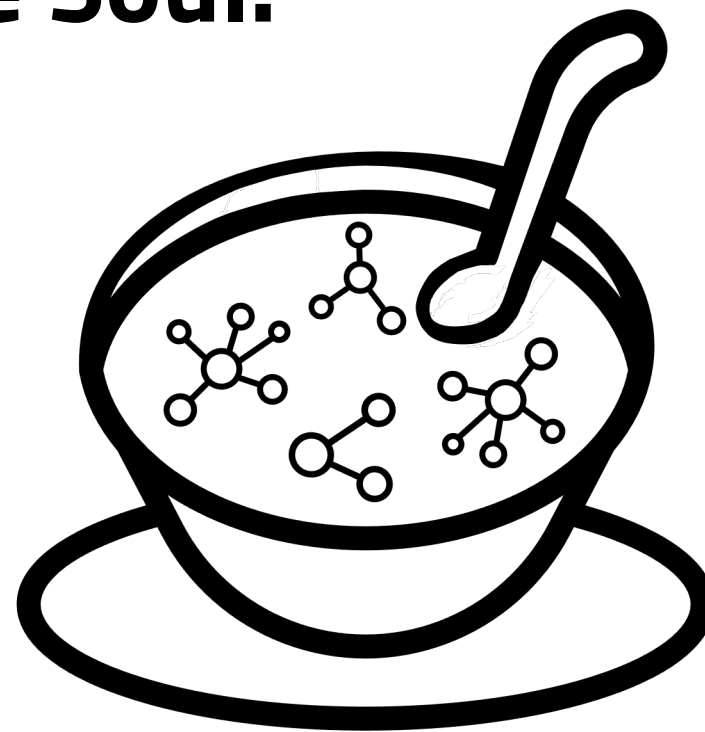


Primordial Soup for the Soul: CO₂ to protein

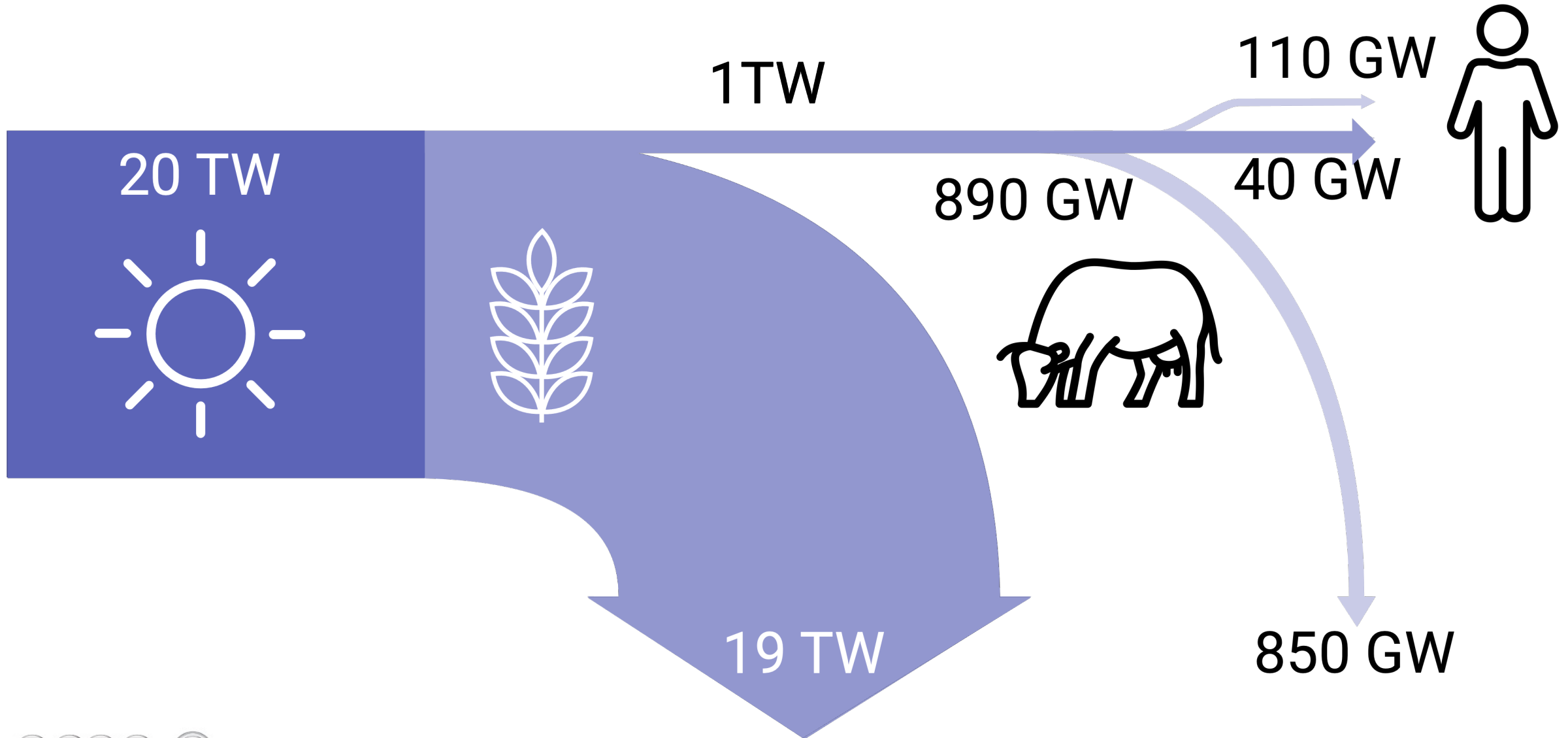
