

The Protein Challenge 2040

Sustainable protein production and consumption for the future

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Key messages

- > The way in which we currently produce and consume it is having a negative impact on the environment and human health.
- > This has led us to The Protein Challenge 2040, which addresses the question: How are we going to feed nine billion people enough protein by 2040 in a way that is healthy, affordable and good for the environment?
- > There are great inequalities of access to protein, with some of us eating more than sufficient protein and others facing a serious lack. Both sets of circumstances are associated with major health risks.
- > There is increasing recognition that protein security could be an issue in the future.
- > We need to take a full systems approach and promote the transition to consumption of more plant protein by humans.
- > Forum for the Future is seeking more partners to help drive forward and scale up solutions. If you are an organization with the resources and expertise to help transform the future of protein, we would like you to join us.

Protein has been thrown back into the spotlight. It is essential for a healthy diet, yet the way in which we currently produce and consume it is having a negative impact on the environment and human health, which will only increase if no concerted action is taken. There are serious questions around whether we will be able to provide sufficient protein sustainably for a further two billion people by 2040.

This has led us to The Protein Challenge 2040, the culmination of a year of enquiry by a really unusual coalition of food companies, retailers, feed companies and NGOs into the central question: How are we going to feed nine billion people enough protein by 2040 in a way that is healthy, affordable and good for the environment?

Understanding the protein system

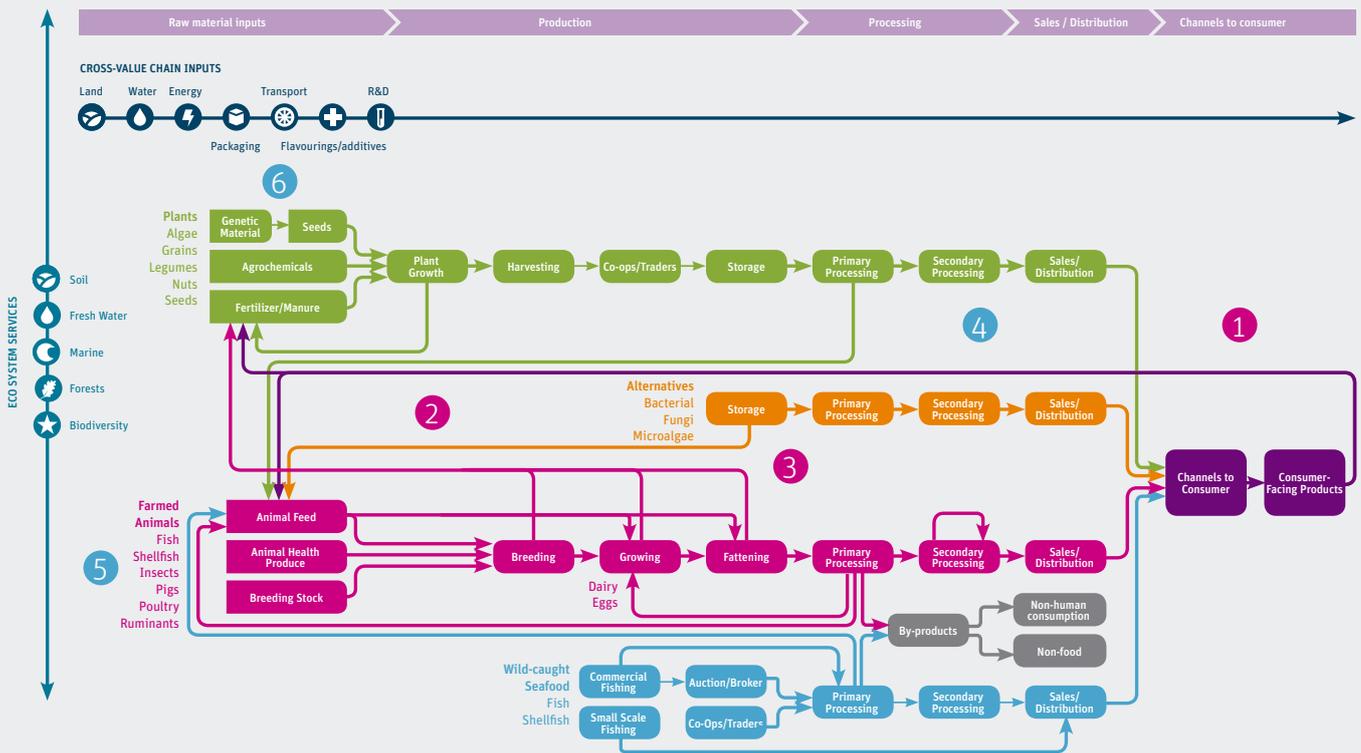
The protein system comprises the animal, plant and alternative protein industries and all their value chains, all of which are very deeply linked. To address the protein question properly, we knew that we needed to understand the system, in all its complexity, as a whole. Drawing on research and expertise from across the system (including by Dr Klaus Kraemer, Director of *Sight and Life*), we worked hard to map the entire protein system – something that has never been done before. We identified different protein supply chains that provide for human nutrition from animal, plant and alternative sources. We mapped the interrelationships between the supply chains and the impacts across the system including social issues, environmental consequences and health problems.

