EIT Food
PROTEIN DIVERSIFICATION THINK TANK

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Protein Diversification for Future-Fit Farming

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EIT FOOD PROTEIN DIVERSIFICATION THINK TANK DISCUSSION PAPER

Knowledge & Innovation Center on Food, part of the European Institute of Innovation and Technology (EIT).

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Introduction

This paper provides an overview of the key points raised during a series of roundtable discussions between the EIT Food Protein Diversification Think Tank members, representatives of farmers, food producers, non-profit organisations, academics and other food system actors from several European countries, offering a starting point for further discussion and action. Firstly, it demonstrates the need to establish a narrative around protein diversification based on opportunities and benefits for farmers. It goes on to highlight key areas of collaboration between farmers and the food industry, and to provide several real-life examples of successful models of cooperation. Finally, this document identifies areas where additional research and support are needed to better understand the intersection of farming and protein diversification and develop robust business models aiding the transition to cultivating diversified sources of protein.

The discussion comes as a follow up to the EIT Food Protein Diversification Think Tank policy brief "Accelerating Protein Diversification for Europe" published on 26 October 2023, prompted by a growing backlash against the EU's green targets from the agricultural sector, and following conversations with policy-makers which highlighted the importance of farming. Insufficient information on the potential benefits to farmers from protein diversification and lack of defined pathways are currently some of the biggest barriers to uptake. The aim of the Think Tank's conversations with key stakeholders, and the resulting discussion paper is to develop constructive solutions and ideas on ways to valorise protein diversification for farmers and to provide an overview of the areas of consensus in the ecosystem. Central to the discussion was the need to identify case studies demonstrating viable paths of shifting to new business models and an analysis of factors that encourage and enable farmers to make that shift.

Disclaimer

This discussion paper does not fully represent the views of the listed contributors and reviewers, nor of their organisations. It is instead a true attempt at fostering and capturing dialogue among the involved parties across the entire value-chain. This publication is the reflection of an imperfect status quo and is meant to spark and support further dialogue, especially to involve more farmers as integral and important partners of this conversation.

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Framing the discussion within food systems transition

There is consensus among the participants of the discussions that a new way of talking about protein diversification is needed, framing it in the wider context of food systems transition, and identifying tangible benefits to farmers. A new narrative is not just about paraphrasing old ideas – it frames who is brought into discussions and where the focus lies. Protein diversification is not a goal in itself, but rather a pathway to ensure resilience of the EU food system, adequate food production, the commercial viability of farming and EU competitiveness, while achieving sustainability goals. Protein diversification and new business models for farmers constitute only a part of the systemic shift needed. These need to be interlinked with other elements and food system goals such as health, adaptation to climate change, food resilience in Europe, reduction of the environmental impact of food value chains, transition to regenerative practices, development of ecosystem services, and carbon credits, among others.

The efforts should focus on moving towards a sustainable diet mix which will improve human health, shifting the discussion from protein quantity to quality. Currently, our diets do not lack protein, yet modern diets are poor in micronutrients that come with animal-based protein-rich foods such as vitamin B12, calcium, iron and iodine. For better health, people in the Western world should aim for a more balanced diet, incorporating more plant-based foods that are low saturated fats, higher in fibre, and rich in a variety of vitamins and minerals. According to one study, depending on several factors such as age and gender, the optimal ratio between animal and plant-based proteins should be 40:60 for nutritionally adequate diets. This would bring environmental benefits, such as a 60% reduction in land use and 81% reduction in GHG emissions[1]. Other research, based on the Planetary Health Diet recommendations, shows that the ideal ratio of plant-based to animal-based ranges from 80:20 to 90:10[2]. However, so far, some approaches to encouraging a shift in consumer behaviour have not always been fully effective. In some cases, the focus has been on offering meat substitutes that do not fully meet nutritional needs, rather than prioritising more balanced alternatives that offer a broader range of nutrients. The Think Tank sees a distinct gap in publicly funded research into the nutritional values and health implications of diverse sources of proteins.

Efforts should also focus on promoting the affordability and accessibility of quality proteins in the Western world, while contributing to the reduction of the number of undernourished people worldwide.

De-polarising stakeholder dialogues

Better language is needed to bring farmers and protein diversification advocates together. From the policy perspective, it is important to highlight the numerous benefits of protein diversification, such as improving human and planetary health, enhancing biodiversity, supporting adaptation to climate change, boosting food resilience, and creating better business models for farmers. At the same time, there is a need for robust data to support these claims. Currently, the available data is either insufficient or presented in a way which does not convince farmers.

Questions regarding definitions remain, particularly around terms like protein diversification, regenerative farming, carbon farming, and carbon credits. Language needs to be simple and understood by all stakeholders: policy

1. Wolfram J. Simon, Renske Hijbeek, Anita Frehner, Renee Cardinaals, Elise F. Talsma & Hannah H. E. van Zanten (2024), Circular food system approaches can support current European protein intake levels while reducing land use and greenhouse gas emissions. Nature Food (5), 402–412. https://www.nature.com/articles/s43016-024-00975-2

2. https://eatforum.org/eat-lancet-commission/the-planetary-health-diet-and-you/

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makers, public procurement officers, producers, farmers, and consumers. Different audiences are receptive to different messaging and even farmers themselves represent a multitude of viewpoints and interests. Therefore, a balance is required between addressing the complexity of the food systems and delivering clear messages.

Effective language to discuss protein diversification with farmers include: emphasising diversified agricultural methods; highlighting food security and self-sufficiency; presenting protein diversification as a way to implement agroecological practices; positioning protein diversification not as a replacement for animal production, but as a complementary source of income and food production alongside traditional animal farming; introducing less intensive farming practices, compensated by other protein-rich foods such as plant-based foods, cellular agriculture, and fermentation-based technologies; framing protein diversification as a solution for both climate and health challenges.