Katharine Greco
ARPA-E Fellow



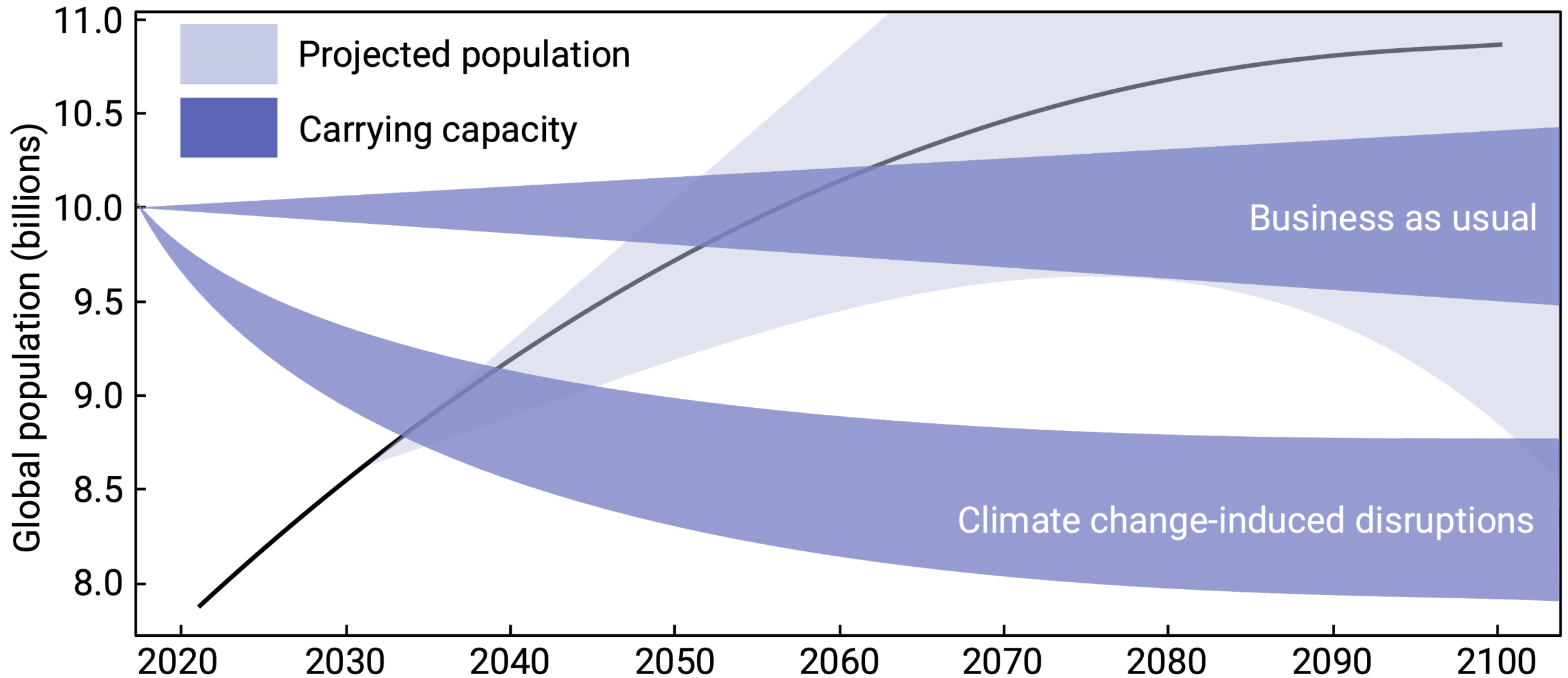
How do you know someone is vegan? They'll tell you.