“Not all sources of protein are the same in terms of how much nutrition they provide and how much impact their production has on the environment”

FIGURE 1: The global protein system

These 6 areas of innovation address key hotspots within the protein system, in order to accelerate change at a system level

- 1 Increasing the proportion of plant-based protein consumption with consumers
- 2 Scaling up sustainable feed innovation to meet demand for animal protein
- 3 Closing the protein nutrition loop
- 4 Developing indigenous plants as protein sources for local communities
- 5 Scaling up sustainable aquaculture for food and animal feed
- 6 Restoring soil health



We discovered that there are great inequalities of access to protein, with some of us eating more than sufficient protein and others facing a serious lack, and both sets of circumstances being associated with major health risks. Not all sources of protein are the same in terms of how much nutrition they provide and how much impact their production has on the environment. Some are resource-intensive and have many environmental impacts such as greenhouse gas emissions, heavy water consumption and habitat destruction.

Over 50% of good-quality plant protein grown is fed to animals, and a good proportion of wild-caught fish is fed to farm animals and fish. The protein system is over-dependent on soy for animal feed, and the cultivation of soy in turn drives deforestation. So it's not simply enough to find more sustainable ways of growing a crop; it's also about finding alternatives and tackling demand.

Protein security

We also found that there is increasing recognition that protein security could be an issue in the future. We found that there is a

lack of agreement on the solutions and that the current discussions are quite polarized, with little consideration of the balance between health and sustainability. On a more positive note, we discovered organizations working toward more sustainable protein in different ways. Some are exploring sustainable nutrition, while others are investigating which future protein sources to support. Realizing the complexity of the issues and the number of different protein sources – not just animal and plant – these organizations saw the benefits of joining forces for the first time, and The Protein Challenge 2040 was formed.

The Protein Challenge 2040 includes leading NGOs World Wildlife Fund (WWF) and Global Alliance for Improved Nutrition (GAIN), retailers Target and Waitrose, leading dairy nutrition firm Volac, taste and flavor experts Firmenich, and food manufacturers The Hershey Company and Quorn. It is the first partnership that brings together representatives from animal, plant and alternative protein industries to understand the protein system's challenges, identify a common way forward, and find new solutions collectively.

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Balancing healthy consumption with sustainable production

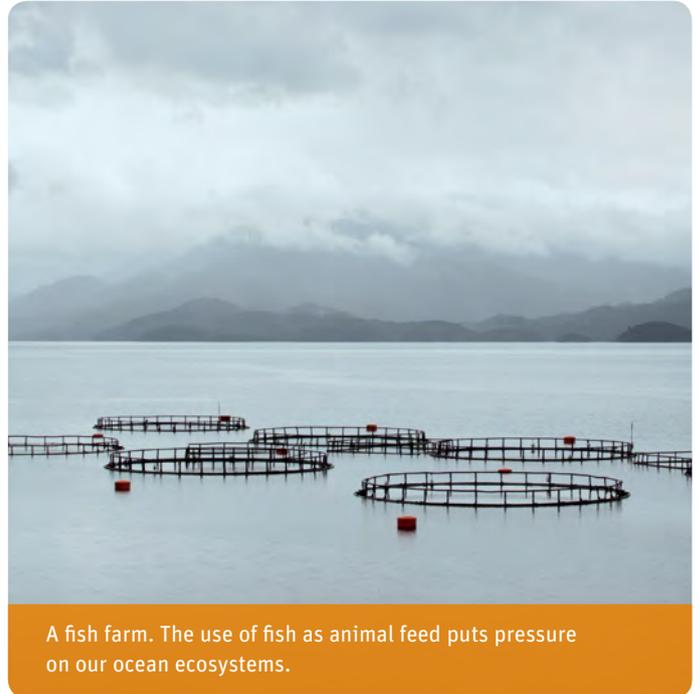
Using future scenarios to test the system in different possible worlds and working with over 200 experts and innovators in London, New York, Rotterdam and San Francisco, we have identified six areas for innovation and action. While each area in itself will need significant investment, we believe that multiple areas need to be addressed to truly have an impact on the scale needed in order to balance affordable and healthy consumption with eco-friendly production.