Co-creating with farmers to deliver actionable solutions

Farmers play a key role in the transition towards sustainable agriculture and resilient food systems, and protein diversification is one of the most efficient tools towards achieving these goals. To be encouraged to engage, farmers need to be brought into the conversations. Their desire to be heard and respected clashes with the top-down approach that does not account for the realities that farmers face on the ground. This includes having to achieve the goals of 25% organic production or the reduction in pesticide use, which can cause implementation challenges, especially in some EU countries. Another example is carbon credits, which do not have credibility with farmers yet. Conversations with farmers should emphasise that protein diversification can be a sound strategy to build resilience and support more agroecological farming. However, solid solutions for financing just transitions for farmers seeking to change their business model are equally vital.

In an environment where economic stability is a concern, the adoption of new crops, technologies, and farming methods carries financial risks that may deter farmers from fully embracing the changes. Thus, farmers also need support and examples showcasing how the adoption of innovative practices and new business models create opportunities to diversify their sources of income, share risks, reposition them as key players in food production, and protect their livelihoods. This should take the form of clear and explicit guidelines outlining what farmers should grow, ensuring that proposed crops are suitable for the local climate zone, identifying potential buyers and specifying market demands. This requires commitment from end-users and food processing companies to reduce-risk in a commercially sensitive environment while engaging in discussions with farmers to secure a sustainable supply-demand value chain.

To meet the growing demand from vegan, vegetarian, and flexitarian consumers, there will be a rising need for new vegetable crops, pulses and legumes with enhanced nutritional content and a low carbon footprint. The demand for under-exploited and novel crops, agricultural by-products and biomass is also expected to increase, as biotechnologies in food production continue to develop. This includes innovations like precision and biomass fermentation, which use agricultural by-products, as well as cell-based production processes like cultivated meat and seafood.[3] At the same time, by 2050, conventional protein consumption is expected to increase by 57% for meat and 48 % for dairy globally.[4] Livestock farmers will thus have to meet the growing demand for meat and dairy and be valued for the land stewardship they provide. A circular approach would also allow them to valorise "side streams" from some plant products, transforming these into feedstocks. With continued demand for animal protein, championing protein diversification and regenerative farming should be accompanied by goals to substantially decrease of emissions from animal farming.

3. The JRC Biomass Mandate. https://knowledge4policy.ec.europa.eu/projects-activities/jrc-biomass-mandate_en

4. European Parliament, 2024. Alternative protein sources for food and feed. https://www.europarl.europa.eu/RegData/etudes/STUD/2024/757806/EPRS_STU(2024)757806_EN.pdf

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To navigate this complex landscape, farmers have to be part of the solutions and brought into the conversation as respected co-creators and experts in the field. Growers associations and farmers' groups play a key role in this, by organising, encouraging and leading their sector's involvement in such conversations.

Timelines

Another factor to take into consideration is timeline: how long will it take for biotechnology-based solutions and transition to regenerative practices to bring benefits to farmers? The discussion showed that many farmers are frustrated with the Farm to Fork's target for 25% organic produce, noting that it was introduced too fast. As a result, some farmers who had transitioned to organic production, suffered losses and reverted to conventional practices when prices dropped.

Another challenge related to timelines is that it takes at least five years to transition from conventional to regenerative agriculture. Farmers willing to engage need to have clear roadmaps for all the processes throughout that period. One discussion participant noted that they discourage farmers from shifting to plant protein production at this point in time, as this can result in bankruptcy, if done independently, without the necessary value chains in place and without adequate financing for the transition period. Instead, farmers are encouraged to form cooperatives that can invest together, build reliable value chains and stay strong in the transition.

The urgency brought by the environmental crisis, coupled with the time needed to put these value chains in place, amounts to an urgent need to speed up the transition processes. While the business models of animal production have been fine-tuned over the centuries, production models of other protein sources are more recent and thus require collaboration across the agri-food sector to co-create a resilient food system.

Farmers need to be included early in any discussions impacting their business. The Danish law on taxing agricultural emissions is a good example of adopting a realistic timeline that allows farmers to become the co-creators of solutions for the future of the food system and to adapt to future-fit farming. Although the law does not specifically focus on protein diversification, it showcases what is possible when farmers are part of the solution. This seemingly top-down approach was possible because there was an extended effort to bring farmers on board with the initiative and extensive pre-consultations with farmers' unions were conducted over several years. This approach may set a precedent and provide the roadmap for other countries to follow.

A model to support transition scenarios: the triptych

The EU food value chain needs to reduce its environmental impact. The research of Think Tank members and discussions with other food system actors have led to a proposal for a narrative centring around the triptych of mutually complementary farming practices (See Figure 1 below):

- the transition to agroecological practices, and in particular regenerative agriculture,
- carbon farming co-financing schemes or, more broadly, rewarding ecosystem services, and
- adopting protein diversification.

These three interlinked practices, when implemented together, represent the most promising business model for food production in Europe, and should serve as the blueprint for its future. In this scenario, rather than pushing for maximum yields, as it happens under the current system, farmers stand to potentially gain much more by engaging in regenerative agriculture practices. Direct payments for committing to regenerative agriculture are one benefit for farmers, but these practices also bring them many other tangible financial advantages. They contribute to boosting soil fertility, reducing the need for artificial fertiliser, conserving water, or more broadly freeing up land

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for more sustainable food production or nature restoration. This also provides the foundation for a new contract between farmers and food producers, aligning them on a shared transition roadmap and on the conditions to deploy it. The expected adoption of an environmental food label which assigns a score to food products depending on their environmental footprint adds immediacy to these combined efforts.

Figure 1. Triptych of mutually complementary farming practices

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The discussion around this proposed model reflected a wide consensus that all the practices and concepts forming part of the triptych require clear definitions. Currently, there are different interpretations of these concepts in both the policy space and among food system stakeholders, creating some confusion and potentially resulting in mistrust. Regenerative agriculture means different things to different people, as does protein diversification, while carbon farming is sometimes a nebulous concept often linked with carbon offsetting. Some participants in the discussion were particularly wary of the latter, as lacking scientific evidence for efficacy in reducing carbon emission and carrying with it the risk of greenwashing or even fraud. The very term 'carbon farming' was questioned in the ongoing discussion, with participants suggesting alternative terminology like "carbon capture and storage". According to some participants, regenerative farming is not necessarily a prerequisite to protein diversification. They suggested a broader approach, including concepts like nature farming, biodiversity farming, clean waters farming or a shift from food-centric intensive and degenerating farming to ecosystem-positive practices. To develop the thinking around the triptych, Think Tank members plan to organise and participate in workshops involving farmers and multiple other stakeholders, to discuss the opportunities of connecting regenerative agriculture with protein diversification.