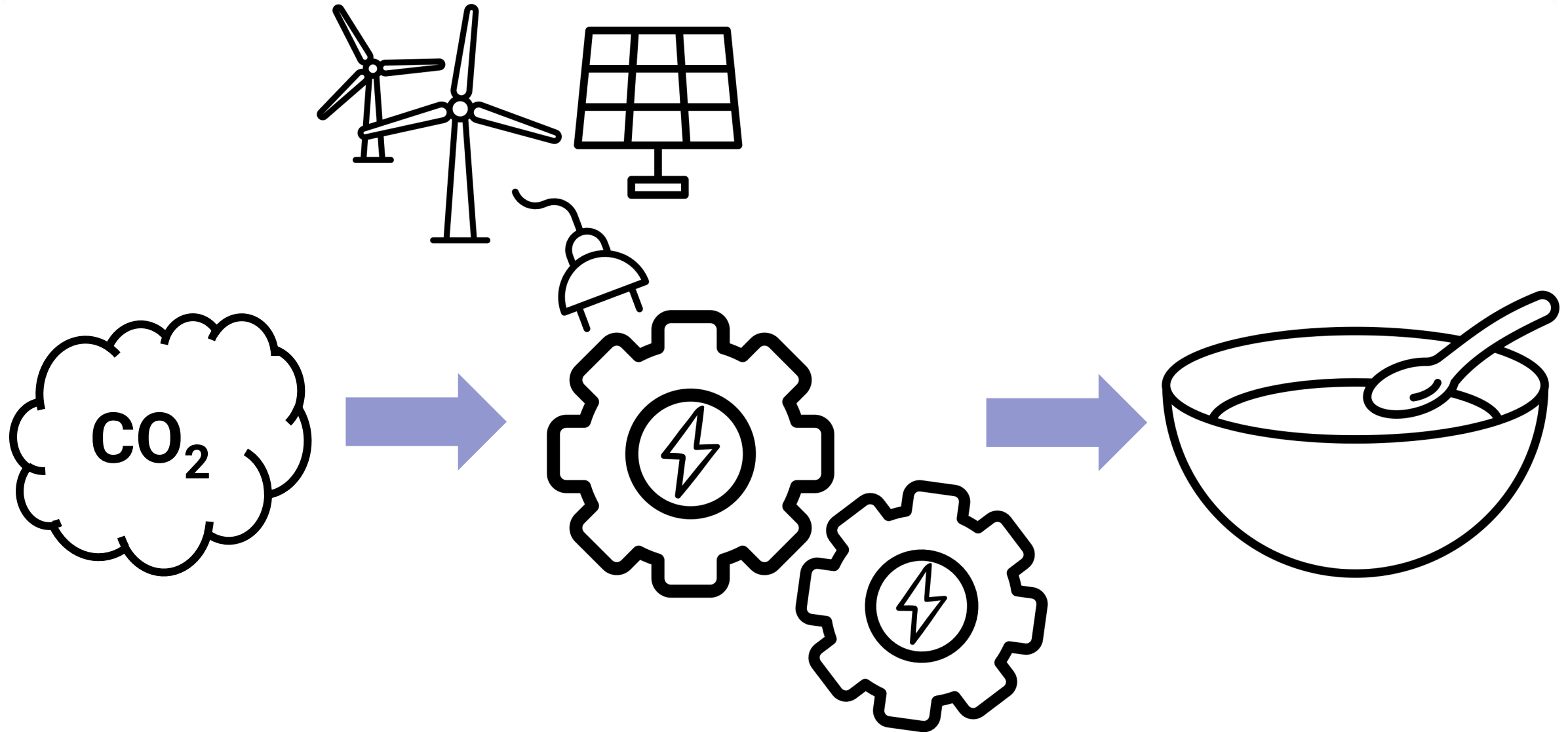
Our current agricultural system wastes massive amounts of energy



