



TRANSITION PATHS FOR LEGUMES



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A truly multidisciplinary approach

Partners on the TRUE (TRAnsition paths to sUustainable legume based systems in Europe) collaboration share their thoughts on their involvement in this innovative agricultural transition pathway project



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What is the importance of knowledge exchange and communicating the outcomes from TRUE?

HM: To achieve the overall goal of the project, it is crucial to share the knowledge, experiences and ideas of scientists and stakeholders along the whole value chain. A multi-actor approach means much more than just communicating the outcomes: this is already an important part of the communication and knowledge exchange ahead of the outcomes. For example, as is achieved via TRUE's Legume Innovation Network workshops. The outcomes will include the contributions of main legume stakeholders and will support decision makers on the European, national and local level.

AK: It is already well understood that an increase in legume production and consumption would reap many benefits for the sustainability of our food system. Despite this, it is not happening fast enough. The transdisciplinary team of TRUE partners is challenging the lack of implementing more legumes in the European food system and it is our task as leader of WP1 to encourage the key actors to act.

How valuable are the Case Studies to this project?

DS: The overall objective is to determine and demonstrate the factors that will contribute to

successful transitions using a network of farm and supply chain-based innovation Case Studies across the pedo-climatic zones, representing a diversity of key legume species and production systems.

GN: All Case Studies are interesting and have important objectives. For example, CS5 is looking at options for producing biomass suitable for animal feed or anaerobic digestion and how legumes in particular can help. CS1 aims to lower the carbon footprint of milk of the national average and the CS4 is using life-cycle assessment (LCA) to determine the economic and environmental performance of contrasting dairy systems feeding legumes and leguminous by-products. CS2 aims to bring the use of white clover for pasture-based farms into sharper focus which would result in a greater alignment of extension services in the promotion of white clover on farms. CS3 aims to increase market value of legume crops by proving feasibility as an alcohol industry adjunct and CS11 will bring the knowledge of how policies can influence the choice of food items used in public food service.

What are the key goals of the nutrition and product development work?

MV: The goal of WP3 is to help increase the utilisation and consumption of legumes, by firstly conducting a nutritional screening of different legume types and then developing novel applications for these, specifically in the food and feed sector. The materials that are being screened come from different types of production systems and the work is being conducted by academia and industrial partners. The work in this WP is highly multidisciplinary and stresses the importance of generating novel uses for legumes in the food and feed industry to comply with the global trend for lowering meat consumption. We are very open to engaging with researchers and other interested parties, so people are free to contact us with questions or suggestions.

In what way does the work on markets and supply chains fit into the overall project?

KH: If the goal of encouraging the use of legumes in food and feed for both the conventional and organic sectors is to be

achieved, a key requirement is to understand demand and supply and the dynamics of local and international markets. WP4 is designed for this purpose.

What are some of the challenges with using the Attributional Life Cycle Analysis?

MW: Attributional LCA is well defined and has been applied for decades, primarily to industrial systems, generating environmental footprints that can be used to benchmark the environmental efficiency of production across different systems.

DS: Attributional LCA is increasingly being applied to farming systems, where it has some drawbacks. Typically, data may be collected for a farm subsystem over one year of operation, providing a "snapshot" of inputs and outputs. This can lead to inaccuracies when assessing systems that are not in equilibrium, and when changes in production have wider consequences. Accounting for these consequences, some of which are indirect and occur via perturbations to the market (economic signals), is tricky. This involves either economic modelling or derivation of scenarios informed by expert stakeholders. This increases uncertainty, but can provide greater insight into the wider environmental consequences of expanding legume production.

Can you explain what the objectives of the economics component are?

LT: WP6 – Economics will combine micro- and macro-economic techniques, such as spatial econometrics, linear programming models incorporating risk analysis, structural choice models and sectoral economic models, to assess the supply and demand of sustainable and profitable legumes across Europe in a farm to fork approach.

SS: More specifically, it will analyse: the farm performance in a number of scenarios following introduction of (novel) legumes into farm production in a number of European countries; the willingness of farmers to uptake and of consumers to pay for (novel) legumes as market forces are a main influence on production choices; and the impact of farmer and consumer intentions/behaviour on sectoral and trade performance at EU level.

How will this work help inform the development of future policy, technology and business models?

BB: The practice-research partnership is a critical component of this work. Only in this way can we generate actionable knowledge to increase sustainable legume cultivation and consumption across Europe. The paradox we face is that policies for legume-based food production, where they exist at all, have failed to increase legume-based diets and even production over the long term. The main aim, therefore, is to enable co-innovative practices to bring into effect policies that may more successfully support current, and future, food and nutritional security challenges via the use of legumes.