To ensure alignment on terminology and concepts, the Think Tank proposes **the definition of regenerative agriculture** as a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services, with key techniques including no tillage, cover crops, increasing biodiversity, rotation cropping, attracting natural predators of pests, and integrating animals.[5] A similar yet enhanced definition is proposed by the Sustainable Agriculture Initiative Platform: an outcome-based farming approach that protects and improves soil health, biodiversity, climate, and water resources while supporting farming business development.[6] The European Alliance for Regenerative Agriculture (EARA) defines it as an ongoing, context-specific, and outcome-based approach aimed at improving the health of living soil ecosystems. This approach focuses on enhancing soil biology, biodiversity, and resilience against extreme weather, while reducing the use of synthetic fertilisers and pesticides. It promotes ecosystem regeneration, prioritising healthy soils and sustainable farming practices to benefit the environment, climate, and food security. EARA emphasises that this transformation is farmer-led and deeply rooted in the agroecological and cultural diversity of Europe's agricultural system.[7]

Carbon farming refers to sequestering and storing carbon and/or reducing greenhouse gas emissions at farm level. It encompasses a number of practices with the potential to deliver benefits to farmers and society, but it also carries risks that need to be managed, such as potentially negative soil health impacts or even negative biodiversity impacts associated with measures that are not locally appropriate. Carbon farming includes practices such as cover crops, improved rotations, peatland restoration or expanding agroforestry systems, and technology that comes with potential co-benefits to farmers and the environment, as well as negative or unintended consequences.[8]

5. EIT Food, https://www.eitfood.eu/projects/regenag-revolution/what-is-regenerative-agriculture

6. https://saiplatform.org/wp-content/uploads/2023/09/sai-platform_-regenerating-together_september-2023.pdf

7. https://regenerationinternational.org/2023/12/22/the-definition-of-regenerative-agriculture/

8. Hugh McDonald, Ana Frelih-Larsen,Anna Lóránt, Laurens Duin, Sarah Pyndt Andersen, Giulia Costa, and Harriet Bradley, 2021. Carbon farming. Making agriculture fit for 2030. https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695482/IPOL_STU(2021)695482_EN.pdf

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Assessment criterion	Managing peatlands	Agroforestry	Maintain and enhance SOC on mineral soils	Livestock and manure management	Nutrient management on croplands and grasslands
Carbon farming actions	Peatland rewetting / maintenance / management	Creation, restoration, and cropland and grassland management of woody management	Cropland and grassland management	Technologies to reduce enteric methane, manure management, increased herd and feed efficiency	Improved nutrient planning, timing and application of fertilisers; reduction in fertilisers
Total EU mitigation potential (Mt CO_2-e/yr)	51 - 54 Mt CO_2-e/yr	8 - 235 Mt CO_2-e/yr	9 - 70 MtCO_2-e/yr	14 -66 MtCO_2-e/yr	19 MtCO_2-e/yr
Per hectare mitigation potential (t CO_2-e/ha/yr)	3.5 - 29	0.03 - 27	0.5 - 7	Not available	Not available
Mitigation mechanism	Avoided emissions	Removal	Removal and avoided emissions	Reduced emissions	Reduced emissions
Type of change	Land use	Management	Management and land use	Management	Management
Co-benefits for farmers	Potential for paludiculture (productive use of wetpeatlands)	Diversification of outputs protects against single crop failure	Improved water holding capacity and workability of soils, productivity	Lower input costs (feed, fertiliser, energy), soil health, productivity	Lower input costs
Societal co-benefits	Biodiversity, flood regulation, water quality	Improved water retention, microclimate, soil health, biodiversity	Improved water retention, soil health, biodiversity	Decreased nutrient runoff; decreased ammonia emissions	Decreased nutrient runoff: decreased ammonia emissions
Risks	CH4 emissions (although net GHG benefit), decrease in production	Non-native species' impact on biodiversity	Biochar and off-farm compost impacting soil health/biodiversity	Animal welfare; water quality impacts of feed additives	Water quality impacts of nitrification inhibitors

Source: Carbon farming. Making agriculture fit for 2030

There are different ways to reward farmers for carbon farming practices, notably public funding through the Common Agricultural Policy (CAP), private financing via payments through supply chains, and voluntary carbon markets. For these to be effective, consolidated and transparent standards, regulations, or codes of conduct must be set in place coupled with rigorous monitoring, reporting and verification methods.

Promoting the concept of the triptych has policy benefits by presenting a compelling, coherent argument that simplifies a complex issue, making it more accessible. Yet the discussion acknowledges that the numerous variables make it challenging to model transitions based on a single scenario. It needs to be modelled and tested on various pathways, and more robust data is needed to determine which practices are truly sustainable and competitive. A number of projects are already underway to provide this data, including the EIT Food funded Tech4 RegenAg[9], which is testing soil samples from farms across Europe to assess the state of the soils in terms of bacteria, fungi, physical and chemical characteristics. In the future, the project will provide large-scale recommendations for specific protocols that farmers can implement. Another project providing key data is the Horizon Europe Lilas4Soil project[10], which explores various carbon farming practices and assesses their impact across 85-100 demo-sites in six Mediterranean countries.

9. https://www.eitfood.eu/files/Tech4regenag-one-pager.pdf

10. https://www.lilas4soils.eu/

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Questions regarding timelines also need to be addressed to complete the triptych model – Which practices should be given priority? When and how should supply-demand discussions begin, to ensure market access for farmers transitioning to agroecological practices? Some participants in the discussion do not necessarily see the need for the drive towards protein diversification to be accompanied by the remaining triptych elements and would like to see more research and clearer evidence-based guidelines for adoption. While there are other viable pathways, it is essential that the problems and solutions are considered in an interconnected manner, linking them with industry, policy and technology development goals. An alternative triptych could also be proposed, involving protein diversification, regenerative agriculture and access to finance.

