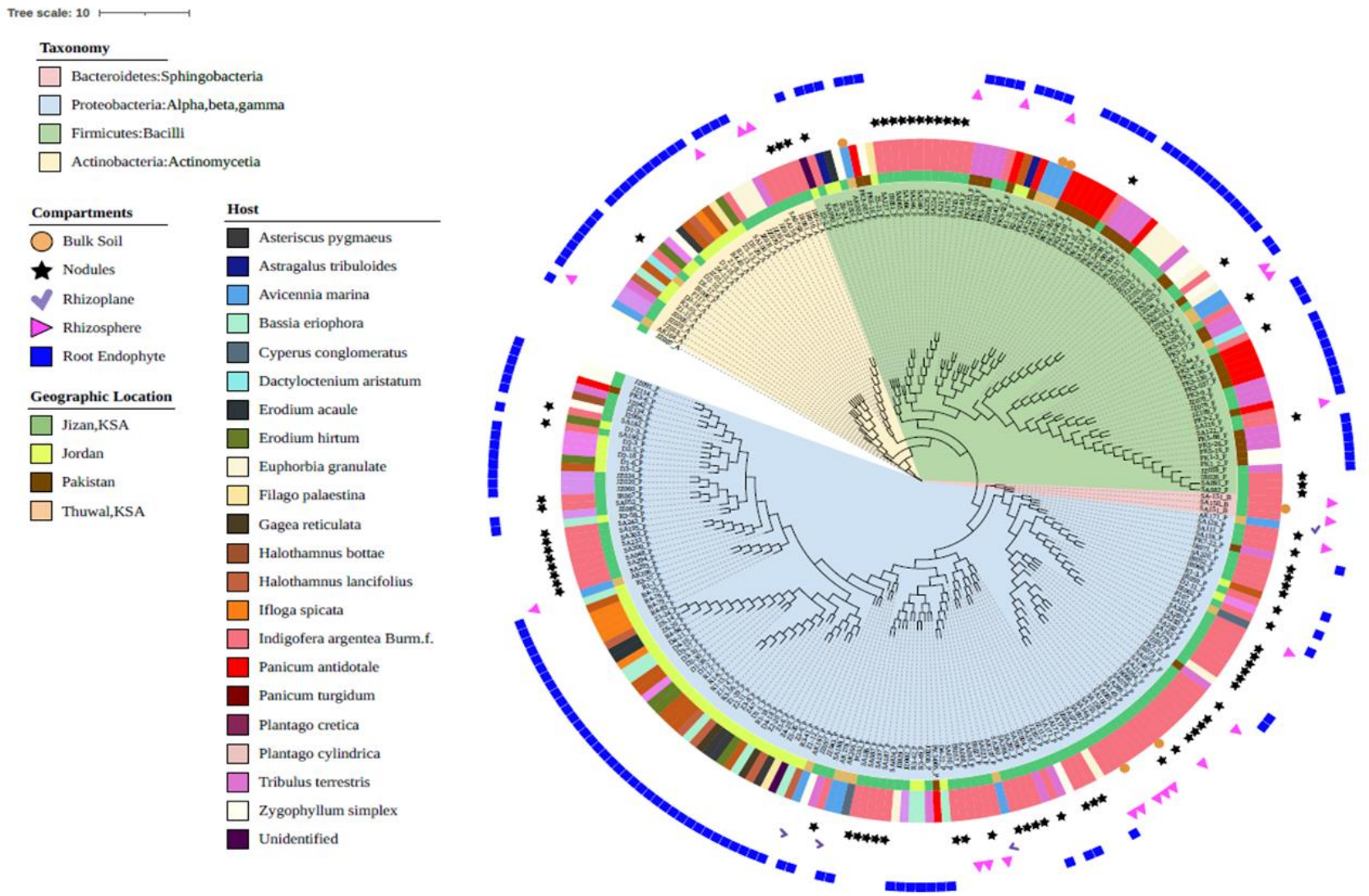
Desert Research Initiative

KAUST, Saudi Arabia



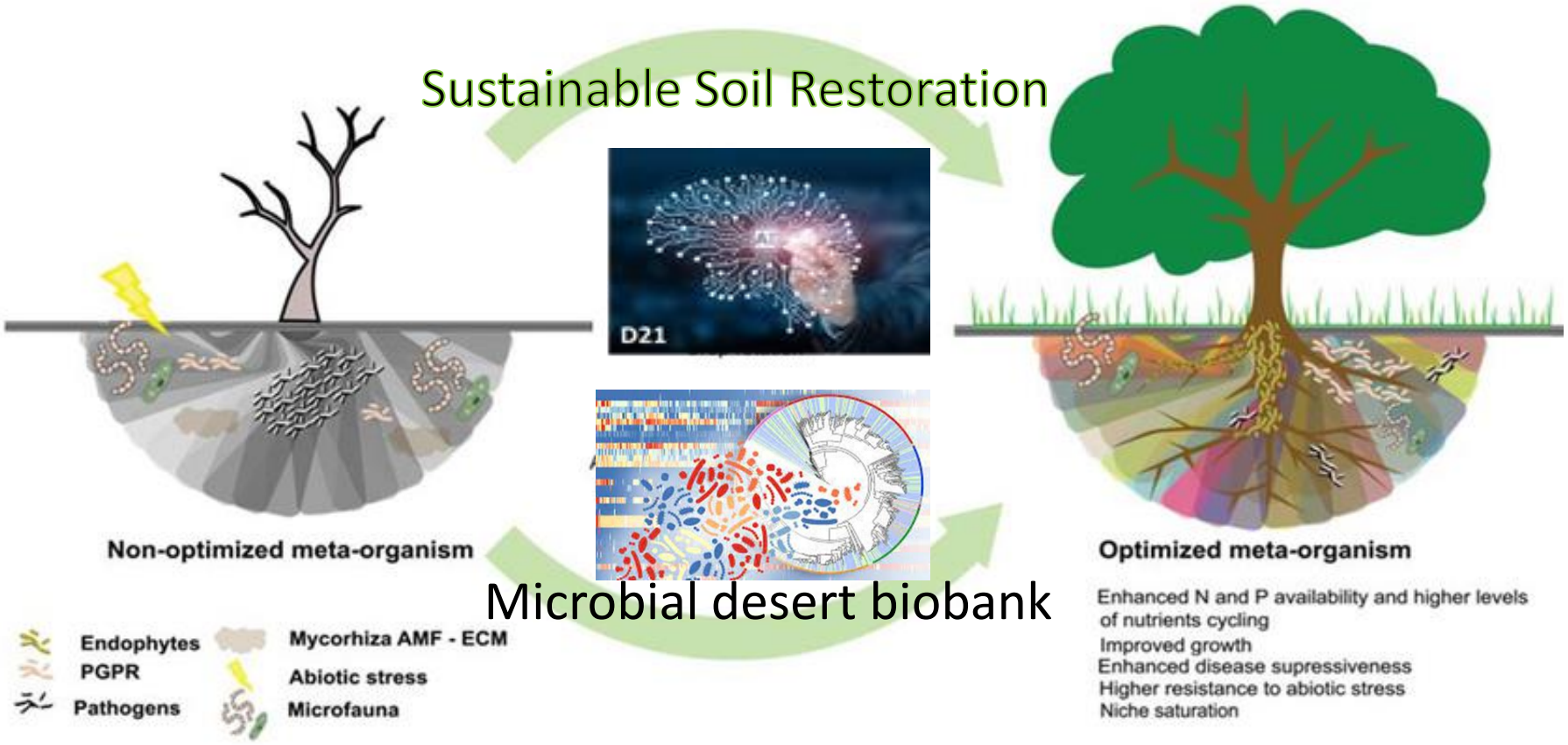

NATIVE
GENOME
PROJECT

Desert Microbial Biobank



Microbial biobank of > 10 000 culturable isolates from desert soils and plants

Sustainable Intervention Strategy Development

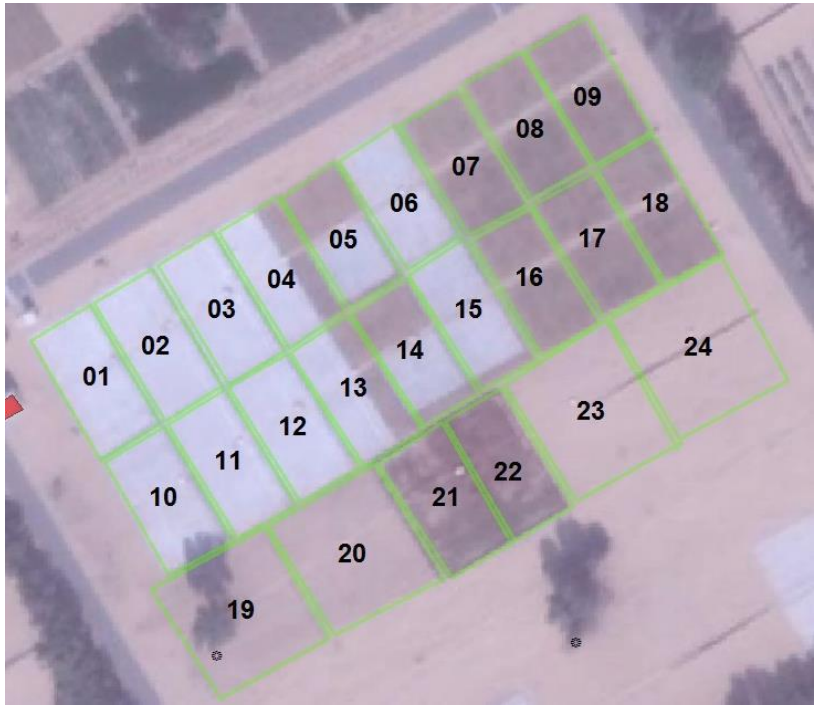


- **Host Genotype**
- **Environmental factors**
- **Quality/quantity**
- **Balance ratio of microbes**

