The untapped potential of protein diversification

Diversifying our protein supply to include plant-based foods and cultivated meat can be a game-changer for climate mitigation and climate adaptation, especially in the countries of the Global South. However, a great deal of research is still required to capitalise on this potential. And political support, as our author demonstrates.

By Ivo Rzegotta

Research by the UK's Oxford University shows that the world cannot meet its climate targets without shifting away from conventional animal agriculture. Today, intensified animal agriculture causes around 20 per cent of global greenhouse gas emissions – equivalent to all the planes, trucks, cars, trains and ships on Earth. Also, industrialised animal agriculture is the biggest driver of deforestation and the loss of biodiversity. Nevertheless, global demand for meat is growing. As people don't want to give up their favourite foods, we need to transform how meat is made, and make sure sustainable options are delicious, affordable and accessible. Complementary proteins, globally known as alternative proteins, are a rapidly growing area of food technology focused on pioneering foods that can provide viable alternatives to animal-derived meat, seafood, dairy, and eggs. These innovative foods taste the same as or better than conventional animal products with similar nutritional profiles. Examples of these new innovative foods include plant-based meat and dairy products and, in the long term, cultivated meat grown directly from animal cells.

Further research is needed to realise the potential of protein-rich plants such as red beans, black beans and mung beans.

Photo: Live and Learn/ shutterstock.com

A building block for more sustainable food systems

Diversifying the food systems to include these options offers new options for consumers, and new opportunities for farmers to deliver the high value crops and regenerative agriculture we need for the future. It is a necessary solution that works with existing consumer behaviours while reducing greenhouse gas emissions and freeing up land for nature restoration and more sustainable farming practices. Peer-reviewed studies show that shifting to plant-based and cultivated meat could reduce climate emissions by up to 94 per cent compared with farming animals – enabling people to eat their favourite foods without accelerating the climate crisis. Also, plant-based and cultivated meat could deliver the meat people want with up to 90 per cent less land (see Figure on page 38).

Complementary proteins reduce the pressures of intensification of livestock farming and the subsequent risk of outbreaks of animal diseases in such confined environments. Furthermore, plant-based meat and cultivated meat are antibiotic-free – so they can deliver meat without driving the problem of antimicrobial resistance and, therefore, protect lifesaving medicines.

These foods have the potential to serve as a tool for the sustainable industrialisation of agriculture, bringing economic and social development to countless rural family nuclei. They can be made with indigenous crops grown by small-scale farmers to suit the needs and tastes of local communities. In regions where protein and micronutrient deficiencies are still widespread, these foods could play a key role along with traditionally farmed protein sources to improve nutrition, reduce monocultures and safeguard local production.

Developing countries have been committing to increasingly ambitious climate mitigation and adaptation goals. But while the general debate on the need for sustainable food systems is gaining relevance, the potential of complementary proteins for food security goals and mitigating climate impacts is – at least for now – a largely neglected topic.

It is thanks to billions of euros in government investment that the cost of solar panels fell by more than 85 per cent between 2010 and 2020. However, protein diversification has received just a fraction of the public investment that has gone to other climate innovations such as renewable energies and electric cars, making this a particularly high-impact opportunity for governments that want to invest in a sustainable transformation. Just like they have funded research and development for renewable energy, governments should fund open-access research into plant-based and cultivated meat. Open-access research can help to make the technology available to everyone and thus prevent the emergence of new dependencies on the northern hemisphere.

Realising the potential of plant-based proteins

In the short term, it is primarily plant-based foods that can contribute to protein diversification in the countries of the Global South. Plant-based meat looks, cooks and tastes like conventional meat – but it's made entirely from plants, without the downsides of industrial animal agriculture.

Crop diversification is an essential component of creating a more secure, sustainable and just food supply. Today, the primary ingredients for plant-based meat world-wide are soy, peas and yellow peas. Soy-producing countries have spent decades optimising that crop and driving down costs through innovative breed-

ing programmes. As a result, producers have more than doubled how much value they get from every single acre of land. Similarly, cereal crops like wheat have nearly tripled their yield sizes over the past 50 years. However, there are many other plants whose potential for the production of plant-based foods has not yet been sufficiently explored. Mung beans have far lower allergenicity than either soy or wheat and are among the most heat-resilient of all legumes. Legumes like mung beans have increased by a comparatively meagre 60 per cent over the last decades. They have been woefully neglected by protein-focused research and development programmes.