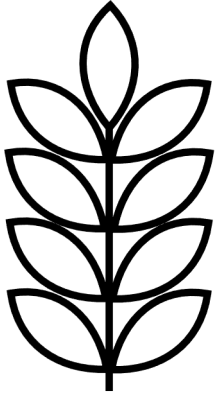
Global population is outgrowing conventional food production



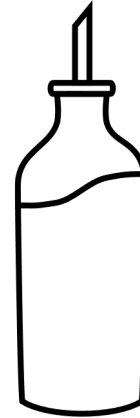
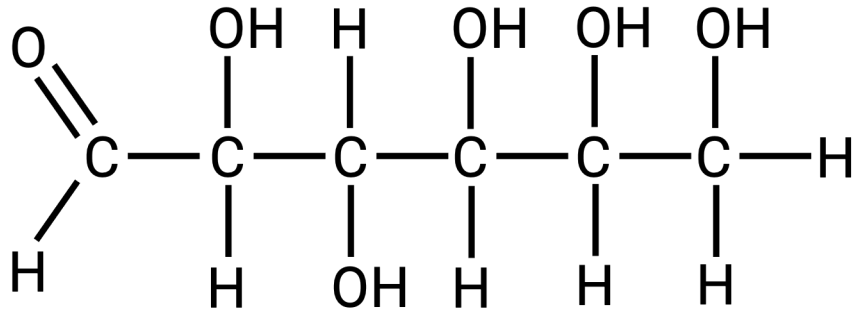
Reimagining food production for greater efficiency and security



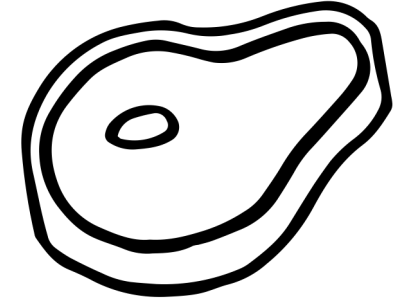
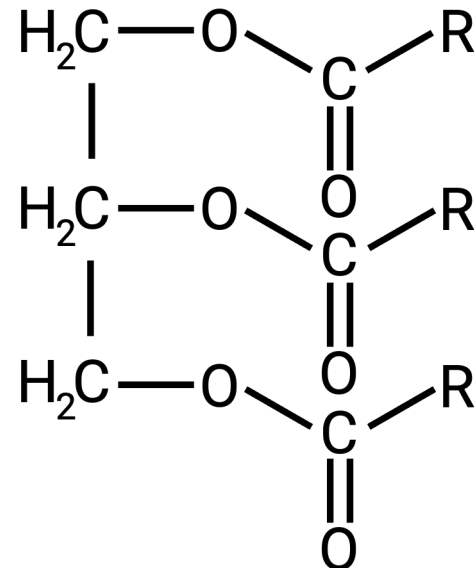
Food can be broken down into three broad categories



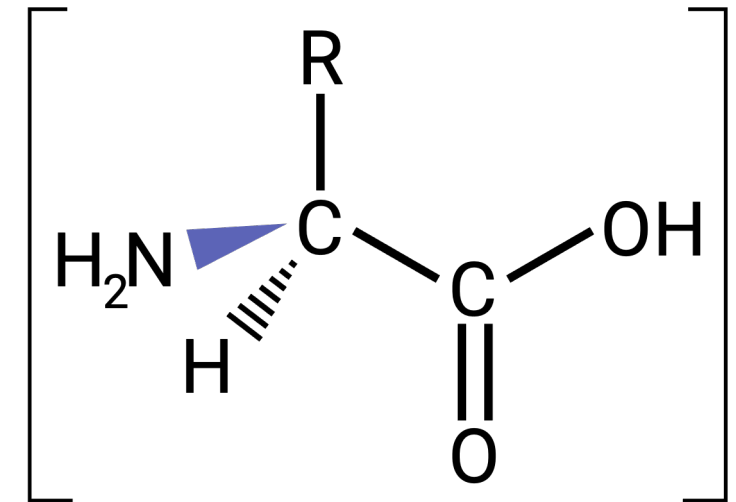
Carbohydrates
(sugars)