Enterobacter sp. SA187 Enhances Heat Resilience of Crops

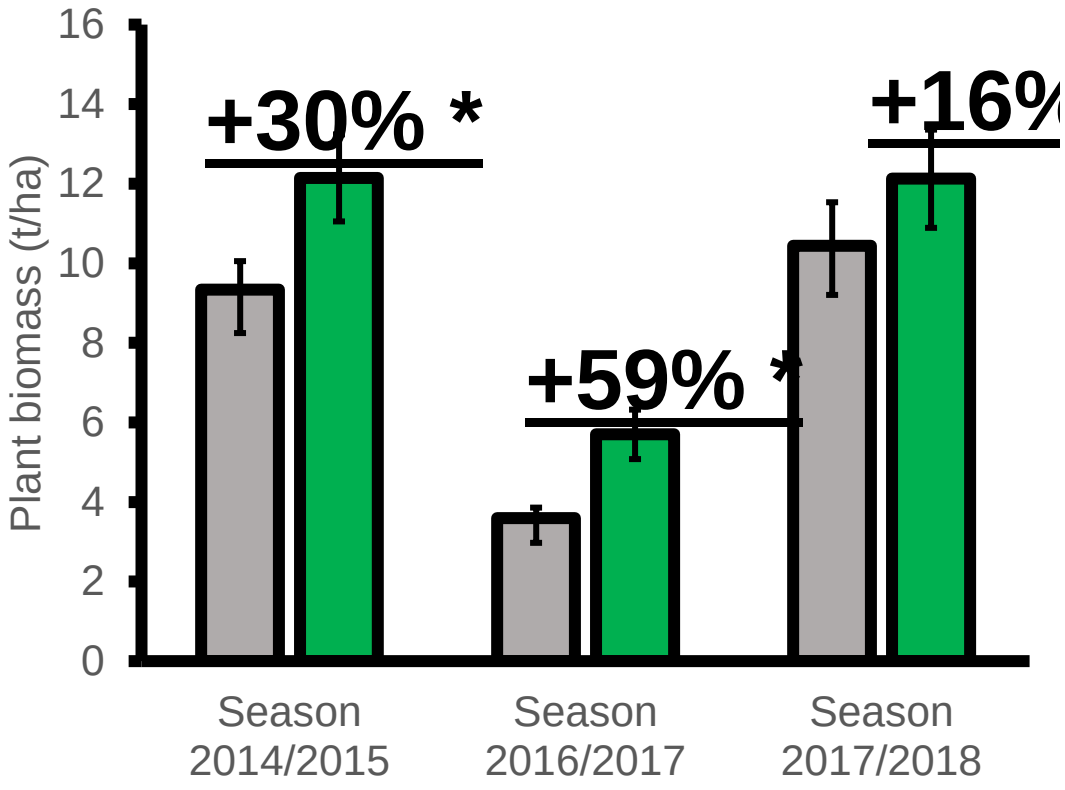
Microbiome treated Crops in Field Trials

