



AGRICULTURE, CLIMATE CHANGE AND TECHNOLOGY

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Three Issues to discuss

1. Three recent trends are currently negatively affecting agriculture: what can be done about them?
 - *Climate change*
 - *COVID 19*
 - *The war in Ukraine*
2. The priority accorded to agriculture in national policy and public expenditure programs is often low, even in countries with agriculture potential. How to increase this priority?
3. If the priority of agriculture is increased, what are the best ways for governments to stimulate agriculture?

Issue # 1: Trends, including recent events, negatively affect agriculture

- **Climate change has already negatively affected agriculture, particularly in the tropics, but has aided agriculture in northern climates. The prognosis for the future is bad**
- **The COVID 19 pandemic has caused supply chain disruptions for both agricultural products and inputs. Shortages and price increases have been the result**
- **The war in Ukraine has exacerbated supply shortages and price increases**



The result of these three phenomena:


- More people have been pushed into poverty, especially in Africa, the Middle East and Central America
- National food insecurity has increased, as has undernutrition
- Unrest due to constraints to food availability are likely in many countries, as occurred in the 2007/08 food crisis



What to do about this given the constraints to action

- **More food aid?** There is reticence to provide more food aid given widespread food shortages or price increases everywhere. WFP already claims large food and funding shortfalls
- **More open agriculture trade regimes can help**, if food deficit countries have the funds to buy expensive food, and if food surplus countries do not impose export controls (which some are already doing)
- **Food deficit countries with agricultural potential could expand public expenditure for agriculture and more vigorously support private investment in agriculture (domestic and foreign).**
- **More donor aid for agriculture and to help agriculture adapt to climate change?** This is difficult given the diversion of aid to other hotspots, such as Ukraine. Will donors expand agriculture aid in this situation? Some positive announcements at April meetings of World Bank and IMF
- **Are there more radical, and more convincing strategies (more on this below)?**





Issue # 2: In many countries, public expenditure on agriculture is low, and policy is anti-agriculture

Private investment in agriculture not forthcoming in countries which accord it low priority and which have a poor policy environment for agriculture


A reason for neglect of agriculture is that it nearly always grows slowly relative to industry and services; hence the view that agriculture-led strategies not a good growth strategy

Reasons to prioritize agriculture despite low growth:

- Employment
- Food as national security issue
- Food issues including undernourishment, obesity, food waste
- Agriculture is cause and victim of climate change
- Agro-industry can grow rapidly

Can the widespread neglect of agriculture be reversed in countries with untapped agriculture potential? If so, this can contribute to solving the problem highlighted in issue # 1.





Issue # 3: Presuming that issue # 2 can be dealt with, what are the best ways for governments to stimulate agriculture?

- 1. Growth of agriculture from agricultural land expansion, more labor, and expanded irrigation will be limited**
- 2. Increased fertilizer use, improved seeds, and mechanization is needed**
- 3. Technological innovation has greatest potential**

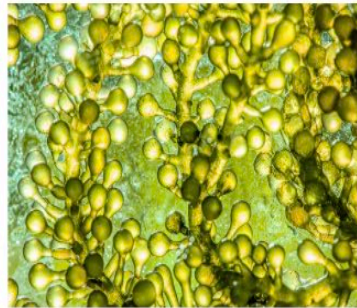
Technological Innovation includes

- Adaption to climate change
- Biotechnology
- Digital agriculture
- Land tenure reform and property rights
- Farmer skills and higher agricultural education
- Novel technologies
- Agricultural research and extension
- Private sector innovation
- **Question: How to shift country level focus to private and public agriculture R & D, in a significant manner, in both industrial and developing countries?**



What are some of the novel technologies ready now?

- Meat analogues made from plants, animal free dairy, microalgae
- Cultivated meat
- Hybrid Meat Development



Microalgae



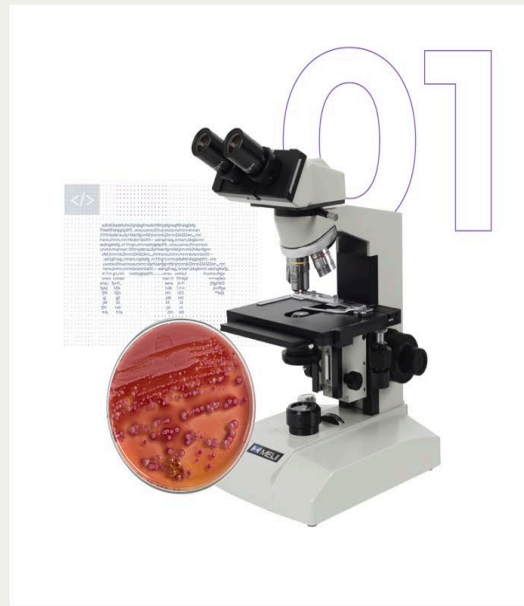
Animal-Free Dairy



Whole Cut Analogues

Examples from “Perfect Day Foods”

Our Process →



Flora

To produce real milk protein, we add the milk-making genetic blueprint from a cow to tiny organisms called microflora (flora).



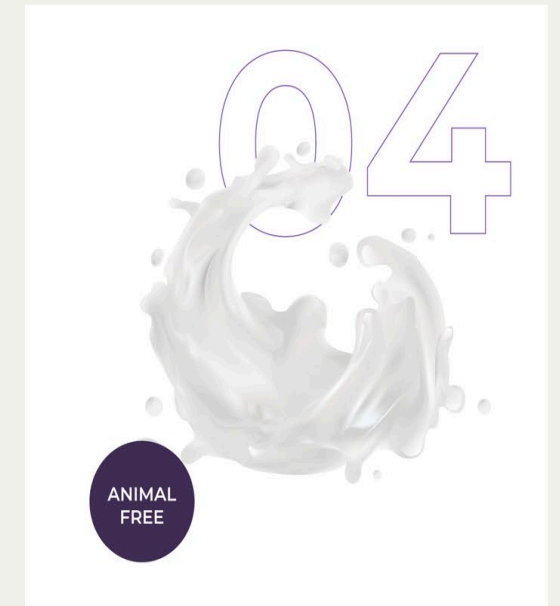
Food

Just like cows, flora need a food source to produce milk protein, so we feed them plant sugars.



Fermentation

We use fermentation to enable our flora to efficiently convert plant sugars into milk protein.



Animal-Free Milk Protein

The result is an animal-free milk protein that is identical to the protein found in cow's milk and that can be used to make any dairy product.

Bioprinting and 3D printing of food

BIOPRINTING: The manufacture of food items by replicating cells and layering them on top of each other to form a tissue

TISSUE: Grouping of cells that forms the substance of our food

3D PRINTING: The extrusion of food through a tiny tube to form complex layers into a desired form