Other approaches put forward in the discussion include nature farming [11] and other farming practices which are beneficial to nature through fostering biodiversity and soil health. Subsidisation schemes which reward stewardship services rendered by farmers are another suggestion. The EU has just launched a new soil monitoring directive which requires farmers to regularly monitor their soils. Established networks, such as EIT Food, support farmers in complying with the new legislation and co-creating a business model which ensures they are not burdened with the expenses. These co-creation activities can serve as lighthouse projects for sharing learnings of the transition and building capacity.

Many participants in the discussions believe that adopting the triptych would on the one hand help meet growing demand for protein, and on the other hand free up land, which can be given over to growing crops that are currently imported, and to restoring or rewilding. This would also provide farmers with new income models and boost their resilience in the face of climate change. Therefore, the narrative should focus not on the need for less farming, but on how protein diversification enables farmers to reduce risks, create new sources of income and expand sustainable, agroecological farming, thereby enhancing competitiveness and food self-sufficiency in Europe.

Land use benefits

Recent studies show that redesigning the food system on principles of circularity could free up to 71% of current agricultural land used in Europe. The land freed up could be used to produce enough healthy food within a self-sufficient European food system or could be used to feed 767 million people outside the EU (+149%)[12]. The potential could be even greater if cellular agriculture, precision and biomass fermentation, and cell-based production of dairy, fish or meat, were added to the picture. It is vital to address the fact that, in terms of land use, the EU is currently living beyond its means to sustain current patterns of food consumption. The recently published Green Alliance land-modelling report, A new land dividend[13] analyses land use in the ten biggest agricultural animal producers in Europe. Based on two scenarios of shifting to alternative proteins – low intervention and high innovation – the study investigates how much land could be repurposed for other food and environmental priorities. It concludes that the land shifts brought about by a higher uptake of diverse proteins could dramatically reduce current reliance on imports, enable a significant expansion of agroecological farming, whilst making far more space for nature restoration projects.

According to the participants of the discussions, A New Land Dividend is a good basis for engaging in conversations with stakeholders. Some farmers have expressed misgivings for various reasons, including the fact that it allocates new land, which is not yet available, to producing alternative proteins for which there isn't yet a robust market. On the other hand, it opens several possibilities, which still need to be defined in cooperation with farmers, such as what kind of business models would make protein diversification even more economically

11. https://www.permalogica.com/post/natural-farming-a-comprehensive-overview

12. Van Zanten, H. H. E., Simon, W., van Selm, B., Wacker, J., Maindl, T. I., Frehner, A., Hijbeek, R., van Ittersum, M. K., & Herrero, M. (2023). Circularity in Europe strengthens the sustainability of the global food system. Nature Food, 4(4), 320–330. https://doi.org/10.1038/s43016-023-00734-9

13. Green Alliance, A new land dividend. The opportunity of alternative proteins in Europe https://green-alliance.org.uk/wp-content/uploads/2024/03/A_new_land_dividend.pdf

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attractive for farmers. In general, the report is compelling and could be used to create impactful messaging and support policy creation around how to diversify land use in Europe.

Moreover, Controlled Environment Agriculture (CEA) practices, such as green houses, and vertical farms have the potential to support protein diversification. These technologies not only facilitate the growth of plant-based products but also enable the use of emerging technologies like molecular farming. While technology's operational costs can be a challenge, they are a key focus of innovation and offer significant benefits in terms of land use.

Biotechnology, the future of food

Over the last few years, the early signs of growing and pressing scarcity of many food ingredients have become clearer, compounded by climate change, and correlated with new diseases. Biotechnology plays a pivotal role in addressing global food security challenges. Food production-related biotechnologies include the bioprocessing of ingredients, as well as foods and beverages using enzymes and microbes. They also include the development of precision fermentation (recombinant compound production) and biomass fermentation (e.g. mycoprotein) for producing diverse food ingredients. They also encompass more innovative processes involving animals, insects, plants, and cells, along with molecular farming, genomic engineering and synthetic biology tools. These technologies have the potential to transform any type of biomass, feedstock, or even air into bio-based inputs for agriculture, new functional ingredients for food or feed, and materials for packaging.

Assumptions are often made that livestock farmers perceive cellular agriculture, precision fermentation and plant-based foods as a threat, but in fact at least some of them see in them the potential to create new markets. Some farmers are ready to explore integrating biotechnologies into their current business model, but they require information about different feedstocks needed for technologies such as precision fermentation and cellular agriculture (new crops, new side streams as feedstock), and about molecular farming opportunities that are gaining traction. In addition, farmers may face uncertainty on when to adopt biotechnology-based food production practices due to lack of market access for technologies that may not yet be ready for full-scale application. To implement these innovations, farmers need support from R&D and public institutions, including more flexible policy approaches, education programmes, reduced bureaucracy, and access to both public and private funds

Consumer acceptance is a key element of the success of these engineering biology approaches. Currently, the level of knowledge, awareness, and receptiveness to these novel ideas varies significantly across regions and demographics.

The future of meat and dairy production

All the discussion participants fully agree that animal products are central to many aspects of European identity and culture, as well as a cornerstone of our economy. Therefore, when shaping future policies, it is crucial to respect those who raise animals, as they play a central role in the transition to diversified sources of protein.

The Think Tank recognises the need for multi-stakeholder conversations around cultivated meat, emphasising that there is broad consensus that Europe still needs animal-based farming. Alternative proteins are not intended to replace this system but to provide a complementary option. Dialogue should address challenges and identify opportunities, while being conducted with prudence. In these technologies, traditional agriculture plays a role

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in providing initial cells and nutrient components used in the cell culture process, but research is needed to determine the most sustainable technologies, and the impact that upscaling biotechnology-based production might have on many aspects of rural economies.

Another avenue for investigation is the potential to implement small-scale, decentralised cellular agriculture on farms; the work of Respect Farms[14] in the Netherlands illustrates this potential. Further analysis is needed to identify which crops and rotations could be used to produce feedstock and media ingredients, particularly those that rely on organic inputs such as proteins, sugars, amino acids, and fibrous polymers. This knowledge, vital for informed decision making, is being gathered through projects such as the Horizon-funded FEASTS project[15] (Fostering European Cellular Agriculture for Sustainable Transition Solutions), research from Dr. William Chen, [16] and the UK project on farmers and cultivated meat[17].