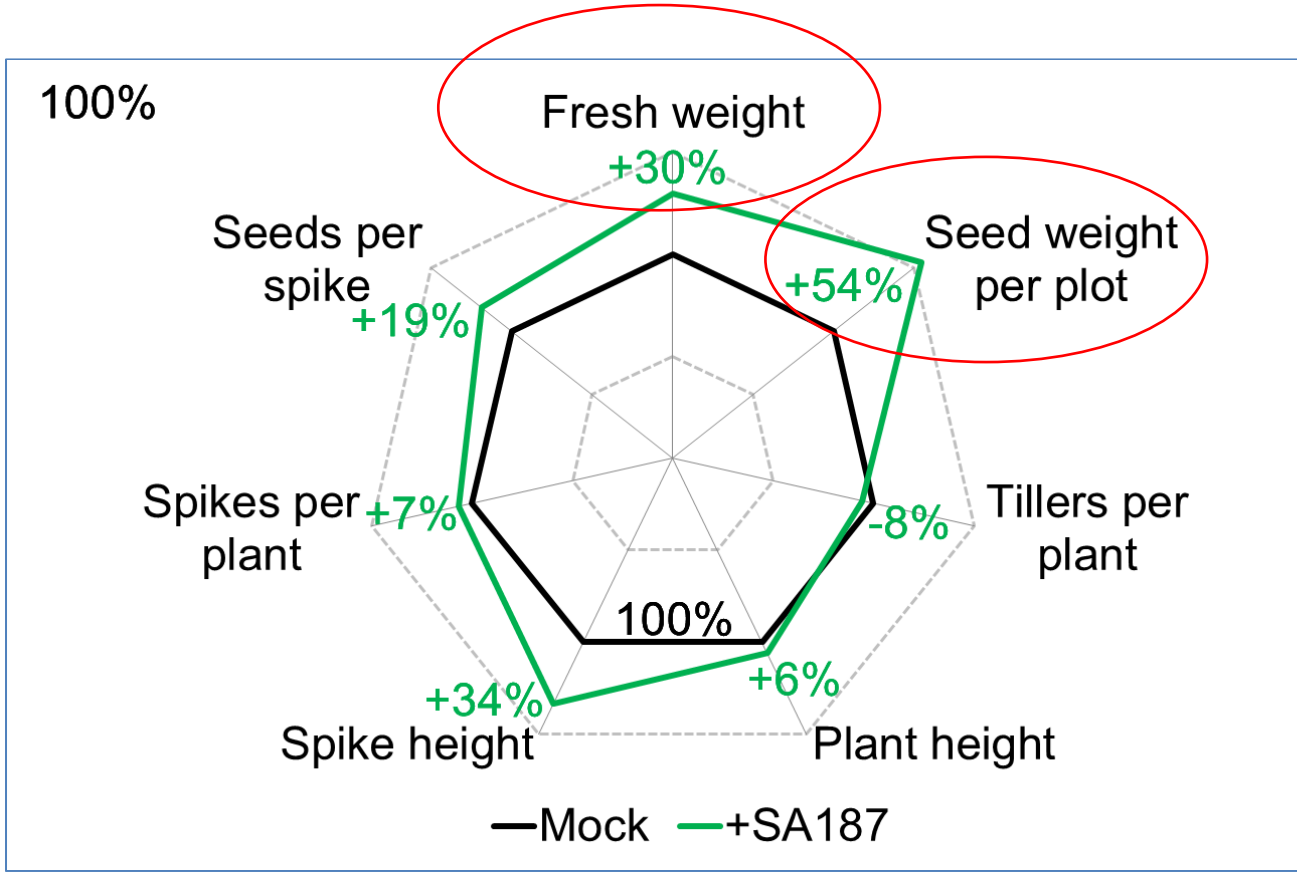
نزرع للغد
ICBA
AGRICULTURE FOR TOMORROW



Microbiome Field Trials: Wheat, Barley and Alfalfa

Enterobacter sp. SA187 Wheat Field Trials

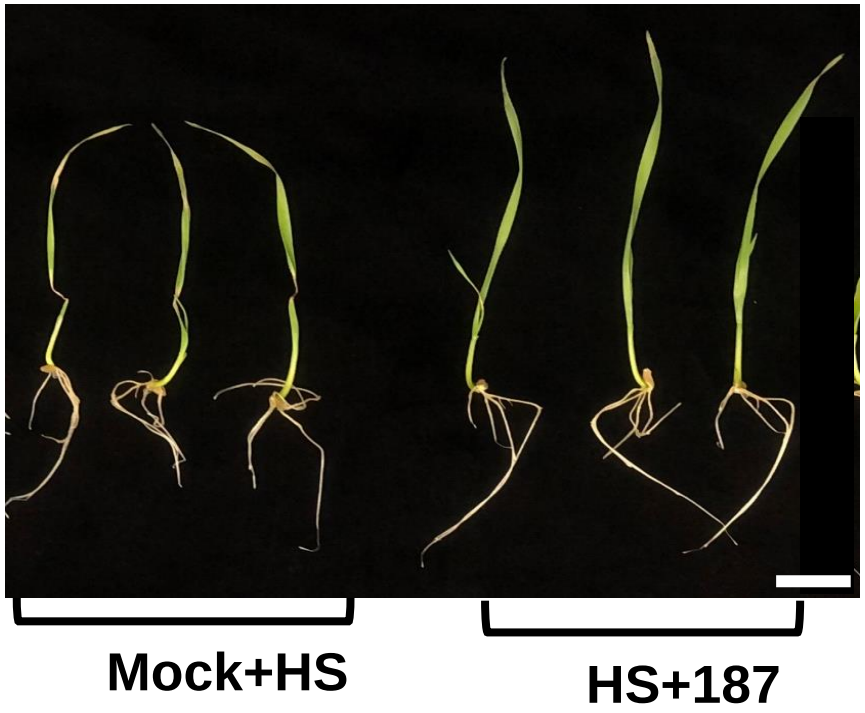


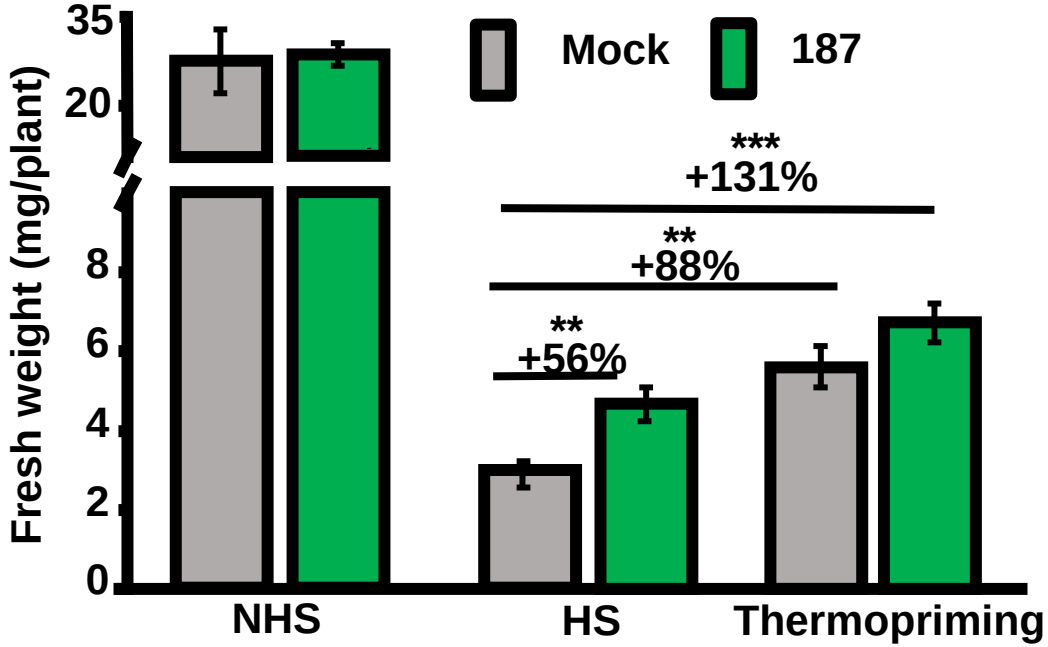


SA187 enhances wheat biomass and yield under conventional desert agriculture

Shekhawat et al., 2021

SA187 enhances heat tolerance of wheat

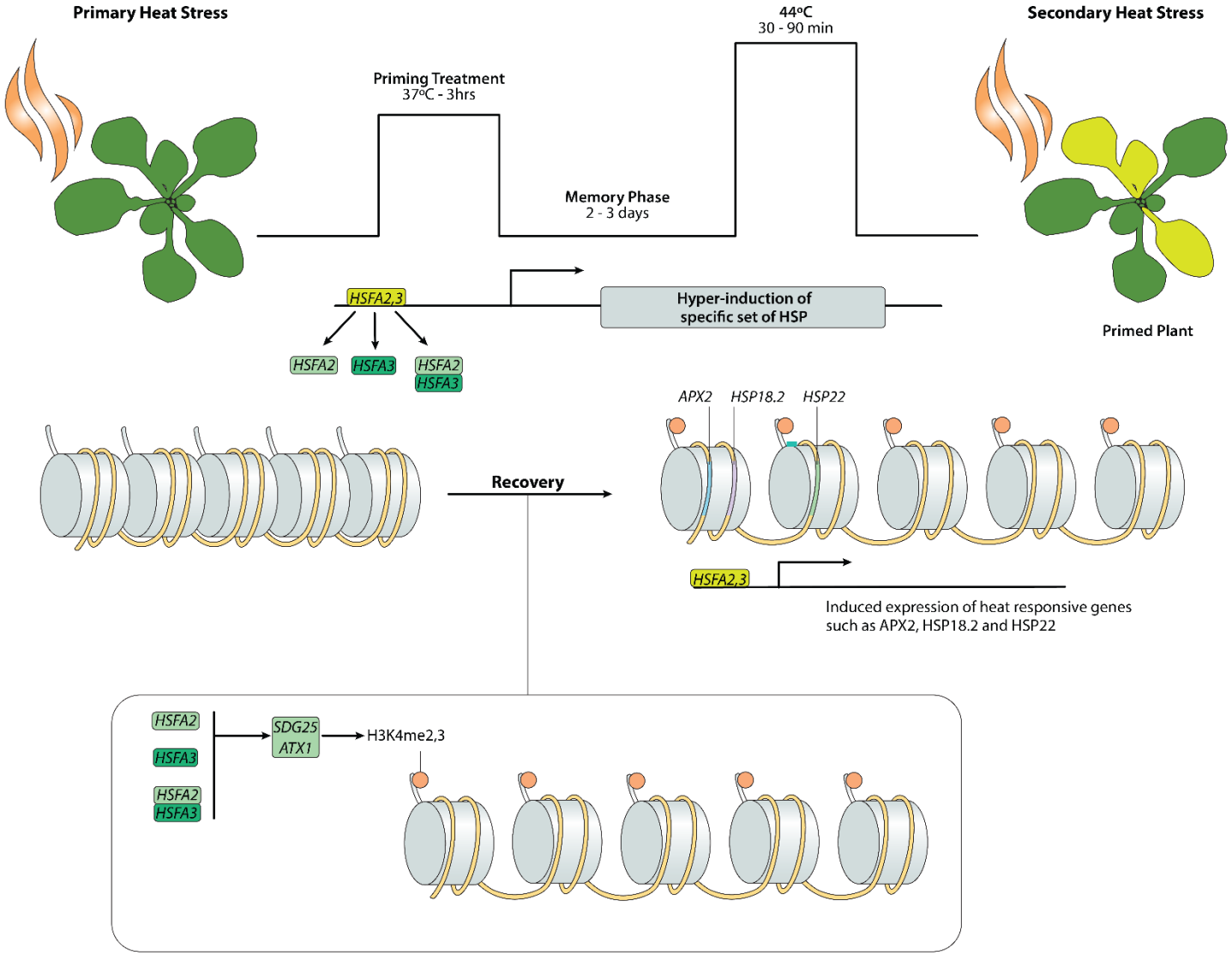




SA187 enhances heat tolerance of wheat in the laboratory to a similar extent as thermopriming

