The European Protein Transition

The European Protein Challenge

Due to suitable climate and soils, many European farmers are remarkably good at growing cereal crops such as wheat, barley and maize. This supports high levels of production of carbohydrate-rich grains used mostly to feed livestock. This productive agricultural system depends on two major inputs into European Union farms: about 11 million tonnes of synthetic nitrogen fertilizer, and the high-protein meal from about 36 million tonnes of soya beans to provide concentrated protein supplement for feeding animals. The increase in plant protein[1] requirements over the last 60 years in Europe is due largely to the increased consumption and production of meat. The European Union is now the second largest importer of soya from South America, after China. While the European Union's agricultural system as a whole is 71% self-sufficient in tradable plant protein, 86% of the plant protein imported to meet the 29% deficit is soya. This protein deficit is a fundamental challenge to the resilience, acceptance and performance of our agri-food systems. This is Europe's Protein Challenge.

The case for a European Protein Transition

Many European farming systems are not balanced in relation to the nitrogen cycle. Carbohydrate-rich cereal crops and oil-rich rapeseed grow very well over much of Europe and consequently many farmers specialize in growing them. In contrast, protein-rich grain legumes account for only 2 to 3% of the arable area of the European Union, mostly soybean, pea and faba bean in that order. This compares to about 14% for global annual cropping as a whole. The combination of this cropping pattern and the high consumption and production of livestock products is the basic reason why we have a protein deficit in Europe.

Addressing the Protein Challenge

Addressing the Protein Challenge and delivering the Protein Transition requires a holistic approach. The system change needed can be regarded as a set of five concentric rings which, starting from the largest, are:

1. **Healthier diets**: While, meat, milk and eggs provide us with high-quality protein, a large proportion of the population consumes more meat and dairy products than is recommended for a healthy diet. Our high consumption of animal protein has far-reaching consequences because a large amount of plant protein is fed to animals in relation to the protein in the products we consume. Most of this plant protein-nitrogen is excreted by livestock adding to water and air pollution. Moderation in the consumption of these products and a corresponding reduction in the intensity of their production would radically

[1] Proteins are nitrogen-based compounds and consequently protein production and use affects the nitrogen cycle. Due to this link, current farming and food systems are largely responsible for the human impact on the nitrogen cycle causing the most exceeded planetary boundary. Through the nitrogen cycle, protein is connected to greenhouse gas emissions from agriculture and land use change, nitrate pollution of water and ammonia pollution of air, and loss of natural habitats and biodiversity.

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improve the performance of our agri-food system in terms of consumer health, the environment, and land use. This dietary change also increases opportunities for high-protein healthy plant-based foods, especially those based on pulses and soya.

2. **Increased efficiency**: Better matching of livestock diets to animals' protein requirements saves protein and reduces pollution by reducing the excretion of nitrogen compounds. This can make an important contribution to farmers' compliance with nutrient balance-based fertiliser management systems. Protein is usually an expensive component of feeds and so more precise feeding reduces production costs.

3. **Improved use of existing and new protein resources**: While protein-rich co-products such as rapeseed meal, sunflower seed meal and distillers dried grains are already used by the feed industry, there remain opportunities for better use of agri-food residues in livestock feeding. Also, our grassland-based production systems could better use grass and high-protein grassland species such as clover (which is a legume) to reduce soya use. Forage crops such as alfalfa could also be better used with less supplementary feeding to reduce soya use in meat and milk production. Insects can also be used to convert protein in low-value residues into feed-grade protein, and there are opportunities in algae culture.

4. **Increased production of grain legumes in Europe:** Increasing grain legume production in Europe will bring a wide range of benefits and reduce the protein deficit. Especially in Europe, they increase diversity in cropping and supporting pollinating insects. They don't need nitrogen fertiliser because they fix their own nitrogen from the air. They counter the build-up of disease, pests and weeds in crop rotations because they are biologically very different to most other crops. The low use of grain legumes in European farms means that we forfeit many of these agronomic benefits and associated environmental advantages. The general lack of cropping diversity is associated with stagnation in crop yields as these crops succumb to increased levels of weeds, pests and diseases. European farmers can respond to an increased demand for plant protein produced in Europe to high environmental and social standards. All such production meets growing demand for non-GM products and can support regional/local value chains. The industry can collectively set standards for all protein sources and signal support to sustainable production. In particular, there is potential to improve cropping systems in central and eastern Europe using grain legumes. This means that trans-Atlantic sourcing would be partly replaced by east-to-west sourcing within Europe contributing to European cohesion, regional development, and rural development and employment in now-deprived rural areas. Also there is potential in western Europe to increase grain legume production without displacing cereal and oilseed production due to the yield benefits legumes have in crop rotations.