EK: TRUE will create a curated list of policies and assess and optimise connectivity between policies. This will be a helpful resource that policymakers operating at sub-EU scales can re-use. We also hope it will help develop a currently missing common understanding on the role of policy in promoting legume supported systems. There is a range of options for successful transitions, a broad variety of legume species and processing approaches could be used that match the pedo-climatic zones and farm types.

What are the key aims and purpose of the Transition Pathways work package?

MD: The key aim of WP8 is to perform sustainability assessment of legume supported production systems and agricultural feed and food chains. The sustainability assessment will consider the entire legume-based agricultural quality chain (from production to policy makers), where each node in the chain will be assessed from environmental, economic and social perspectives. If certain nodes do not meet the sustainability criteria, a transition pathway to sustainability will be proposed.

AT: Several possible pathways could lead to the conditions and states fulfilling the sustainability criteria, hence the selection of the most appropriate pathway represents a challenging decision problem. To make the results of this WP operational, a web-based application for sustainability assessment and modifications of the legume-based quality chain (if the sustainability criteria are not met), will be developed and made available to a wide spectrum of end-users.

Project Insights

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Impact Objective

- Identify and enable transition paths to realise sustainable legume supported food systems



Transition paths for legumes

A global collaboration called TRUE involves 24 partner institutions working together to identify key mechanisms and sustainability indicators for supporting improved agrifood systems, with a focus on Case Studies highlighting innovative farm networks, processors, retailers and 'consumer citizens'

A practice-research partnership TRUE (Transition paths to sUustainable legume based systems in Europe) aims to increase sustainable legume cultivation and consumption across Europe through the development of a Decision Support Tool for primary producers, agronomists, processors, associated businesses and decision makers. This tool will enable a range of options for successful transitions to be identified, encompassing a variety of legume species and processing approaches. The work of 24 institutions from 11 countries is coordinated by Dr Pietro Iannetta, who is based at the James Hutton Institute in Scotland, UK. This is a four year Horizon 2020 project funded by Research and Innovation action that will run until March 2021.

TRANSITION PATHS

Iannetta explains that the researchers involved are seeking to identify transition paths to legume supported cropped systems that are able to harmonise the three pillars of sustainability – economic, social and environmental – which are in conflict. 'Generally, the economic pillar takes precedence at the expense of the society and environment pillars,' he says. 'Legumes can help balance all three and also support good nutrition and valuable food culture.'

The collaborative nature of the project is of the utmost importance, and is well balanced, as Iannetta highlights. 'We have

an equal number of academic and non-academic partners, the latter including SMEs and NGOs,' he says. 'Also, we are completely gender balanced. We have a true focus on transdisciplinarity and co-innovation.' The project involves 24 Case Studies that will work to characterise key mechanisms and associated ecosystem services indicators. TRUE comprises nine different works packages (WPs), each led by a different institution. These WPs are: WP1 - Knowledge Exchange and Communication; WP2 - Case Studies; WP3 - Nutrition and Product Development; WP4 - Markets and Supply Chains; WP5 - Environment; WP6 - Economics; WP7 - Policy and Governance; WP8 - Transition Pathways; and WP9 - Coordination

KNOWLEDGE TRANSITION

TRUE has already made considerable headway. One example is the project's work in the area of soybeans highlighting the potential importance of a dual bradyrhizobia and AMF (arbuscular mycorrhizal fungi) seed inoculum. 'This increased dry matter yields (for forage to feed animals) by over 30 per cent above the bradyrhizobia-only treatment,' highlights Iannetta. Production of seed inoculum containing a range of AMF types at commercial arable scale has only recently been achieved. This is of great utility for the world's most produced and consumed grain legume and other legumes too.'

The project's approach aims to understand and manage in a balanced manner, economic and environmental aspects of food systems by optimising societal elements. The partners are focused on optimising diversity and resilience in commercial and environmental terms throughout the supply chain and seek to deliver excellent nutrition to ensure the highest possible states of health and wellbeing for people and animals.

'The challenge lies in harmonising the whole supply chain, and even at different scales, small and large, and in a manner that pays respect to national, regional or local ambitions for sustainability,' Iannetta observes. 'Among all the transitions that can be mapped, the 'knowledge transitions' will be key. Many people, even some producers and plant scientists, are unaware of the capacity of legumes for biological nitrogen fixation, and the functional or ecological significance of this.' With almost 18 months of the project already completed, the researchers are now looking towards developing unique intellectual property (IP), novel processes, products and patents. They are excited about the opportunity the next three years will offer to deliver some very tangible outcomes in regards to sustainable legume supported agrifood systems.