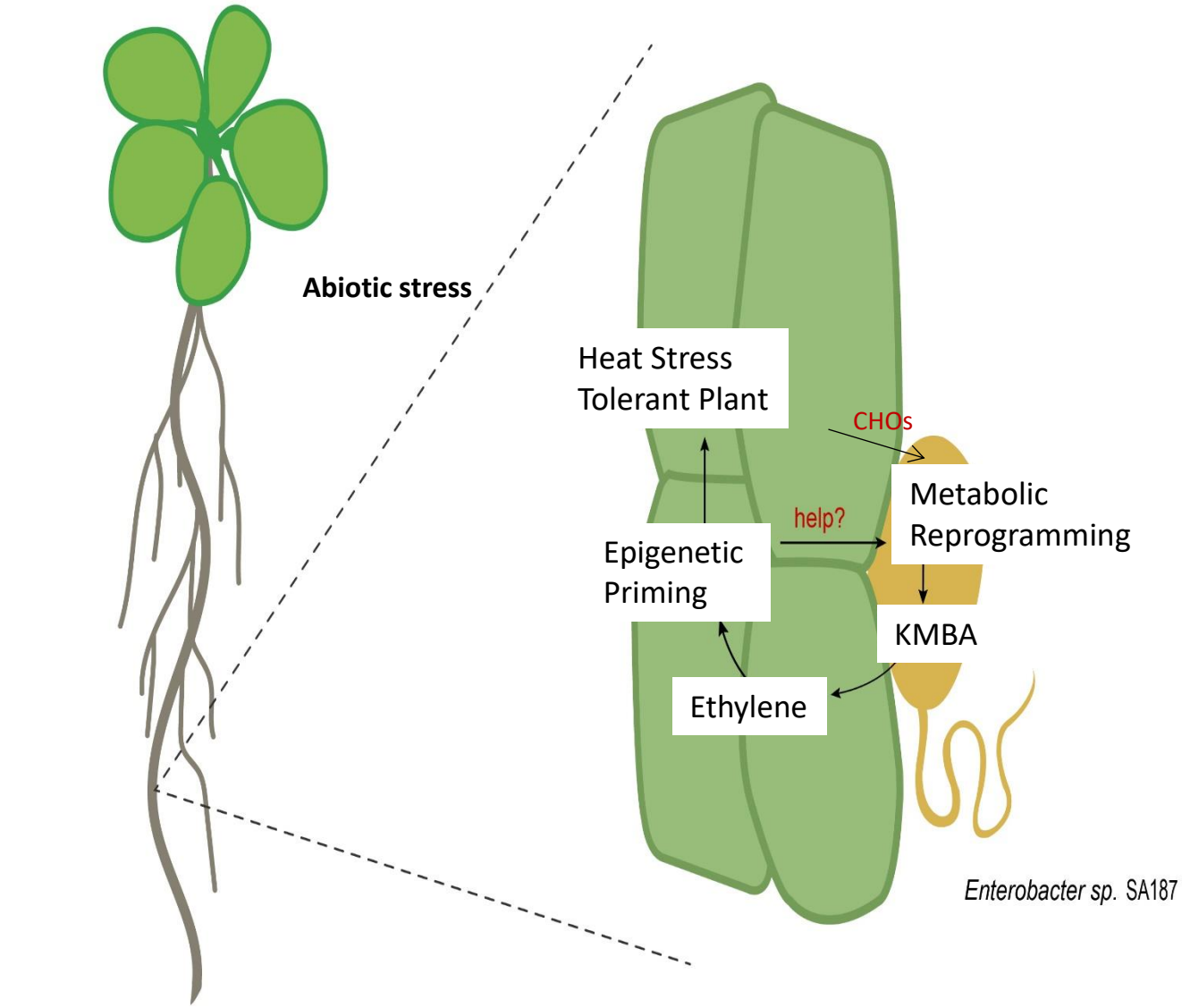
Shekhawat et al., 2021

Thermopriming and heat tolerance in Arabidopsis



Shekhawat et al., 2022

Mechanism of *Enterobacter* sp. SA187 induced Plant Heat Stress Tolerance

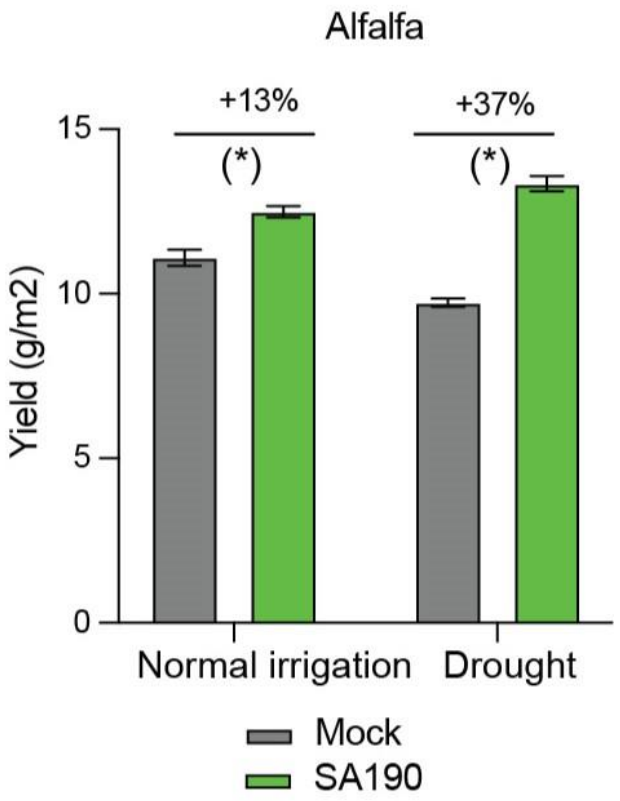


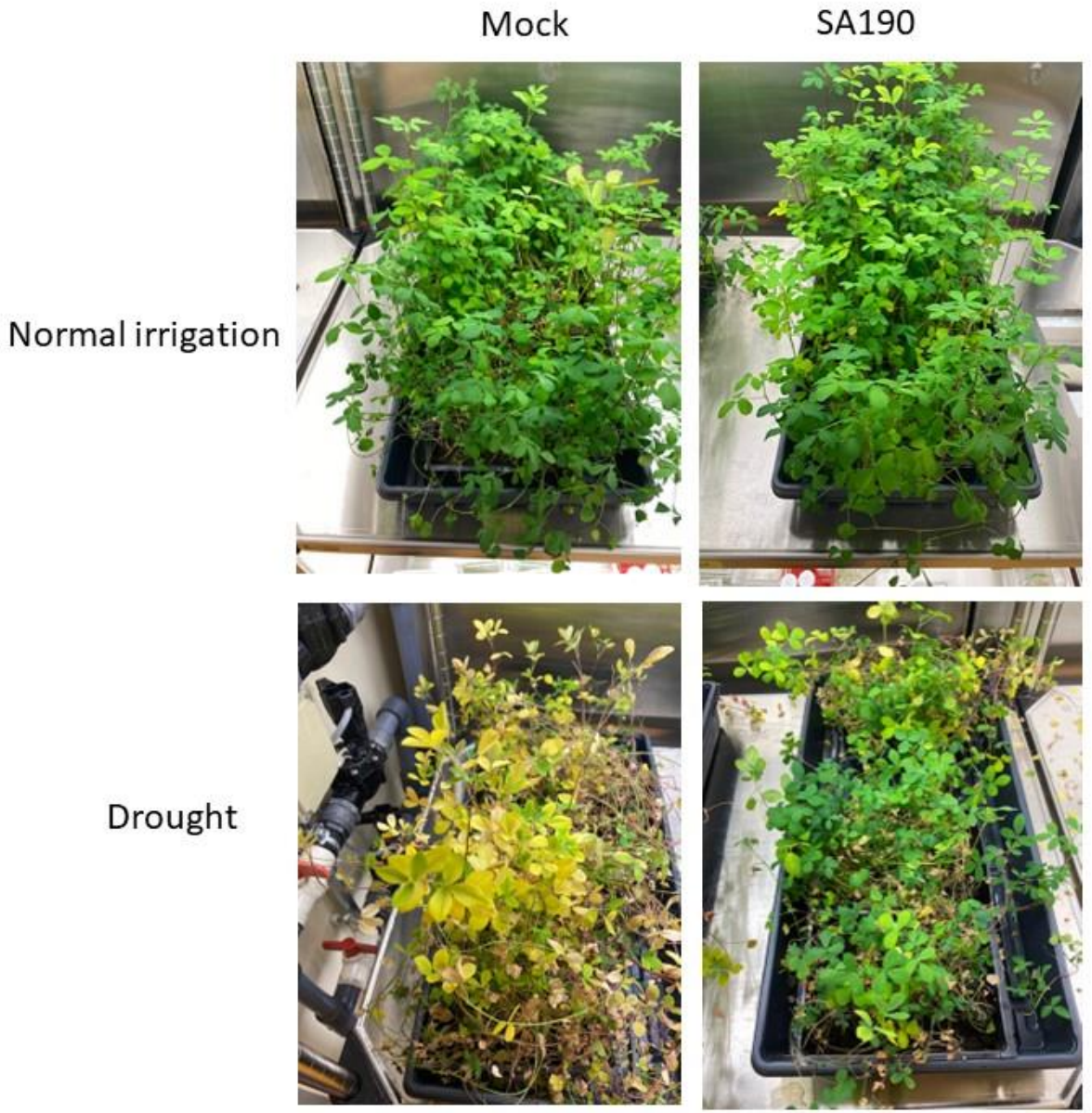
SA187-GFP root colonization

Andres-Barrao et al., 2017
De Zelicourt et al., 2018
Andres-Barrao et al., 2021
Synek et al., 2021
Shekhawat et al., 2022