The first of these “innovation areas” involves encouraging the consumption of more plant-based protein in daily diets. In the West, we consume far too much animal protein, and demand for animal protein is also growing exponentially among emerging affluent classes in developing economies. Rebalancing consumption of animal, plant and alternative proteins among consumers will help address many key impacts across the protein system, such as the impact on human health, greenhouse gases, water use and pollution, land use change and habitat loss.

We are working to overcome barriers to increasing the intake of plant protein. This might happen by influencing government policy, supporting new product innovations, or creating common messaging around plant proteins. We are now working with food service companies, retailers and food manufacturers to design potential solutions, from re-training chefs to establishing a new discourse around the consumption of plant protein.

The second area of innovation is about scaling up sustainable animal-feed innovations. Over the last 60 years, farmed cattle, chickens, pigs and fish have increasingly been fed on grains, soy and fishmeal. Many of these feedstocks are high-quality sources of protein that could be used to feed humans, particularly in places where protein deficiency is common. Additionally, the use of fish as animal feed puts pressure on our ocean ecosystems. Developing new sources of animal feed to meet the growing demand for animal protein is critical for taking the pressure off land use, and to reduce the overall land footprint of agriculture and impact on ocean ecosystems.

There is already a huge amount of innovation in alternative feeds, from insects to methane based products, and we are working with innovators such as Calysta, which is a methane-bacteria feed producer. We want to help scale up these innovations,



A fish farm. The use of fish as animal feed puts pressure on our ocean ecosystems.

turning them into an unstoppable systemic change in favor of sustainable feedstocks that reduce the pressure on land use for agriculture. We will develop a place where feed innovators can come together to scale up their solutions.

Third, we want to end the loss of good protein sources while also finding new protein sources from waste sources from animals and humans. Globally, 30% of all produced food is wasted, much of which could be converted into useful protein sources. For example, waste protein sludge from starch companies could be used as animal feed. Or proteins could be recovered from sugar beet leaves, which are typically left in the field. Closing the loop on protein waste would mean we could drastically reduce the environmental footprint of protein production.

Some innovation is already happening in this space, but mainly in the form of commercial agreements between two or more businesses. We need greater collaboration in order to scale up the most effective solutions – and eventually make this type of nutrient cycling a mainstream activity across the food industry. This innovation area will bring together groundbreaking research to explore how and where protein loss occurs, as well as to drive advocacy work and practical initiatives that focus on piloting and scaling up solutions.

We are exploring three further areas for innovation, which will need greater engagement with businesses, governmental organizations and NGOs across the world, and particularly in the developing world. We want to encourage the development of new indigenous plant protein sources in countries where undernutrition is a problem, so as to support local food security. Many of these crops are often better suited to local climatic conditions, and may even be more resilient in the face of global climate change.

Can Crickets Save the World?

How edible insects hold the key to solving the protein problem

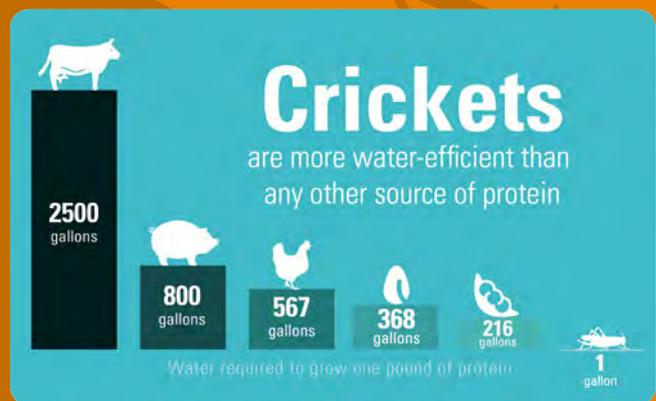
Leslie Ziegler
Bitty Foods, San Francisco, CA, USA

Eighty per cent of the world already eats insects. They are the least water- and resource-intensive protein source on the planet. They contain a multitude of vitamins and minerals, and are high in fiber and protein. The United Nations calls edible insects a “key to global food security.” And since by 2050 there will be nine billion people on the planet, finding scalable ways to improve our food systems are critical. So why hasn’t the western world put them on the menu until now?