14. https://www.respectfarms.com/

15. https://feasts-innovation.eu/

16. Dr. William Chen from Nanyang Technological University is applying the valorization of soya waste to cultivated meat feedstocks. https://www.foodnavigator.com/Article/2023/01/13/researchers-develop-food-waste-based-scaffolds-that-could-make-cell-based-meat-cheaper

17. Royal Agricultural University, 2022. Cultured Meat: Threat or Opportunity for UK Farmers? https://www.rau.ac.uk/about-rau/news-and-events/events/cultured-meat-threat-or-opportunity-uk-farmers.

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New value chain models and ensuring certainty for farmers

Think Tank discussions also focused on the need to establish new value chain models, which could ensure a measure of stability for farmers shifting to diversified sources of proteins. Participants pointed out that while there is a pressing need to separate EU value chains from global ones for reasons of sustainability and self-sufficiency, there is also a need for new, integrated and diversified protein value chains within the EU.

As businesses, farmers have three major priorities: incurring low risk (for example when embarking on cultivating new crops), increasing their revenues, and preserving their natural environment. Becoming part of integrated value chains, which guarantee they can sell their protein crops, is a way to meet these priorities, while also providing support in the deployment of agroecological practices. Participants in the discussion also pointed out that mid-term security, which farmers aspire to, would require them receiving three to five-year contracts. The discussion looked at the roles of different actors in ensuring demand, with food processors, food producers and retailers identified as key in this respect.

Contracting

Examples of integration from the French market focus on successful contracting between farmers and the downstream value chain. In this model, farmers are sure of selling the pulses they grow, for example to companies that produce plant-based alternatives to meat.

Hari&CO is a French plant-based food start-up working with legume farmers who supply it. This provides an excellent example of protein diversification that works well for farmers (4 testimonial videos). Intact Régénérative is a startup which in partnership with Axéréal is committed to structuring a local pea and fava bean value chain for HappyVore, a producer of plant-based meat alternatives [18]. Last but not least, Nutrition & Santé, a French company which in 1997 pioneered Europe's soybean farming sector, is involved with local partners in local sustainable agricultural chains with minimum three-year contracts.

Keeping value on the farm

It is worth considering various models of diversification which keep value on the farm-level. One of them is for arable crop farmers to start processing crops onsite, keeping production on the farm or within a cooperative. Another model entails farmers renting out facilities to biotech companies. However, transitioning to new farming methods, such as regenerative practices or protein diversification, often requires significant initial investment costs in new seeds, technology, and infrastructure, which could present a challenge, particularly for smaller or rural farms with limited access to technological resources. The solutions could be provided by socially conscious investors deciding to invest more in the companies that ensure farmers are getting a fair deal in the value chain; and by governments introducing targeted grants for equipment to help farmers diversify revenue. A participant in the discussion put forward the concept of an "economic sweet spot". It entails reducing inputs, which results in smaller yields, but allows farmers to strike a balance, as even at lower yields they can still make a profit. Further work is needed on developing farm-centric business models that would channel the benefits to farmers.

18. https://www.axereal.com/sites/default/files/2023-12/AXEREAL_DPEF_2022-23_web%20pl%20OK%20EN.pdf

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Co-operatives

Farmers and processors working in the same cooperative within the plant-based value chain can ensure that shifting to plant-based alternatives does not result in the loss of primary, high-value products from the farm. These examples of cooperatives also producing plant-based products include Lantmännen, a Swedish farming cooperative and Northern Europe's agricultural leader, which invested SEK 1 billion (around 94 million EUR) in a pea protein production facility in 2022, and has put in place a host of other initiatives for future farming; [19] and Valio, a Finnish company, which channels all payments to farmers through dairy cooperatives while also manufacturing plant-based alternatives to milk, dairy and cheese. The discussion also brought up the case of the Limagrain co-operative, one of the largest seed producers in France, also growing cereals, grains and legumes. Having once been the leading producer of pulses, five years ago Limagrain launched a much-needed re-education programme for its farmers about growing pulses and treating diseases which affect their crops.

Retailers and consumers

Some of the discussion participants identified retailers as key to controlling the market and influencing value chains. Thy provided examples of farmers and retailers creating business models around this kind of cooperation. One is the case of the French retailer Carrefour working with Moulin Marion and EIT Food Rising Food Star (2024) Carbone Farmers, experimenting with low carbon wheat for organic bread and exploring with farmers how to improve the sustainability characteristics of their wheat. Another example of a current project bringing together local farmers and producers is the EIT Food funded GROW Project[20], focused on capacity building, promoting sustainable and zero-carbon practices, enhancing farmers' entrepreneurial skills and adoption of sustainable digital technologies. As part of the project, the biggest retailers in Portugal and Poland are financing 100 farmers to enrol in this programme to learn how they can farm more sustainably with regenerative agriculture, and apply digital solutions.

It is important to note that both consumer trends, such as the increasing demand for organic and sustainably produced foods, and corporate social responsibility targets of retailers are drivers for collaboration on sustainable practices. There is consensus in the discussion that the role retailers might play in boosting both supply and demand for diverse sources of protein is very important, and the transformation would benefit from greater commitment on their part.

Ideally, there are retailers leading the change in consumption patterns. The Norwegian supermarket chain REMA 1000 has significantly reorganised its sales of beef, with the contents of packages reduced by up to 20% to help reduce climate footprint and prices lowered accordingly, so that cost per kilo remains the same. It is also nudging consumers towards healthier choices, by offering options where packages of meat are sold together with vegetables. Meanwhile in Denmark, the supermarket Lidl, part of the Legume Partnership, has committed to gradually increasing targets of sales of pulses and legumes.

As much as retailers are key to influencing what and how farmers produce, it is consumers and their choices that create the demand. For consumers, taste is crucial, but the food industry still needs to work on improving the taste of complementary protein products. To help producers improving the taste of these foods, RDI funding should be unlocked [21]. This will provide the necessary resources to foster innovation and accelerate the development of more appealing and palatable diversified sources of proteins.