5. **Sustainable and responsible imports:** Even with significant change, Europe is likely to still need imported plant protein from traditional exporting regions. We need to switch to certified produce from production regions and systems that are thoroughly validated against high environmental and social standards. The Protein Challenge is global. It is essential that improvement in Europe is not off-set by continued unsustainable production for export to other regions of the world that also have plant protein deficits. In particular,

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collaboration with China is required to achieve a world-wide move towards more sustainable production and use of protein. We need global standards for responsible production and trade. In this, Europe and China together can drive global change in plant protein production and use.

Delivering change – The Protein Transition Action Plan

The Protein Transition depends on combined efforts in the public and private sectors, all based on the use of sound science, technology and innovation. Some measures can be implemented now in conjunction with on-going commercial activities and current policy instruments. Others require longer term changes.

For the short term (1-5 years): There are still reports of poor standards of production in soya exporting regions. There is increasing concern that our protein sources are not sustainable with reports of unsustainable agronomic practices, exploitation of the rural poor, and continued habitat loss in the producing regions of South America. In addition, delivering non-GM soya in these supply chains increases costs. A first step in a response is an immediate tightening up of standards within European value chains. This can be delivered by joint commitment across all trading organisations operating in Europe. The retail sector can contribute significantly to an impulse for change. We need to switch to 100% certified soya and we also need collective joint working across the trading sector to validate that the certification of that soya is really supporting high production standards. This could be achieved by a programme of evidence gathering to assess and validate the impact of certification. The overall goal is to raise production standards and prices in exporting countries. This will increase the demand for other protein sources in Europe stimulating the development of alternative value chains.

Public agencies already support public health guidelines that indicate that a large proportion of the population consume more meat and dairy products than is recommended for good health. The resulting 'healthy moderation' message could be more clearly communicated and debated in public. Healthy eating guidelines have not been prominently linked to sustainable development ("Sustainable healthy eating"). We need unambiguous political acknowledgement and public information about healthy and sustainable dietary choices. This will provide more favourable conditions for change in the food industry and sustain the current trend towards moderation in livestock product consumption opening up options to reduce European livestock production, plant protein imports, and nitrogen pollution.

Short term measures can also include increasing and improving the regulation of nutrient use in farming. The current development of farm-level nutrient balances in Germany is an example of how policy in related areas has the potential to support the Protein Transition by incentivising more precise protein feeding. Parallel to this, it is essential that the recent increase in grain legume cultivation in Europe is maintained within the Common Agricultural Policy and through continued technical support for farmers.

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For the medium term (1-10 years): Parallel to, and building on, the short term measures, we need investment in technical innovation on farms and in other parts of the value chains. Technical development programmes such as those organised by Donau Soja in south-eastern Europe need to continue, integrated into the development of value chains. This requires 'bottom-up' innovation tailored to local circumstances within a wider framework of change. We need more systematic translation of relevant agricultural and food research into practice at all levels: European, national and local.

The development of global standards for responsible trade and imports through collaboration with China is also a reasonable medium term objective that can be initiated now through the Donau Soja Europe-China Protein Council that was launched in Beijing in 2017.

Also in the medium term, the reform of the Common Agricultural Policy can be steered to support the Protein Transition. Measures to increase the diversity of cropping and to improve on-farm biodiversity can directly and indirectly support the production of grain legumes. All CAP reform measures can be proofed for their effect on the protein balance, both at member state and European level with national targets set.

For the long term (1-20 years): Improvements in plant breeding are particularly relevant in the long term. It takes about 12 years from initial parent selection to the delivery of a new tested crop variety. The foundation of this is the availability of a more diverse range of well-characterised and tested parent breeding lines for breeding programmes. Traditionally, because genetic improvement of in-bred crop species such as wheat, barley and most grain legumes such as soya is not well protected by Plant Breeders Rights, there is under-investment by the private sector. This means that public support is required if society is to gain from the potential of plant breeding. In the case of grain legumes in particular, there is potential to improve crops in the medium and long term by incorporating new breeding material from for example China. The development of completely new value chain infrastructures is also a long-term undertaking. These are various, but of particular note is the development of new east-west trading within Europe.

Conclusion

The Protein Transition depends on consensus. EU member states, businesses, and public-good organisation such as Donau Soja must cooperate to foster consensus and bring the components of change together. A halving of the European Union's Europe's soya imports from the peak level of about 40 million tonnes (soya bean equivalent) in the years 2003 to 2008 is a realistic goal for 2030. If that is achieved, European agriculture will be more resilient; many Europeans will be healthier; the local, regional and global environment will benefit; and rural economies especially in eastern and south-eastern Europe will be more prosperous.

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