

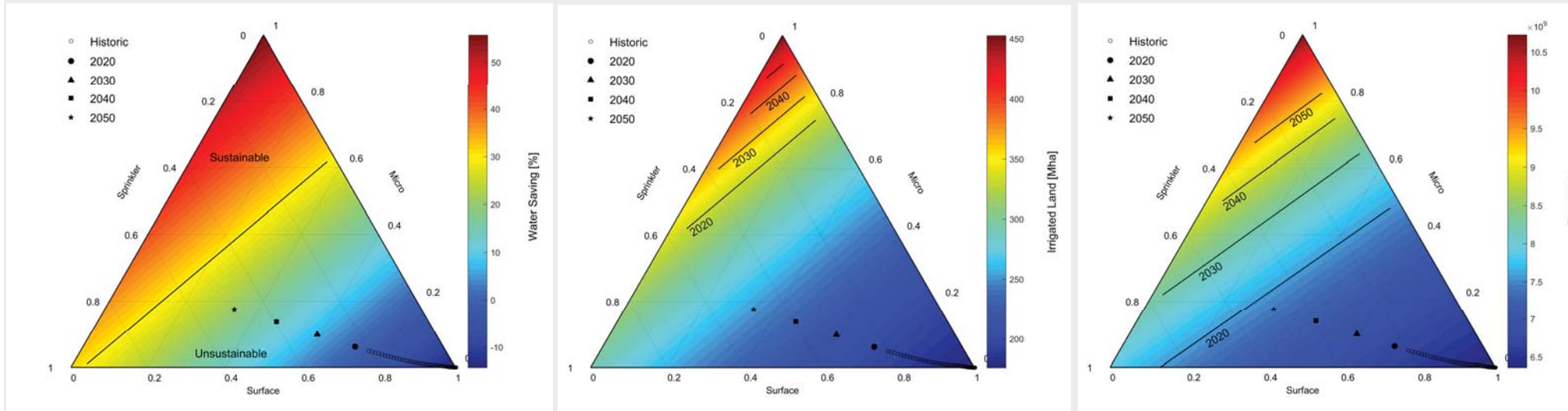
# SUSTAINABLE AGRICULTURE SCENARIO EXPLORATION

What are the limits of our technology, where have we been and where are we going?

## SUSTAINABILITY HORIZON

The year in which sustainability would be reached at the pace of current technological adaptation assuming a evolution of exogenous factors: climate change, alternative food development, or transformative agricultural innovation.

Combined view of resource needs and constraints in the food-energy-water nexus



### WATER

- Irrigation accounts for more than 85% of the world's water consumption
- Irrigation can be used to mitigate climate change impacts on food supply. Water cost is additional 40-100%
- Approximately 30% of irrigation water is drawn from unsustainable sources, globally
- Basin level water management has a different set of constraints than farm level water management.
- Additional water resource development (re-use, desal., etc.) come at a high energy cost.

### LAND

Agriculture occupies more than 40% of the earth's terrestrial area.

Irrigated agriculture is 2.7x more productive than rainfed lands on average.

IPCC report attributes 19% of agriculture's GHG footprint to land expansion

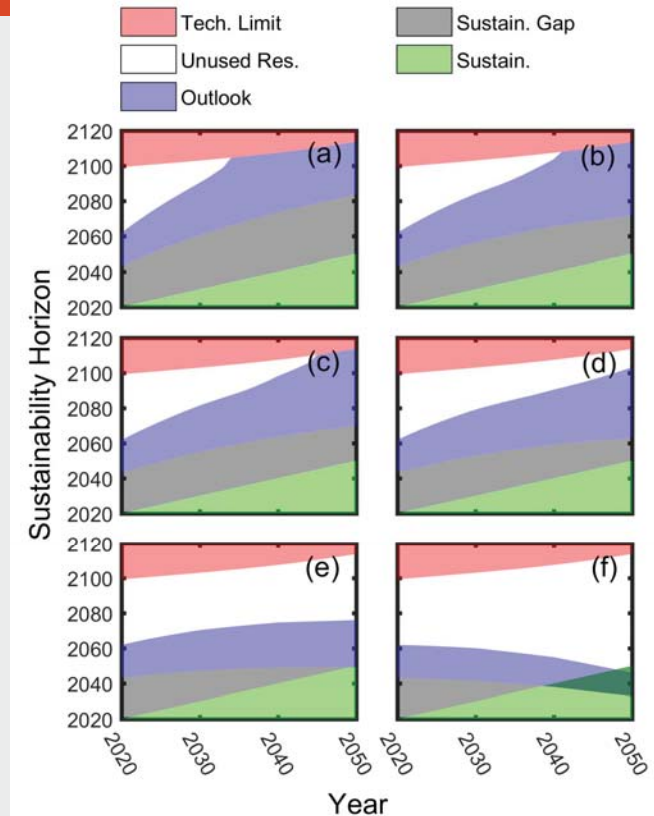
### POPULATION

Agriculture provides the vast majority of food for the world's population

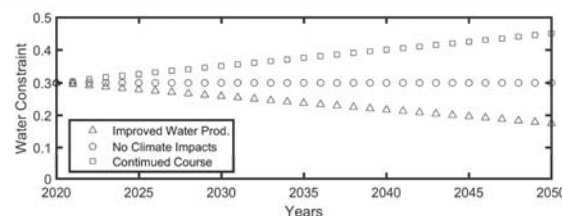
9 Bn people will require 13.5 Bn metric tons of food by 2050

10% of people are expected to experience undernourishment

In short: agriculture will likely require additional water to mitigate risks associated with climate changes and meet demands associated with rising populations, but will also likely face challenges with the water supply. This study looks at the potential of technological development to avoid this impasse.



	Name
(a)	Current Course
(b)	No Climate Risk
(c)	Alternative Foods
(d)	Major Greenhouse Production
(e)	Agrivoltaic
(f)	Agrivoltaic + Alternative Foods



Parameter	Value Range [-]	Reference
$E_M$	0.80 - 0.90	11
$E_{Sp}$	0.50 - 0.60	11
$E_{Su}$	0.30 - 0.35	11
$C_M$	1.2 - 1.9	12
$C_{Sp}$	1.12 - 1.40	13
$C_{Su}$	2.37 - 2.57	14,15