19. Lantmännen. Farming of the Future. The road to climate neutral farming 2050. https://www.lantmannen.com/contentassets/a7c4d84884744bc082914ffeca6a4ff7/lantmannen-farming-of-the-future.pdf
20. https://www.eitfood.eu/projects/grow
21. https://www.eitfood.eu/files/EIT-Food-PDTT-Policy-Brief-Accelerating-Protein-Diversification-for-Europe.pdf

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Moreover, consumers would also benefit from greater awareness and access to quality education about the nutritional benefits of whole foods, cooking skills and the environmental impact of modern diets. A good place to start would be mandatory cooking classes in public schools and accessible resources on how to eat within dietary guidelines and planetary boundaries. A great example is the EIT Food Educators Programme[22], a community of teachers, schools, universities, NGOs and SMEs, which provides learning materials to teachers and schools across Europe, reaching thousands of children and young people each year, inspiring healthy and sustainable food choices.

Corporate Science Based Targets Initiative

Some participants in the discussion noted that the push towards plant-based protein is not primarily driven by the retail sector, but by companies further upstream in the value chain. These companies are motivated by sustainability goals rooted in science-based targets, which offer a clear and defined roadmap for reducing emissions, in line with the goals of the Paris Agreement. As most of the carbon footprint comes from purchased goods, both retailers and food manufacturers are dependent on their suppliers for meeting Science-Based Target Initiative (SBTI) [23] targets, so there is demand from buyers for sourcing more sustainable ingredients, as well as for primary data that can be valorised in carbon accounting. Participants provided examples of large bakeries and bakery ingredient suppliers which have CO2 reduction in their sustainability targets, like Puratos, the Belgian La Lorraine Bakery Group, and Grupo Bimbo Global Bakeries. All those companies have made commitments towards SBTI and translated them into sustainability initiatives with their suppliers. This clearly demonstrates that in this industry there is a move towards practices of reducing CO2 emissions and water use. It also sends a strong signal to farmers that the demand for their product is changing with lowering carbon impact now emerging as the new priority for the entire food industry. Some Think Tank members shared the view that retailers were in fact the least prepared for this shift.

It is crucial to remember that farmers are entrepreneurs who run businesses, and as such, their concerns mirror those of any entrepreneurs. Transitioning to regenerative farming practices requires upfront investment in new seeds, technology, and infrastructure. Farmers are focused on increasing their revenue streams while minimising risk in their investments, when it comes to cultivating new protein crops and adopting regenerative agriculture. In the past, subsidies under the Common Agricultural Policy (CAP) were a key tool to minimise risk for farmers. However this support is less prevalent today. Currently, the security farmers need comes from securing procurement agreements with retailers or the government (e.g. for public canteens), as well as the demand from downstream players in the value chain focused on meeting their SBTI goals.

In an example of value chain integration and support for farmers in light of SBTI, Danone works with dairy farmers who deliver exclusively to the company and whom the company supports on a journey towards regenerative agriculture. By guaranteeing offtake of crops that are sustainably farmed, it gives financial security to the farmers. It also runs initiatives aiding the transition to regenerative practices aimed at arable crop farmers (oats, almonds), while in Poland it is working with EIT Food on regenerative agriculture guidebooks for farmers.

Carbon farming

There is a clear need to clarify and promote new business models, including in relation to the anticipated development of carbon farming schemes and credits. This includes outlining their contribution in co-financing the transition to sustainable agriculture and examining how they will reshape relationships and value-sharing between breeders, growers, food processors and EU market retailers. As stated above, many of the discussion

22. https://www.foodeducators.eu/
23. https://sciencebasedtargets.org/

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participants perceive the practice of carbon offsets through credits for farming practices that sequester carbon as ineffective, inherently hard to monitor, susceptible to fraud and greenwashing, while offsets that do occur are seen as often easily reversed. Another key issue which remains to be tackled is how to scale to impact some of the experiments and initiatives mentioned in the discussion. Valio's Climate Programme, which has to date trained 1500 carbon farmers and has a network of over 1500 dairy farms practising carbon farming on almost 130,000 hectares, is an inspiring example of implementation [24].

Some of the participants brought up the theme of the new contracting framework supporting the transition to agroecological and regenerative practices. A relevant example is Axéréal, which has helped 200 farms transition to regenerative agriculture practices with the aid of carbon farming schemes. There are also a number of startups which play a key role in this discourse, such as Carbone Farmers. They are in the process of deploying around ten new low carbon value chains, bringing and aligning together multiple stakeholders within each value chain around a shared roadmap. This roadmap will guide and pilot the implementation of low-carbon practices to produce ingredients and animal products with improved sustainability scores, via, among other levers, the introduction of complementary crops. This programme makes use of low carbon credit schemes, which finance the deployment of new agroecological practices, help pay for training, trials, auditing, and provide direct, tailored support as well as metrics and documentation to all farmers concerned. It constitutes an excellent example of using carbon credits generated by deploying regenerative agriculture practices to finance the transition, while diversifying and thus consolidating the future of farming activities.

Private and public sector incentives

Policies driving protein diversification can also be boosted by incentives at the most basic level, like those introduced by the Danish cooperative Arla[25], which resulted in CO2 emissions reduced by 22% in one year. Arla's point-based system rewards past and future climate and environmental sustainability practices undertaken by farmers. For every activity that meets specific criteria, farmers can collect points which add 0,03 euro cent per every kilo of milk delivered to Arla. The rewarded activities are the potentially most impactful, feasible and cost-efficient for farmers to lower their farm's carbon footprint, protect nature and improve biodiversity. The 19 levers include feed efficiency, fertiliser and land use, protein efficiency, soy use, grazing, continuous plant cover, perennial crops, soil sampling and a number of others. Currently Arla is on track towards its 2030 target of reducing emissions compared to the 2015 baseline, as well as other sustainability goals such as enhancing biodiversity.

