Definition of Alternative Proteins:
"Alternative proteins" is a term of art that describes foods that are produced to provide the sensory experience of animal meat - but using plants, fermentation, or cellular agriculture (Center for Strategic & International Studies 2023).[1]

Theory of Change: Change the product, not human nature
Alternative proteins are a supply side intervention; they are not focused on changing consumer behavior. The theory of change for alternative proteins analogizes to renewable energy and electric vehicles: Just as we need to change how energy is produced and vehicles are powered, so too we need to change how meat is made. While campaigns focused on energy efficiency, improved public transportation, and reduced meat consumption are valuable, we are unlikely to convince a majority of consumers almost anywhere (let alone globally) to consume less energy, drive less, or eat less meat. So we need to meet consumers where they are - with price-competitive renewable energy, with electric vehicles that satisfy consumer needs, and with plant-based and cultivated meat that taste at least as good as conventional meat and that cost the same or less.

Climate Mitigation:
- Animal agriculture:
  - causes ~20 percent of direct climate emissions (cite);
    - food = 35% & animal foods are 57% of that (so 20%);
  - misses out on 26 Gt of sequestration potential through vast land needs for grazing and feed crops (cite); and
  - causes the plurality of methane emissions, from ruminant digestion alone - which is roughly the same as oil and gas emissions combined (cite).
- Animal agriculture is predicted to rise inexorably through 2050; the most conservative predictions suggest a 50% rise through 2050 (cite); if this happens, Paris climate targets will be impossible to meet (cite).
- According to McKinsey economists, the mitigation potential of alternative proteins is 5 Gt/CO2eq per year by 2050, at roughly fifty percent adoption. The economic value of this climate savings is ~$5.5T (cite).
  - This calculation does not consider the potential to use freed-up land for carbon sequestration (or production of renewable energy). As cited above, sequestration potential of shifting away from industrial animal agriculture is ~26 Gt/year (cite).
  - According to Boston Consulting Group (BCG), at 11% penetration, alt proteins would have roughly the climate mitigation impact of totally decarbonizing air travel (cite) - and this also doesn't include the sequestration potential of land freed up by decreased grazing and feed crop production.
  - Another study from IIASA in *Nature Communications* (2023) finds that 50% plant-based meat penetration would eliminate 3.1 Gt/year CO2eq by 2050 in direct emissions and have the potential to sequester another 3.4 Gt (cite).

[1] "Alternative proteins" do not include animal feed or insect-based proteins. The former is not for human food at all, and the latter involves convincing consumers to eat insects; it does not involve turning insects into something indistinguishable from conventional animal meat, so it is different from "alternative proteins," as used by CSIS, the Kremer Commission on Food Security, Climate, & Agriculture; UNEP; Climate Advisers, GFI, et al..

        - "Agriculture and land use emissions reduction in 2050 in the 90% scenario are 11.9 Gt CO2eq reduction."

Nature Preservation:

- Animal agriculture requires eighty percent of agricultural land (cite); requires more than 1.4 billion metric tonnes of feed crops for farm animals (cite, cite); and requires 77% of the global soy crop, mostly to feed chickens, pigs, and farmed fish (cite).
    - All of these numbers are rising year after year after year - and will continue to rise, unless alternative proteins are successful.
- According to the World Resources Institute, 9 calories of feed are required to produce 1 calorie of chicken meat, and 40 calories of feed are required to produce 1 calorie of beef (cite, pg 39). So there is 800-3,900% food waste inherent in the animals' physiology.
- Land use benefits are also significant: Plant based chicken requires roughly one-sixth the land of animal-based chicken, and plant-based beef requires roughly one-twentieth of the land of animal-based beef (cite). Cultivated chicken requires roughly one-fourth the land of conventional chicken, and cultivated beef one-twentieth the land (cite).

Co-benefits: Decreased AMR & Decreased Pandemic Risk

- Two co-benefits of a shift from conventional meat production to alternative proteins are decreased risk of antimicrobial resistance (AMR) and decreased pandemic risk. These are both global scourges in their own right.
    - Approximately 70-80 percent of medically important antibiotics are fed to farm animals, which increases AMR risk (cite, cite). Resistant bacteria kill more than 1.3 million people per year and are on track to kill 10 million people per year by 2050 (cite). Alt proteins do not require antibiotics.
    - According to a report from ILRI, CGIAR, & UNEP, two of the seven most likely causes of the next pandemic are increasing demand for animal protein and industrial animal farming (cite).
        - More animals means more potential disease vectors, and industrial animal farming involves vast numbers of genetically similar animals crammed into unsanitary conditions that suppress their immune systems.
        - Alt proteins totally eliminate these two risk factors and mitigate four of the other seven.

The Global Majority (smallholders, pastoralist, subsistence fishers):

- The global populations that benefit the most from a transition to alternative proteins are those in the Global South: By alleviating land pressure from the expansion of industrial animal agriculture and the impact of commercial fishing on fish stocks, alternative proteins will be good for regenerative ranching, smallholder farmers, pastoralists, and subsistence fishing communities. By slashing climate emissions, alternative proteins will mitigate the impacts of climate change that are harshest for the world's most vulnerable communities. Superbugs from antibiotic resistance and the prospects of another pandemic will most adversely impact the global poor.
- Nobel Laureate Michael Kremer's commission on climate change, climate adaptation, and hunger/malnutrition finds that "Alternative protein innovation has the potential to

contribute to climate mitigation, relieve food insecurity, and help address malnutrition." (cite)

Theory of Change Part Two - building on the renewables/EVs analogy:

- The only two options that appear to have any chance of decreasing animal agriculture are population-level diet change (the world eating less animal protein) and the success of alternative proteins; the former of these has not decreased meat consumption globally so far and seems unlikely to start doing so any time soon. Attempting to convince consumers in developed countries to eat less animal protein has not decreased even per capita consumption (cite). But if we can create the precise meat experience from plant-based or cultivated meat and at a lower price, we can slash the external costs (food insecurity, climate change, land and water use, and more) of animal agriculture without requiring consumer sacrifice (cite).
- **Of course alt proteins are not a silver bullet** for everything that's wrong with food production globally. No single solution will address all of the problems that stem from our current food system. This is precisely why we need an "all of the above" approach. But alt proteins are **a critical part** of the solution (and as noted above, they are the only solution that is likely to cause industrial meat consumption to decline); they are one critical arrow in our quiver of food systems solutions.

Jobs & Economic Value of Government Investment:

- Alternative proteins represent 98% of economic value ($700 billion) generated by food system methane innovation according to ClimateWorks Foundation and the Global Methane Hub (cite). They can also create 83 million jobs globally by 2050 - this is two-thirds of jobs created across all agricultural methane interventions (cite). These economic returns should make them especially appealing to the "finance ministers and policymakers who make budget decisions" - a key concern identified by the Kremer commission (cite).

Why Government Support is Critical (i.e., why can't markets solve this?)

- Just as energy transition deserves government support, so too the alternative protein transition. There are both scientific and scaling challenges involved in creating a similar or improved animal meat experience from plant-based or cultivated meat, and requiring that every single company solve all of these challenges independently is a prescription for delay (at best).
- Cultivated meat has received just north of $3b in global investment in all of time (the vast majority of which have been equity investments) - this is the cost of one EV battery factory or bringing two drugs to market, and it has been spread across more than 100 startups.