Pseudomonas argentinensis SA190 Enhances Drought Resilience and Water Use Efficiency of Crops

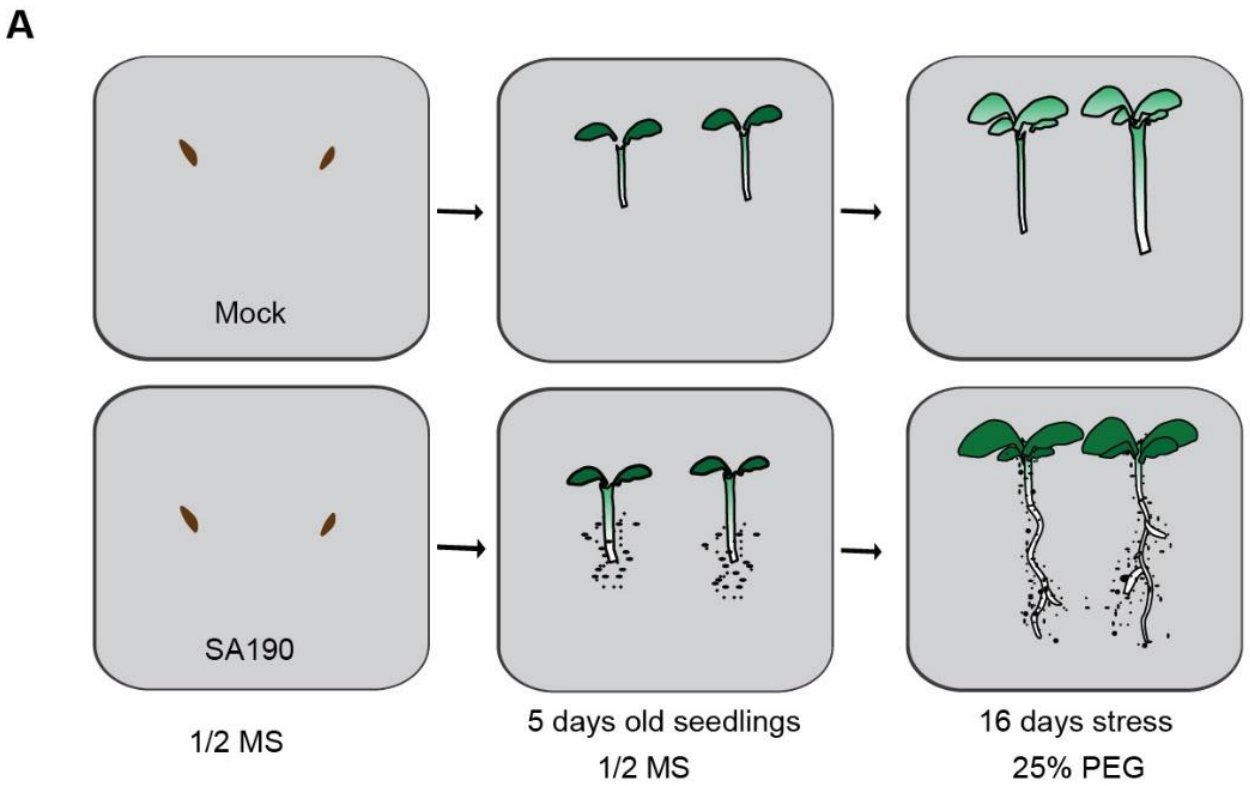
SA190 induces drought tolerance in *Medicago sativa*

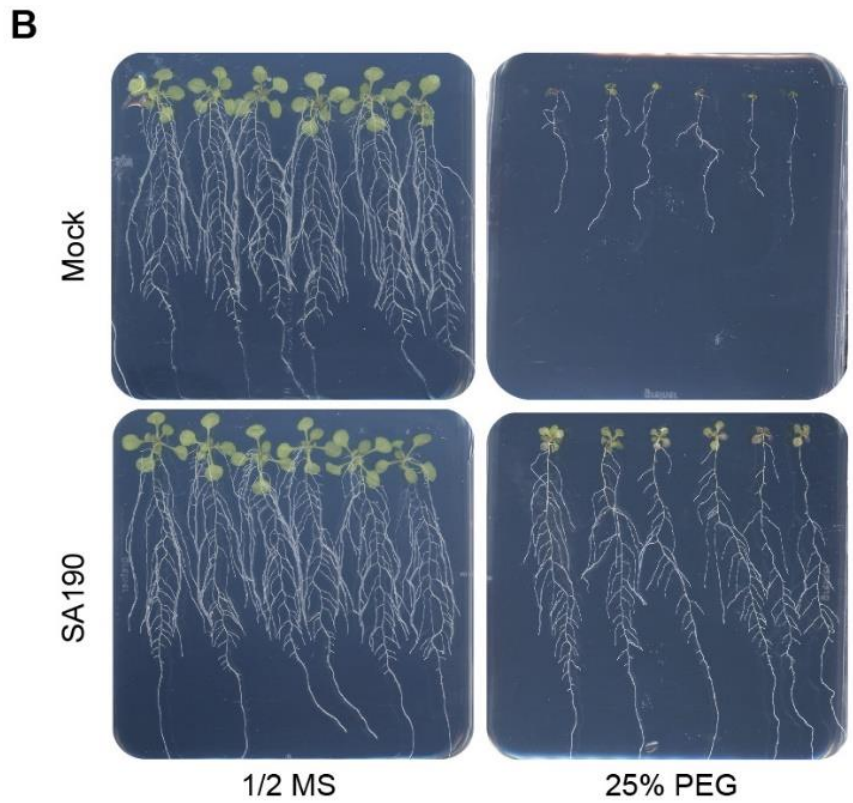




Alwutayd et al., 2023

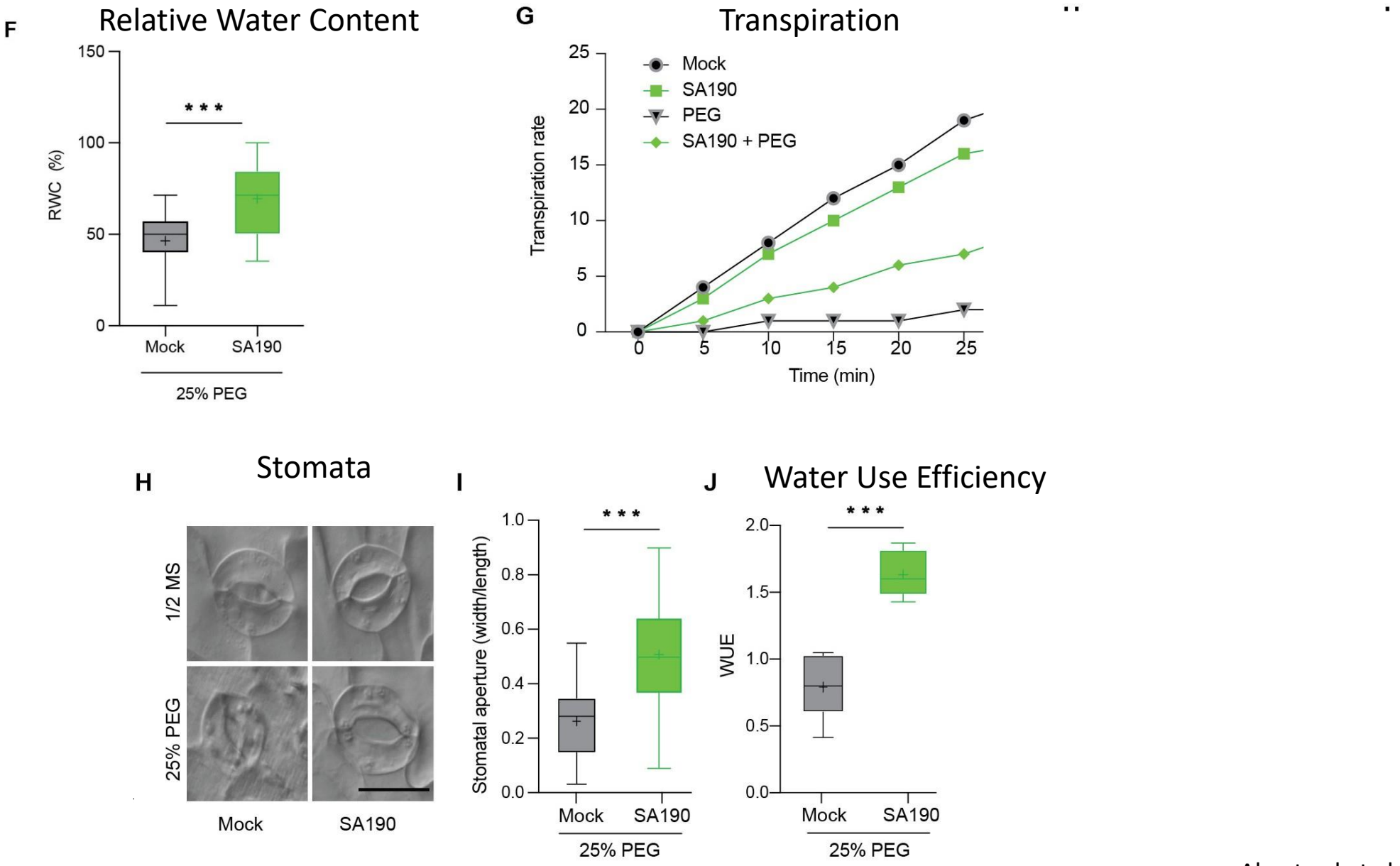
SA190 induces drought tolerance in Arabidopsis