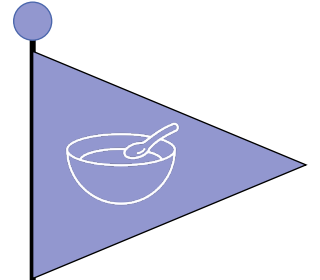
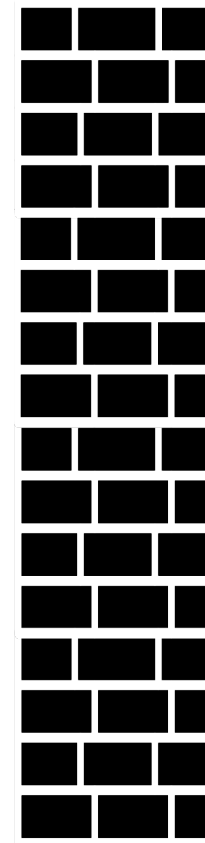
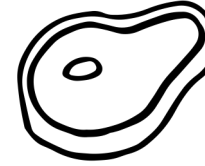
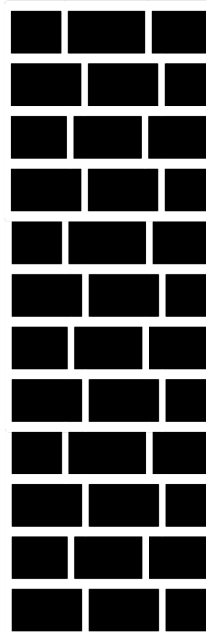
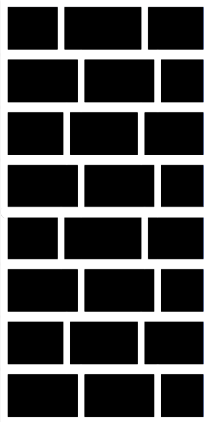
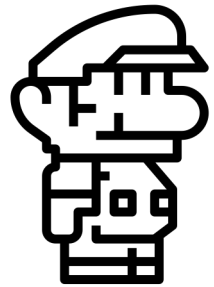
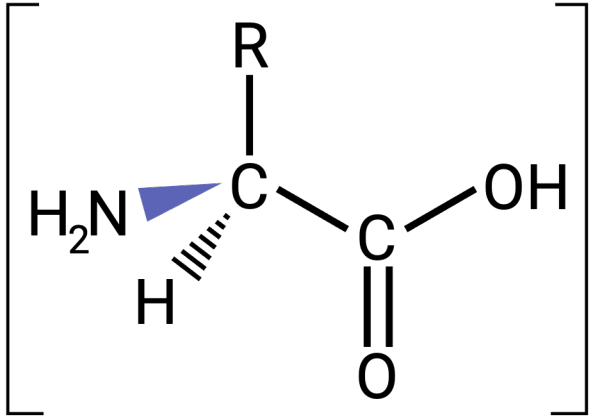
Fats
(triglycerides)



Proteins
(amino acid chains)