For the uninitiated, the idea of popping an insect into your mouth sounds rather unappealing, though they are consumed that way in many cultures. But they can also be roasted and milled into a fine powder and easily incorporated into the foods we eat every day. Chips, cookies and bars containing this highly sustainable, all-natural ingredient are already on the market. And if no one mentioned it, you would never know it’s there, as crickets – which are the most popular insect du jour in the United States to date (the “gateway bug”, if you will) – have a nutty flavor that mirrors that of almonds.

“Crickets are nutritionally complete, containing fiber, omega-3 fatty acids, iron, and a slew of other important vitamins and minerals”

Crickets are nutritionally complete, containing fiber, omega-3 fatty acids, iron, and a slew of other important vitamins and minerals. Every pound (0.456 kg) of crickets grown take up just 2 square feet (0.6096 m²) of pasture versus beef’s 200 square feet (60.96 m²). They emit zero greenhouse gases. They require only one gallon (4.55 L) of water for every one pound grown as compared to beef, which takes 2,500 gallons (11,365 L). Beef is only 20–28% protein and crickets are 65%, which means they’re also far more



For conversion to metric scale see text

efficient pound for pound and kilo for kilo (cf. *Edible Insects: Future prospects for food and feed security*. FAO 2013. www.fao.org/docrep/018/i3253e/i3253e.pdf).

The company I cofounded, Bitty Foods, is doing exactly what I just described. Our patent-pending, all-purpose baking flour can be used cup for cup in any recipe, making baked goods a rich source of omega-3 fatty acids and many nutrients not found in its non-fortified counterpart. We also make wholesome, delicious chips and cookies, supercharging even snacks with protein. Though our current markets are primarily the United States and Europe, our flour’s transformative potential will also reach developing countries, providing a source of high protein to populations that need it the most.

We must move toward alternative protein sources and delivery mechanisms that reduce our dependency on meat, instead moving it into the staple foods we eat every day. Not only will we be able to feed the world, we will also reduce the environmental impacts of animal protein consumption, which is just as critical to the generations to come. As individuals and organizations, the most powerful way we can help create change is to shift market demand from the goods that consume the most resources to those that consume less. And if today’s growing insect market is any indication, it’s going to be a delicious future.

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Indigenous crops such as finger millet, yams and tubers are better suited to local climates and can play an important role in regional food security.

Our fifth goal is to tackle sustainability issues in the aquaculture industry, in particular the issue of sustainable feed. Today, aquaculture supplies over 50% of all fish consumed by humans globally. It is projected to be the prime source of seafood by 2030, due to demand from the growing global middle class and the depletion of wild-capture fisheries. It will be very important in Asia and for feeding growing populations, and addressing the sustainability issues around aquaculture will help it become a much more viable and effective protein source in the long term.

Finally, we will lead on creating a global plan to restore soil health – which underpins our plant protein production and without which no food could be produced!

Transforming our food production processes

Something we have learned during this journey is that there is not going to be a one-size-fits-all solution. Protein needs inevitably vary by population, and the means of meeting these needs should be individually developed for local circumstances. Prices for animal proteins are undoubtedly going to rise in the future, so finding sustainable and affordable locally produced alternatives – particularly those from plant and novel protein sources – will be critical. One of the UN's seventeen Sustainable Development Goals is 'to end hunger, achieve food security, improve nutrition and promote sustainable agriculture.' Yet forecasters suggest that the number of available food calories worldwide will need to increase by 50% by 2030 simply to ensure that everybody is adequately fed. To achieve the goal requires not just a complete transformation of our current food production processes, but a global clampdown on waste and a shift in attitudes towards healthier products.

“Prices for animal proteins are undoubtedly going to rise in the future, so finding sustainable and affordable alternatives will be critical”

The Protein Challenge is urgent. As we struggle to feed nine billion people, demand for protein is growing, and much of that demand will be for animal protein, which is resource-intensive. We need to meet the needs of the future population for protein. So we definitely need to take a full systems approach and promote the transition to consumption of more plant protein, while also addressing the diets of animals themselves.

A challenge on this scale is not something any one organization can tackle alone. There needs to be much stronger collaboration between government, business and the not-for-profit sector. Forum for the Future is actively building new partnerships and seeking more partners to help drive forward and scale up solutions. If you are an organization with the resources and expertise to help transform the future of protein, we would like you to join us.

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Demand for sustainable sources of protein is growing worldwide, and the Protein Challenge 2040 is urgent.