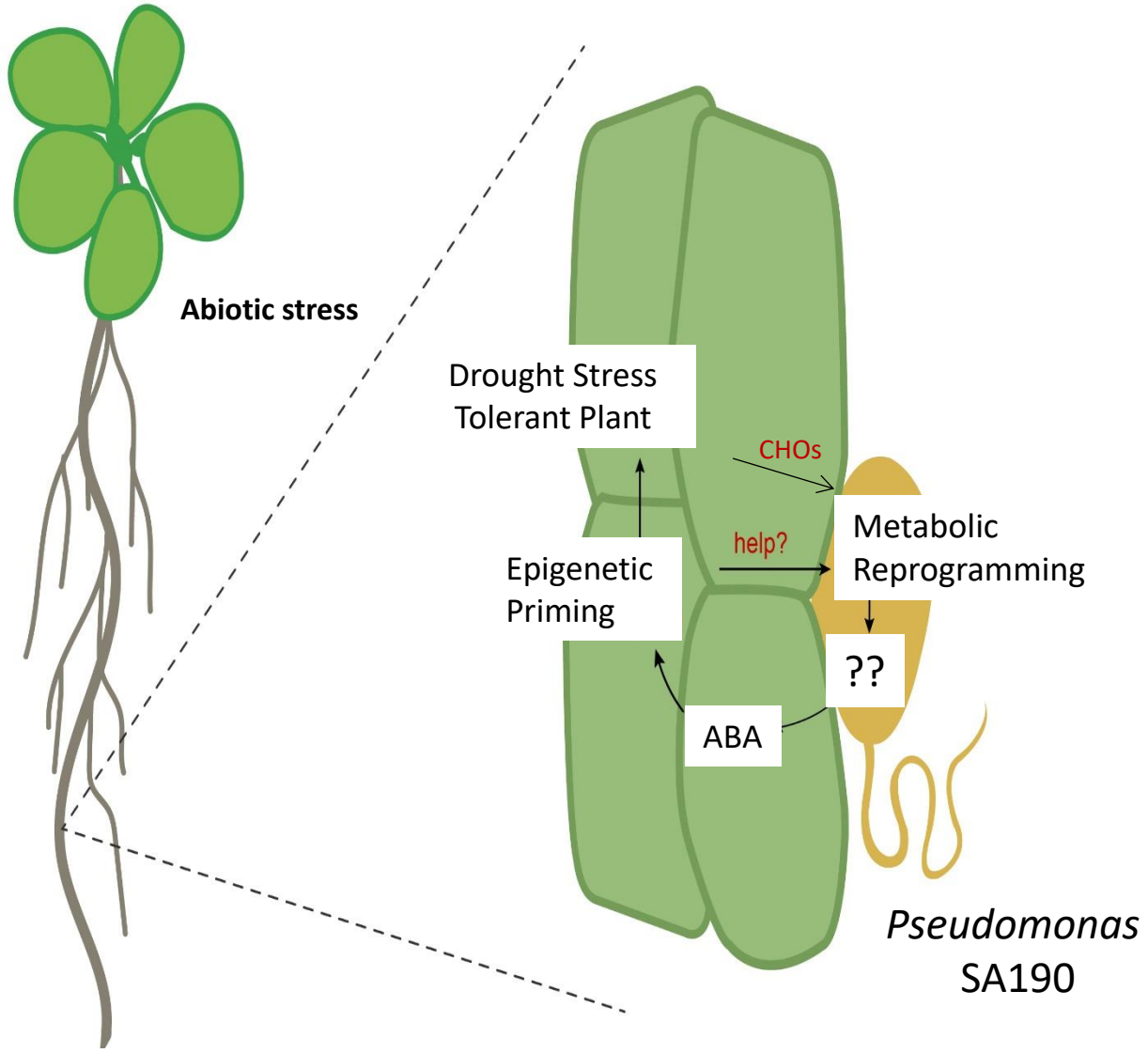
Alwutayd et al., 2023

SA190 enhances Arabidopsis water use efficiency under drought conditions



Alwutayd et al., 2023

Mechanism of *P. argentinesis* SA190 induced Plant Drought Resilience

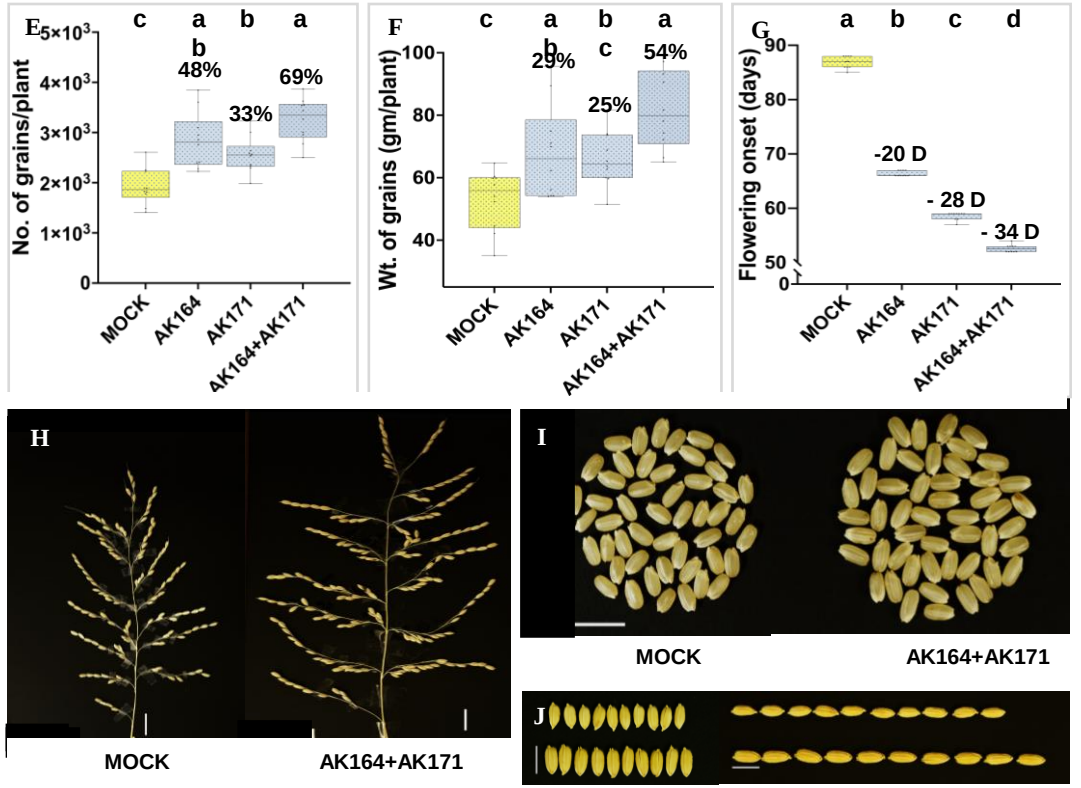


Arabidopsis inoculated with SA190

Alwutayd et al., 2023