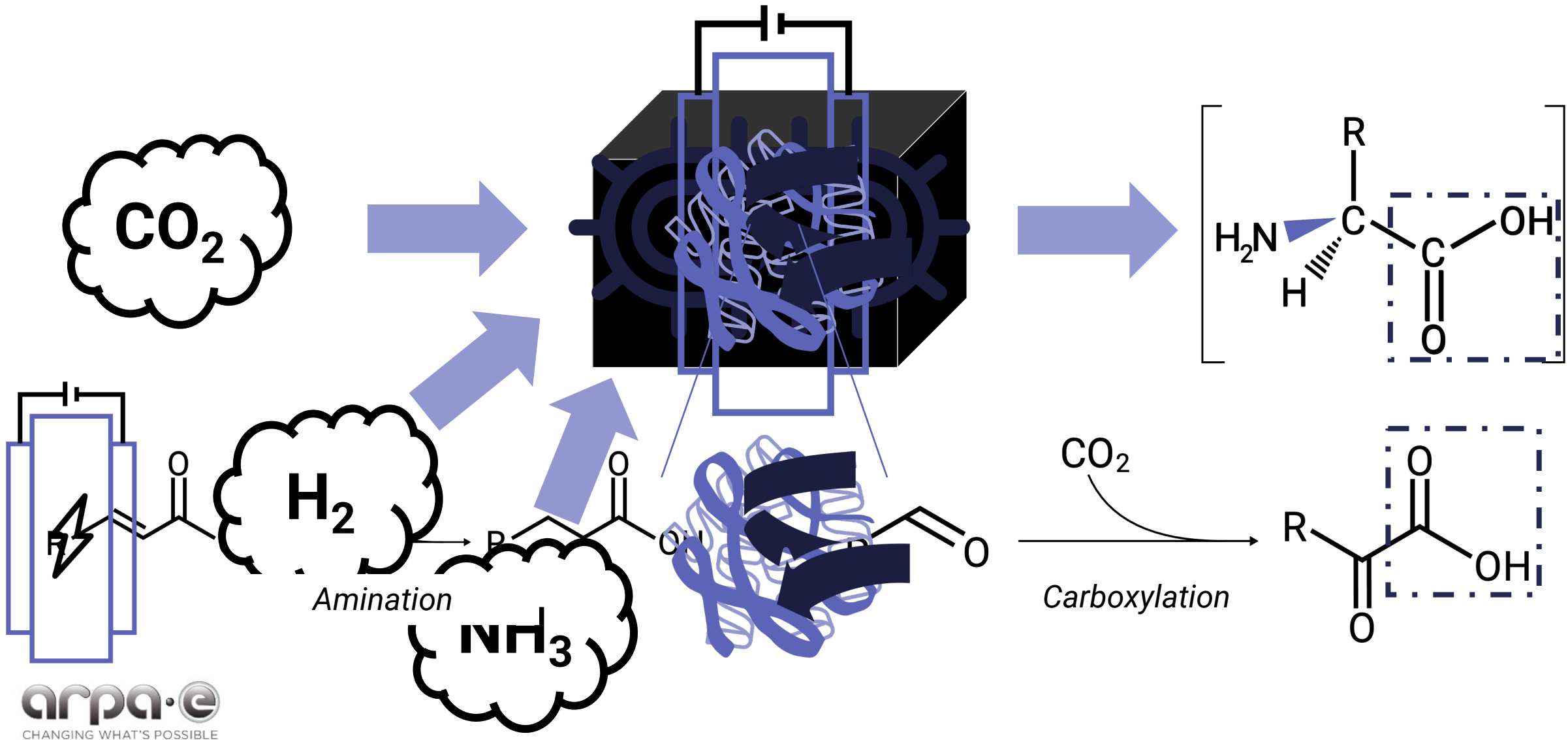
Protein is the most difficult macronutrient to synthesize