Further research is needed to realise the potential of protein-rich plants. Besides mung beans, these include, for example, barley, canola, black beans, cowpea beans, chickpea, sesame and sunflower seeds. The plants that come into question are highly dependent on the respective local conditions. More research is also needed in the area of processing, for example on how off-flavours can be avoided in the production of plant-based foods and how products can remain "clean label" with just a few healthy ingredients.

Incentivising the private sector to establish supply chains for these crops, which can act as ingredients for plant-based meat, would also help to increase the cultivation of these crops and ensure consistent yields for farmers. Here is one example from Brazil. The Good Food Institute Brazil is currently running a project which aims to use beans to replace its cousin peas, which are imported from countries in the northern hemisphere in an already processed form, as an ingredient for plant-based products. The goal is to process the broken beans that are unsuitable for bulk sale, which are currently treated as animal feed waste, into a protein concentrate that could be sold directly to the plant-based industry. Producers would then have a new source of income, complementary to the sale of intact grain with high added value. Projects like this one contribute to reversing the country's age-old logic of exporting commodities with no added value and importing the grain back after processing.

Fostering open-access research in the field of cultivated meat

In the long run, cultivated meat can also significantly contribute to climate mitigation and climate adaptation in the Global South. Cultivating meat involves taking a small sample of cells from an animal and growing them in a fermenter, similar to those used for brewing beer. This supports the same process that happens inside an animal by providing the warmth and the basic nutrients needed to produce meat – water, proteins, carbohydrates, fats, vitamins and minerals. The result is ground meat, which can be formed into a range of final products that are indistinguishable from conventionally produced meat.

At present, cultivated meat is still at an early stage of development. It has already been authorised for sale in some countries, but is not yet being produced on a commercial scale. Prospectively, the countries of the Global South could play a major role here because cultivating meat requires energy, which can be abundantly harnessed from the ample sunlight available in many of these countries.

Additionally, as climatic conditions worsen for crop farming in many regions of the Global South, this new way of making meat can provide a more reliable alternative. In this way, protein diversification can help adapt to the impacts of climate change and enhance food security in vulnerable regions. For cultivated meat to become an impactful option for the Global South, more public investment is needed to lower the production costs significantly. To this end, governments around the world should particularly support open access research in this field so that innovations can be democratised and have a global impact.

A sensitive understanding of local contexts is needed

For plant-based and cultivated meat to be seen and accepted as a relevant food choice for most people, they have to shed their perception of a premium food option available to only the rich. They must offer comparable protein quality and nutrient density to be considered viable alternatives to animal-source proteins. And also, they must provide a fair path to transition for local farmers.

Protein diversification is not at odds with other approaches to a more sustainable food system. Regenerative agriculture, organic farming and complementary proteins all share a common goal: transitioning from industrial animal agriculture to a more sustainable system. Each of these approaches has its own role to play in creating a healthier, more sustainable and just food system. And by reducing land use, complementary proteins also create the conditions for these other approaches, which often require more land, to be successful.

The preconditions in individual countries vary greatly in terms of climate, soil quality, the availability of sustainable energy sources and workforce, and many other factors. Therefore, it is necessary to approach protein diversification with a sensitive understanding of the various local contexts, promoting inclusion and fostering collaboration for positive transformation towards food and nutritional security, economic development, food diversity and sustainability.

Environmental benefits compared to conventional meat

	Plant-based meat*	Cultivated meat*
GHG emissions (CO_2e)	Up to – 94 %	Up to – 92 %
Land use	Up to – 89 %	Up to – 90 %

* if produced at scale and with renewable energies

Source: Plant based meat: Sarah Nájera Espinosa et al. in Nutrition Reviews (2024); Cultivated meat: Pelle Sinke et al. in The International Journal of Life Cycle Assessments (2023).

Ivo Rzegotta is Senior Public Affairs Manager at the Good Food Institute Europe (GFI Europe). GFI is a non-profit and think-tank for building a more sustainable food system by diversifying protein production. GFI Europe is powered by philanthropy.
Contact: ivor@gfi.org