Mangrove bacteria enhance flooding and salt stress resilience to crops

Mangrove Microbiome Project

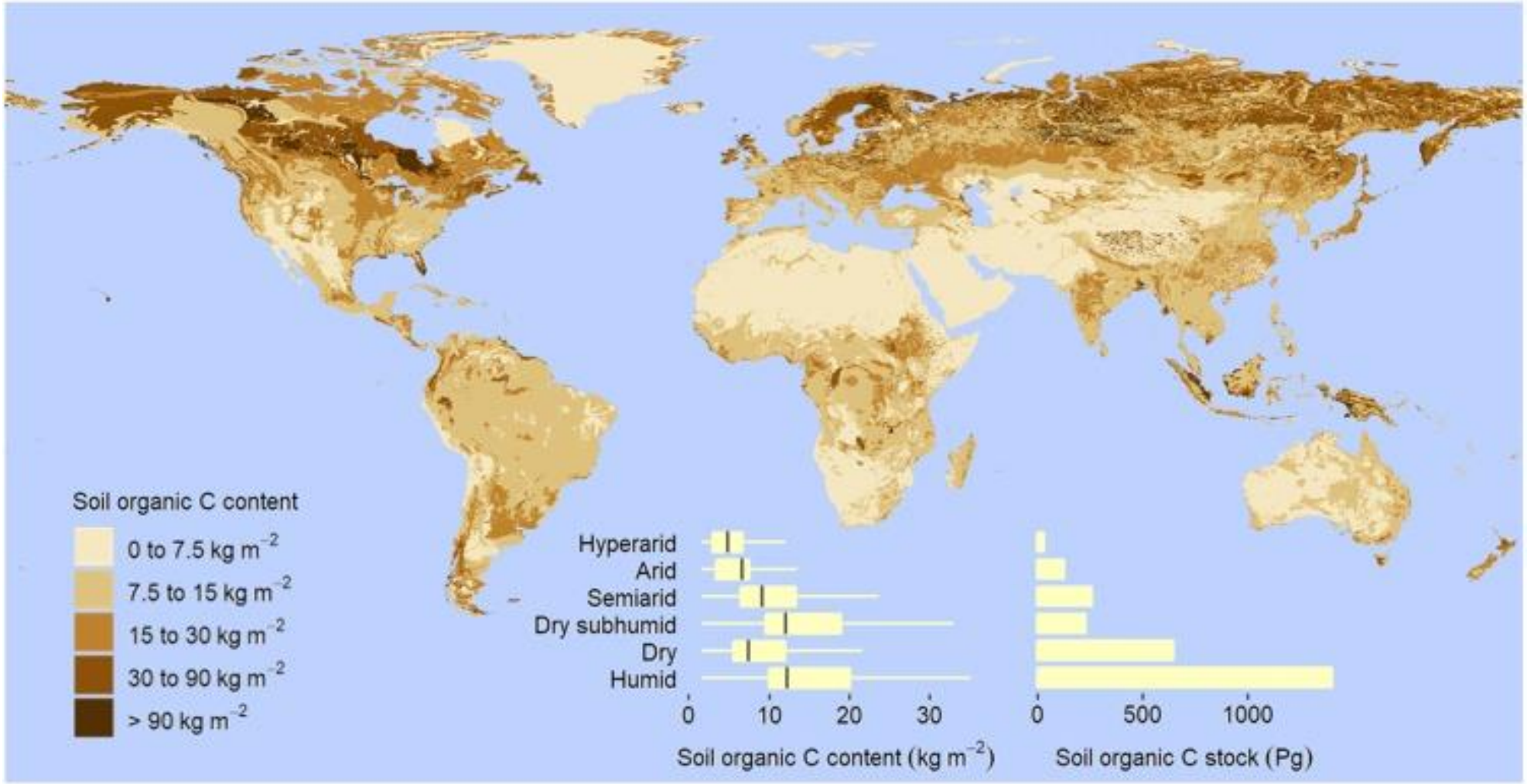


Enhanced productivity and shortening of life cycle of O. sativa cv. Nipponbare by AK164 and AK171

Alghamdi et al., under review

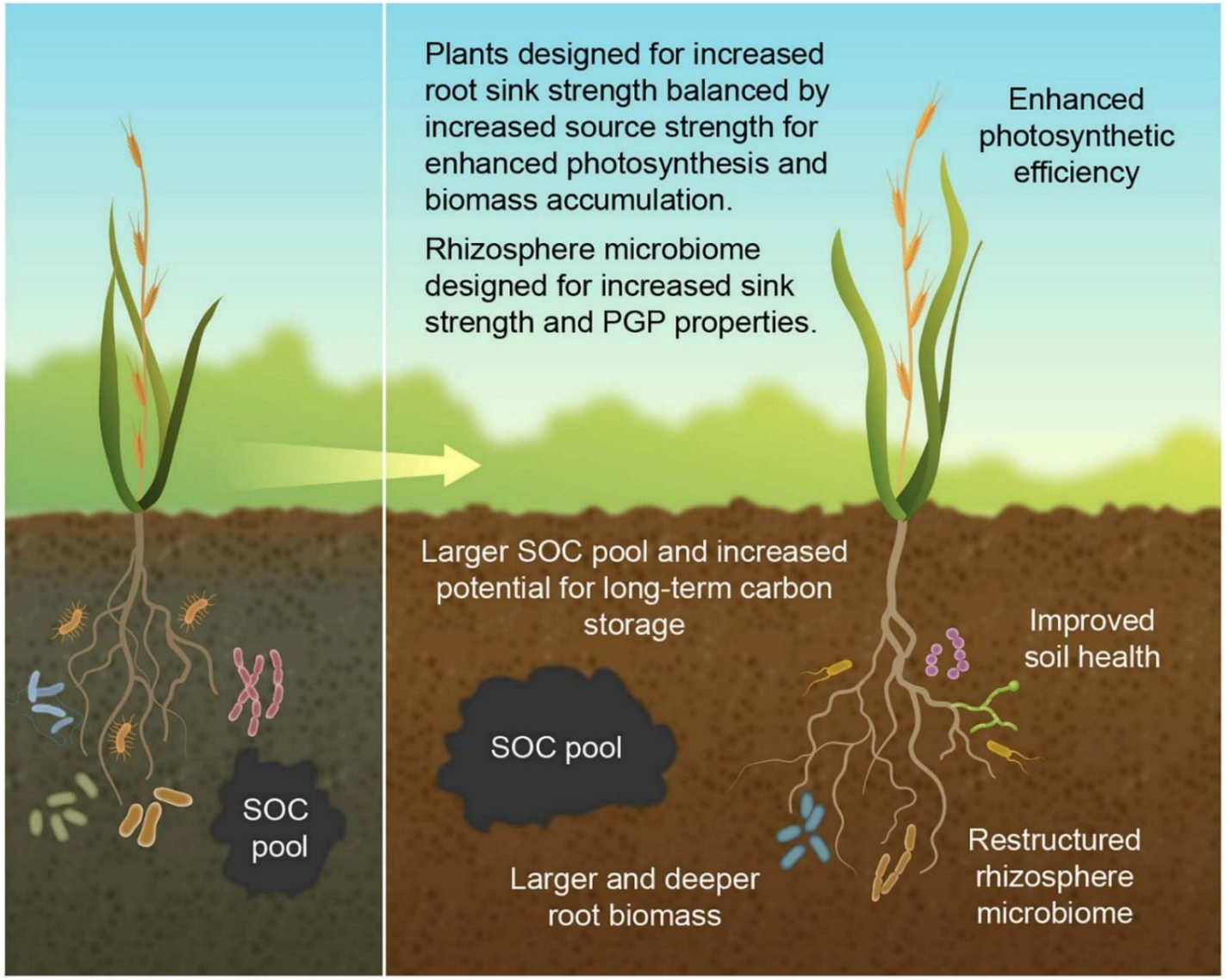
Increase soil carbon sequestration on arid lands