Incentives can also be provided by the state, as seen in the Danish model, where, for the first time globally, an agricultural greenhouse gas emissions tax is being introduced. This is supported by measures to limit land available for animal production and encourage farmers to diversify production, engaging in practices that deliver ecosystem services. While subsidies and grants are vital to ease the burden and reduce risks for farmers seeking to transition to regenerative agriculture practices, it is equally important to ensure that farmers can in fact access funds. To achieve this, farmers need to be aware of available programmes and face limited bureaucratic obstacles when applying for funding.

On various occasions, the discussions broached the fact that the food system lacks a level playing field – animal protein production gets more support than plant-based proteins. For example several European countries impose higher VAT rates for plant-based alternatives than for milk and dairy. There is considerable bias in the way agricultural production is currently subsidised, which results in consumers paying only a part of the cost of food. True cost accounting is needed to shed light on the environmental, social, and health costs excluded from food prices. Integrating externalities, such as ecosystem degradation, greenhouse gas emissions, water pollution, loss of biodiversity, and negative health impacts due to excessive pesticide use or poor nutrition, would provide more transparency and become a driver for consumers, policymakers, and producers to make informed decisions,

24. https://www.valio.com/sustainability/climate-programme/#:~:text=Our%20goal%20is%20to%20cut%20the
25. https://www.arla.com/sustainability/the-farms/arlas-sustainability-incentive-model-qa/

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supporting a shift towards a more fair and resilient food system.
A system in which European farmers receive rewards for regenerative practices and ecosystem services instead of the current CAP subsidies, a key feature of the triptych model described previously, could be one pathway towards addressing the issues of these externalities without raising food prices for consumers.

New value-added options for farmers

The discussion highlighted pilot projects that could serve as promising scenarios for introducing value-added options, though they have not yet evolved into fully developed business models. These and other scenarios are still under research but already show potential. Located in Northern Europe, where grass is abundant, these initiatives benefit from the region's resources. However, as pointed out by one Think Tank member, to maintain a sustainability advantage, grass should be used as a primary protein crop only when other crops cannot be grown.

One of these projects is a grass biorefinery. Scenarios are being developed by universities and research institutions in the Nordic countries which demonstrate how grass, a middle crop in regenerative agriculture, can be used for multiple purposes: to fraction RuBisCO proteins (most abundant protein on Earth with valuable amino acid composition), obtain biomass in precision fermentation as potential feedstock for cellular agriculture, and as residue which can be fermented in bioreactors. The concept has already been presented to farmers' associations and they are enthusiastic, as this would allow them to use grass not only as feed, but also to develop new business practices and new revenue streams. This is a positive example of integrating potential new models into existing ones and adding value by finding new uses for incumbent agricultural products. The data around potential revenue streams for farmers in this project is still being analysed, but this appears a promising scenario.

Public procurement and building a value proposition with farmers

The challenge of effectively addressing and engaging farmers is universal. For example, there is a need for systemic change in public procurement and new ways of working with farmers in the area of public procurement are imminent [26]. Yet, procurement officers often face challenges in directly connecting with farmers to communicate their requirements, preventing farmers from adequately preparing to meet demand and plan accordingly. Engaging farmers in joint projects is particularly difficult – apart from GDPR hurdles, it can be challenging to find farmers who actually want to embrace change. They are often hesitant, fearing alienation from their families and community. In many regions, farming is deeply rooted in tradition. Transitioning from conventional practices to protein diversification, regenerative agriculture, or other innovative methods may encounter resistance, particularly from farmers accustomed to growing specific crops or raising livestock.

Yet bringing in the demand side, especially in the public sphere, can be an important driver of change. Once again, it is crucial to clearly define what is expected from farmers and approach them with a concrete set of requirements. This also involves allowing sufficient time for long term planning (around 15 years) and encouraging engagement by co-creating the value chain with farmers. In doing so, health considerations and educational support should also be integrated into the process. Good relations with farmers can be established by meeting them in times of uncertainty and experimenting together. The Legume Partnership[27], involving 45 partners across the whole value chain, from retailers to farmers, effectively illustrates this point. With the participation of retail giant Lidl, municipalities across Denmark, food producers and farmers, the initiative is a collective effort to help Danes meet the recommended daily intake of 100 g of legumes, by promoting the consumption and production of these products, thus benefiting public health and the planet.

26. JRC134432, 17.07.2024. Sustainable public procurement: current status and environmental impacts. https://publications.jrc.ec.europa.eu/repository/handle/JRC134432

27. https://www.baelgfrugtspartnerskabet.dk/om-bfp

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In the right channels, engagement between procurement officials and farmers is possible. Access points to farmers include cooperatives, companies that farmers supply, such as KMC (a potato starch company) and Meelunie (a plant-based ingredients supplier); EU-funded projects; other national public funded projects; researchers like Professor Cor van der Weele, from Wageningen University, who held focus groups with 55 farmers on 3 clusters on future technology; animal husbandry, business model and family heritage; students from agricultural schools.

To incentivise farmers to incorporate new practices leading to protein diversification, it is important to offer a concrete value proposition which defines a market for their produce and is suited to their specific situation. Developing such a scenario would require, on one hand, commercial expertise and insights, and on the other, identifying a farmer interested in co-creating the scenario, with insights from the start of the value chain. This could mean for example developing a solid business plan to transition to a more sustainable business model; linking farm production to health and disease prevention; introducing production geared towards school meals; working with farmers on a nutritious whole food at a reasonable price for the consumer. The case of Alpro and its range of plant-based alternatives to milks and yoghurts drives the point that, when executed strategically, a transition to diversification is both possible and beneficial to both consumers and producers.

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Towards understanding and action

There is no doubt that the farming sector needs to adapt to a changing world. Practices in line with the principles of regenerative agriculture, combined with a shift to diversified sources of protein, currently offer the best route towards new paradigms. The Think Tank identifies the need for a cohesive framework to drive change, as along with the importance of continuous support and education for growers and cultivators who may not be familiar with the various aspects of protein diversification. To mitigate these educational gaps, stakeholders along the farming value chain will need comprehensive training and support to understand the new protein sources and how to cultivate them, particularly if they are transitioning from traditional animal-based agriculture or staple crops.