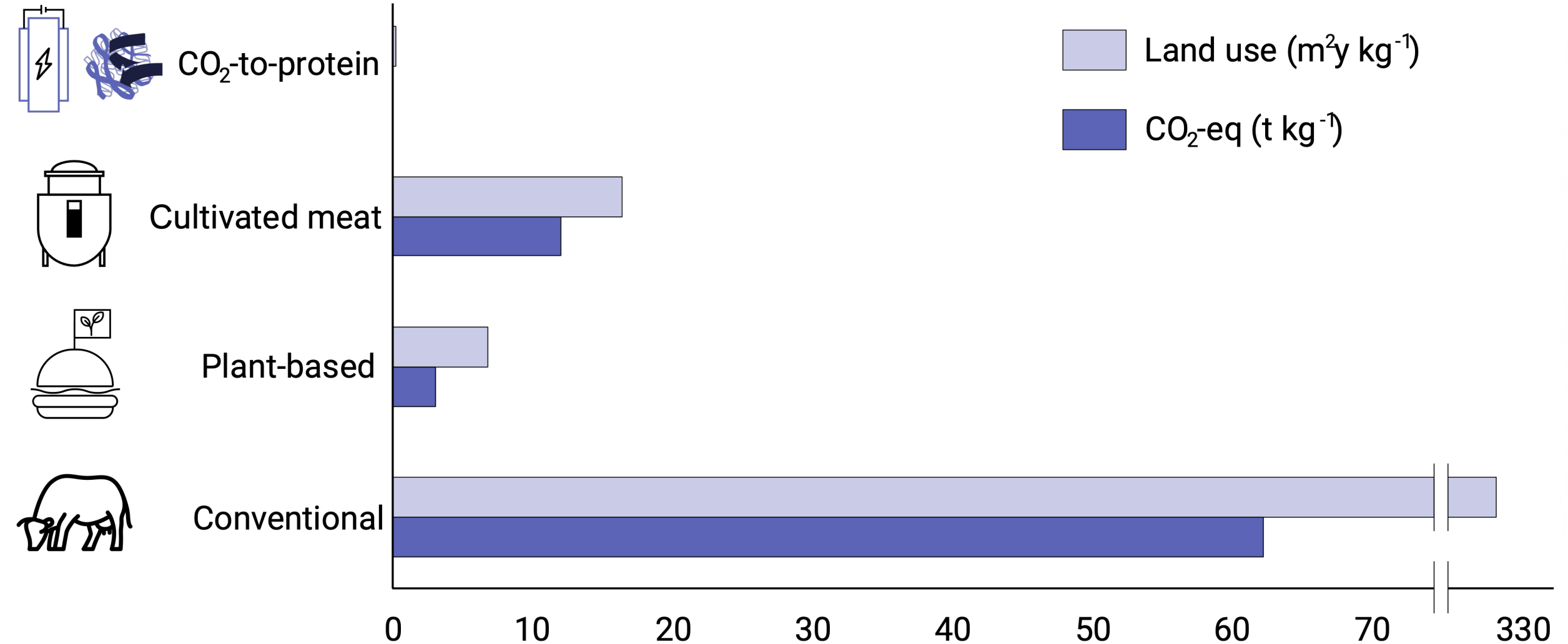
difficulty

Technical pathways to convert CO₂ to protein

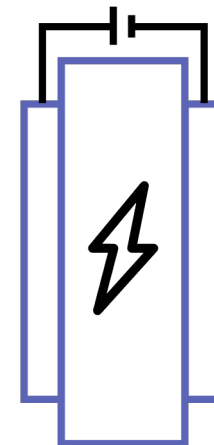
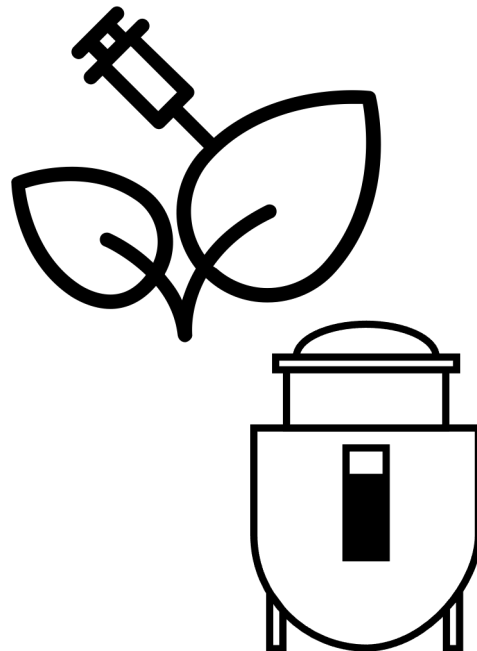
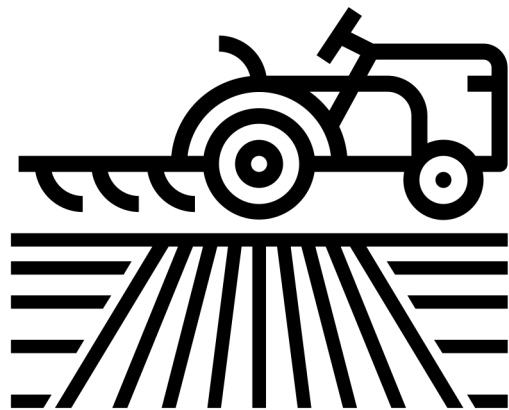
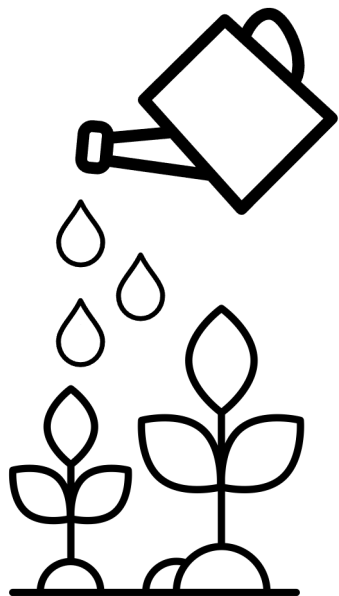
1. Microbial biosynthesis
2. Enzymatic catalysis
3. Electrochemical catalysis



There is a huge potential to abate land use and emissions



What's next for the future of agriculture?



10,000 BC

1700s-1900s

Present

Future

Birth of
agriculture

Mechanization
of farming;
Horse power

GMO food crops;
cultivated meat
Let's talk!

Decoupling of crops
and livestock from
agriculture

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