Soil Organic Carbon Contents by Country

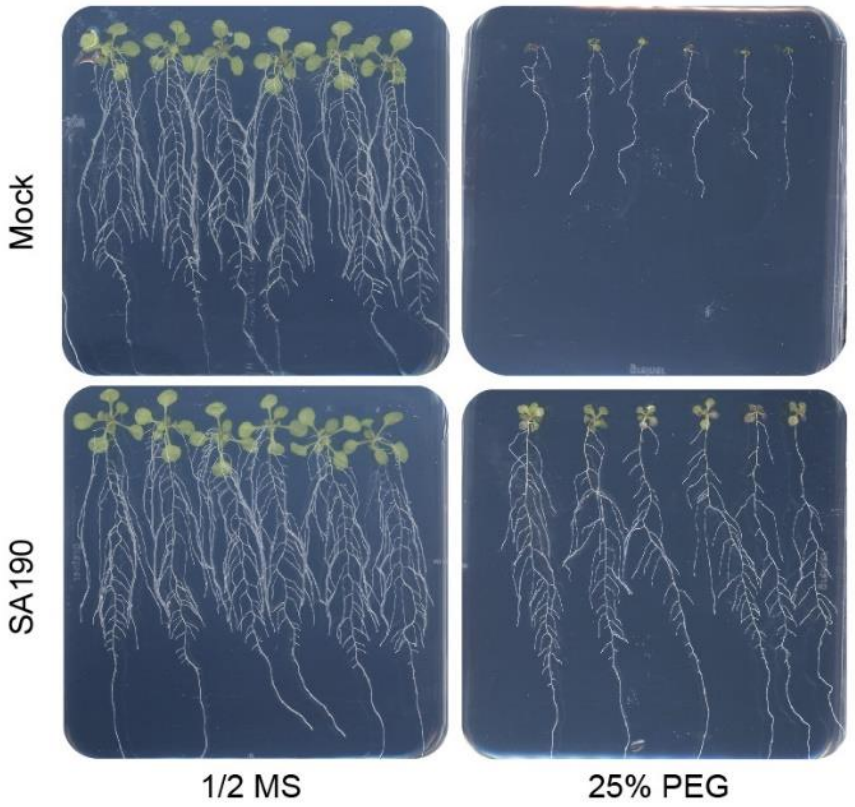


Plaza et al., 2018

Designing Soil-Plant-Microbe Ecosystems for Carbon Capture



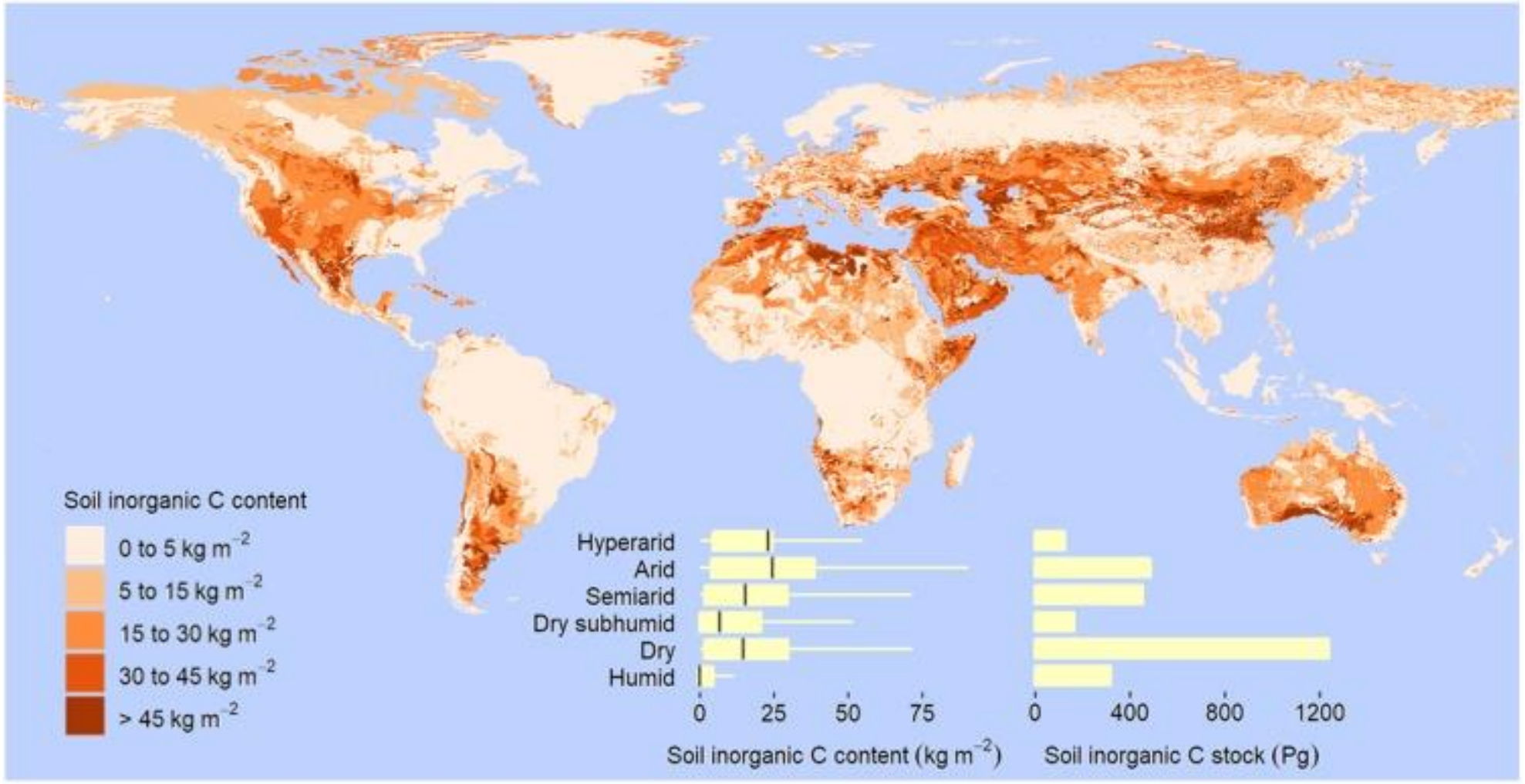
Current crops **Future crops**



SA190 induces massive root growth under water limiting conditions

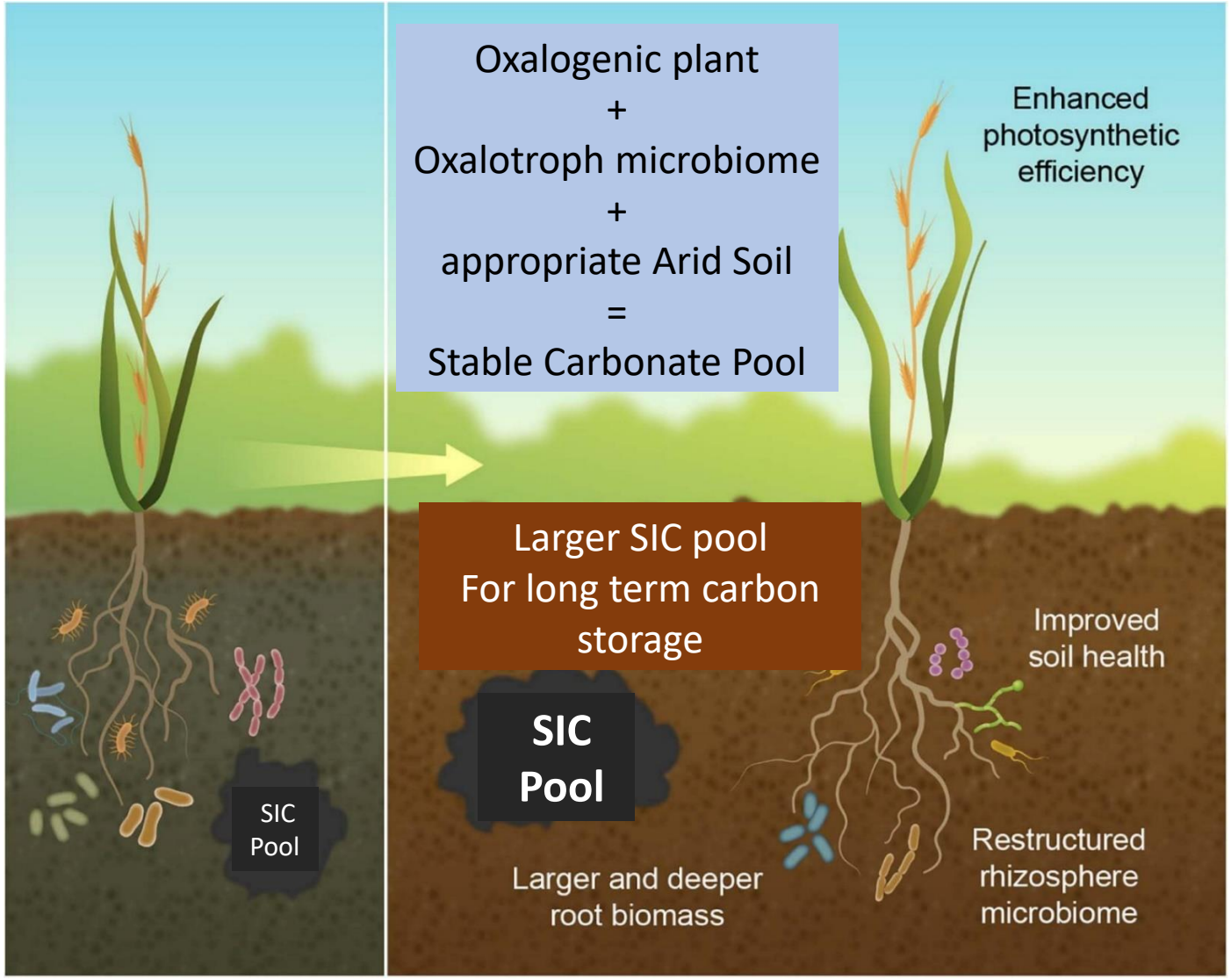
Jansson et al., 2021

Soil Inorganic Carbon Contents by Country



Plaza et al., 2018

Designing Soil-Plant-Microbe Ecosystems for Carbon Capture on Arid Lands



4-8 % of total annual emitted CO2 could be captured globally oxalogenic Engineering

Hirt et al. 2023

Agriculture and climate change : Challenges and opportunities

PlantACT! Initiative

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