At the heart of this approach must lie a fundamental respect for farmers, driven by an understanding of their concerns. To incentivise farmers to adopt new practices leading to protein diversification, it is important to offer a concrete value proposition and business model which defines a market for their produce and is suited to their specific situation. Developing such scenarios would require knowledge and insights from businesses, identifying like-minded farmers who are interested, and co-creating the scenario with insights from the start of the value chain.

Amongst the most promising avenues to ensure profitability for farmers, enhance supply chain resilience, while enabling a fair transformation of the food system, the series of discussions has identified the following:

- Making sure that solutions are co-created respectfully, involving stakeholders from across the whole value chain and especially farmers who are central to changes in the food system.
- Placing the discourse around protein diversification in the wider context of changes in the food system that are necessary to build resilience against growing demand for protein (and food) demand, climate challenges, and geopolitical volatility.
- Prioritising policy solutions which explore multiple, interconnected approaches, such as the triptych of regenerative agriculture, carbon farming and protein diversification, where complementary practices offer tangible benefits to farmers.
- Considering and incentivising business models for carbon credit financing, introducing an Emissions Trading Scheme (ETS) for the agriculture and food sectors, developing rewards for ecosystem services and leveraging the opportunities of carbon farming schemes to cofinance the transitions.
- Ensuring that the cost of transition is well documented and shared between all actors of the value chain, by reinventing how supply chains and their business models operate.
- Demonstrating that protein diversification is an opportunity for farmers to diversify their income, restore soils, develop environmental services and reduce the sustainability impact of their activities.
- Developing strategies to support farmers in embracing protein diversification, based on the understanding that farmers are entrepreneurs who run volatile businesses, and at the same time seek to lower the risks they incur.
- Supporting the implementation of protein crops in the value chain, for example by offering training in the growing of protein crops and ways of ensuring seasonal stability of yield, facilitating access to new types of seeds, agricultural inputs and tools, and providing ongoing technical support and advisory services to help farmers implement new practices effectively and troubleshoot issues as they arise.
- Developing business models which allow farmers to integrate their existing models into new ones, e.g. new applications for existing crops and agricultural products and providing support in integrating them into stable value chains.
- Documenting future needs for agriculture biomass and crops which will serve the projected development of

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food production-related biotechnology solutions, such as precision and biomass fermentation, cell-based production and molecular farming.

- Identifying new business opportunities for farmers arising from the collaboration with biotech-related value chains and ways of generating income from agricultural byproducts or grass.
- Exploring business models which help farmers keep value on the farm, such as collaborating in cooperatives, keeping processing within the company (for value-added profits) and deploying governmental infrastructure grants to help farmers diversify income streams.
- Providing training and support for designing, testing, piloting and scaling up projects, with guidance on helping develop them into fully fledged business models.
- Introducing systems that highlight – and add value to – environmental impact reductions and the benefits of regenerative practices, making these visible to retailers and consumers throughout the entire value chain. Both the Corporate Sustainability Reporting Directive (CSRD) scoring and Eco-score (environmental food label displayed on every food product) should be strongly supported in their deployment and application to food products.

To develop and implement these principles, expanded collaboration among academia, the agricultural sector, the food industry, governments, and EU policymakers is vital, as is further research and, not the least, an open ear and massive support for continued innovation. New technologies and business models are crucial in order to transform food systems.

The engagement of stakeholders is instrumental in maintaining dialogue and ensuring that all perspectives are taken into consideration. **The EIT Food Protein Diversification Think Tank is committed to furthering this dialogue and provides a platform for policymakers and stakeholders to collaborate in shaping a food system in which the wide-spread adoption of diversified sources of protein is foundational to improving human health and agricultural sustainability.**

We are at the cusp of necessary transitions in the agriculture and food sector that can offer new types of successful collaboration and business models with farmers at their centre. In the meantime, EIT Food and its Protein Diversification Think Tank welcomes any further contributions to advance and consolidate the reflection on farming and protein diversification. Please share your ideas and join the discussion by contacting us at PDThinkTank@eitfood.eu

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Reports referenced in the discussion:

Wolfram J. Simon, Renske Hijbeek, Anita Frehner, Renee Cardinaals, Elise F. Talsma & Hannah H. E. van Zanten (2024), Circular food system approaches can support current European protein intake levels while reducing land use and greenhouse gas emissions. Nature Food (5), 402–412. https://www.nature.com/articles/s43016-024-00975-2

European Parliament, 2024. Alternative protein sources for food and feed. https://www.europarl.europa.eu/RegData/etudes/STUD/2024/757806/EPRS_STU(2024)757806_EN.pdf

Anne-Katrin Bock, Maciej Krzysztofowicz, Jennifer Rudkin, Vera Winthagen. Farmers of the future. JRC, 2020. https://publications.jrc.ec.europa.eu/repository/handle/JRC122308

Van Zanten, H. H. E., Simon, W., van Selm, B., Wacker, J., Maindl, T. I., Frehner, A., Hijbeek, R., van Ittersum, M. K., & Herrero, M. (2023). Circularity in Europe strengthens the sustainability of the global food system. Nature Food, 4(4), 320–330. https://doi.org/10.1038/s43016-023-00734-9

EIT Food, Accelerating Protein Diversification for Europe, 2023. https://www.eitfood.eu/files/EIT-Food-PDTT-Policy-Brief-Accelerating-Protein-Diversification-for-Europe.pdf

McKinsey, 2023. Sustainable feedstocks: Accelerating recarbonization in chemicals.

ProVeg. AMPLIFYING FARMERS' VOICES: Farming perspectives on alternative proteins and a just transition. https://proveg.org/report/amplifying-farmers-voices/

European Commission, 2024. Building the future with nature: Boosting Biotechnology and Biomanufacturing in the EU. https://research-and-innovation.ec.europa.eu/document/download/47554adc-dffc-411b-8cd6-b52417514cb3_en

Green Alliance, A new land dividend. The opportunity of alternative proteins in Europe https://green-alliance.org.uk/wp-content/uploads/2024/03/A_new_land_dividend.pdf

European Commission, Joint Research Centre, 2024. Sustainable public procurement: current status and environmental impacts. https://publications.jrc.ec.europa.eu/repository/handle/JRC134432

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