

# TRUE

TRansition paths to sUustainable  
legume-based systems in Europe

## TRUE Deliverable 7.1 (D40)

Report on Co-design of Policy Analysis (Report, Public)

[www.true-project.eu](http://www.true-project.eu)



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## TRansition paths to sUstainable legume-based systems in Europe

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*"The era of commodity research aimed at feeding a starving world is over. A new era has begun that requires us to nourish everyone in ways that can be sustained environmentally, economically and culturally. Policymakers urgently need to recognise that diets are compromising economic productivity and well-being as never before. Delegates to the upcoming G20 and G7 meetings in 2017 should take collective responsibility for fixing our failing food system. Funders who support agriculture and nutrition research must focus much more of their resources accordingly, doubling their current allocations to more-nutritious food systems by 2020. Scholars and journals must become more pluralistic in the methods and approaches that they support. We can only fix problems in our food systems if we diagnose them correctly. If we do not, the world's future health and economic problems will be very much greater than they are today." (Haddad et al. 2016)*





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### Deliverable Description & Contributors

- **Due date:** 31<sup>th</sup> December 2017
- **Actual submission date:** 24<sup>rd</sup> January 2018
- **Project start date:** 1<sup>st</sup> April 2017
- **Duration:** 48 months
- **Work package:** Policy (WP7)
- **Work package leader:** Bálint Balázs (ESSRG)
- **Deliverable Title:** Creating an effective science-policy interface to support legume supported cropping systems and food and feed supply chains
- **Nature of deliverable:** Report
- **Dissemination level:** PU: Public
  
- **Deliverable description:** This report, '**Creating an effective science-policy interface to support legume supported cropping systems and food and feed supply chains**', will be co-developed *via* TRUE partners especially those involved in developing the Innovation Case Studies, Legume Innovation Networks and the ISAB and other associated partners. The report will advance reflective learning techniques for policy assessment. The main output will be a summary of specific research and information needs, an outline of stakeholders' interests in knowledge exchange, and identification of desired communication tools to advance the project - especially with a view to effective policy impact.
  
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### 1. Background to the TRUE Project

#### 1.1 TRUE Project Executive Summary (*abbreviated*)

TRUE's perspective is that the scientific knowledge, capacities and societal desire for legume supported systems exist, but that practical co-innovation to realise transition paths have yet to be achieved. TRUE presents 9 Work Packages (WPs), supported by a *Intercontinental Scientific Advisory Board*. Collectively, these elements present a strategic and gender balanced work plan through which the role of legumes in determining 'three pillars of sustainability' – 'environment', 'economics' and 'society' - may be best resolved. TRUE realises a - multi-actor approach, the basis for which are three *Regional Clusters* managed by WP1 ('*Knowledge Exchange and Communication*', Universitaet Hohenheim, Germany), that span the main pedo-climatic regions of Europe, designated here as: *Continental, Mediterranean* and *Atlantic*, and facilitates the alignment of stakeholders' knowledge across a suite of 24 Case Studies. The Case Studies are managed by partners within WPs 2-4 comprising 'Case Studies' (incorporating the project database and *Data Management Plan*), '*Nutrition and Product Development*', and '*Markets and Consumers*'. These are led by the Agricultural University of Athens (Greece), Universidade Catolica Portuguesa (Portugal) and the Institute for Food Studies & Agro Industrial Development (Denmark), respectively. This combination of reflective dialogue (WP1), and novel legume-based approaches (WP2-4) will supply hitherto unparalleled datasets for the 'sustainability WPs', WPs 5-7 for '*Environment*', '*Economics*' and '*Policy and Governance*'. These are led respectively by greenhouse gas specialists at Trinity College Dublin (Ireland; in close partnership with Life Cycle Analysis specialists at Bangor University, UK), Scotland's Rural College (in close partnership with Universitaet Hohenheim), and the Environmental and Social Science Research Group (Hungary), in association with Coventry University, UK). These *Pillar WPs* use progressive statistical, mathematical and policy modelling approaches to characterise current legume supported systems and identify those management strategies which may achieve sustainable states. A *key feature* is that TRUE will identify key *Sustainable Development Indicators* (SDIs) for legume-supported systems, and SDI thresholds (or 'safe limits') consistent with sustainable states. Data from the *foundation WPs* (1-4), shared between the *Pillar WPs* (5-7), will be resolved by WP8, '*Transition Design*', using machine-learning approaches (e.g. *Knowledge Discovery in Databases*), allied with *DEX (Decision Expert)* methodology to enable the mapping of existing knowledge and experiences. Co-ordination is managed by a team of highly experienced senior staff and project managers based in The Agroecology Group, a Sub-group of Ecological Sciences within The James Hutton Institute.

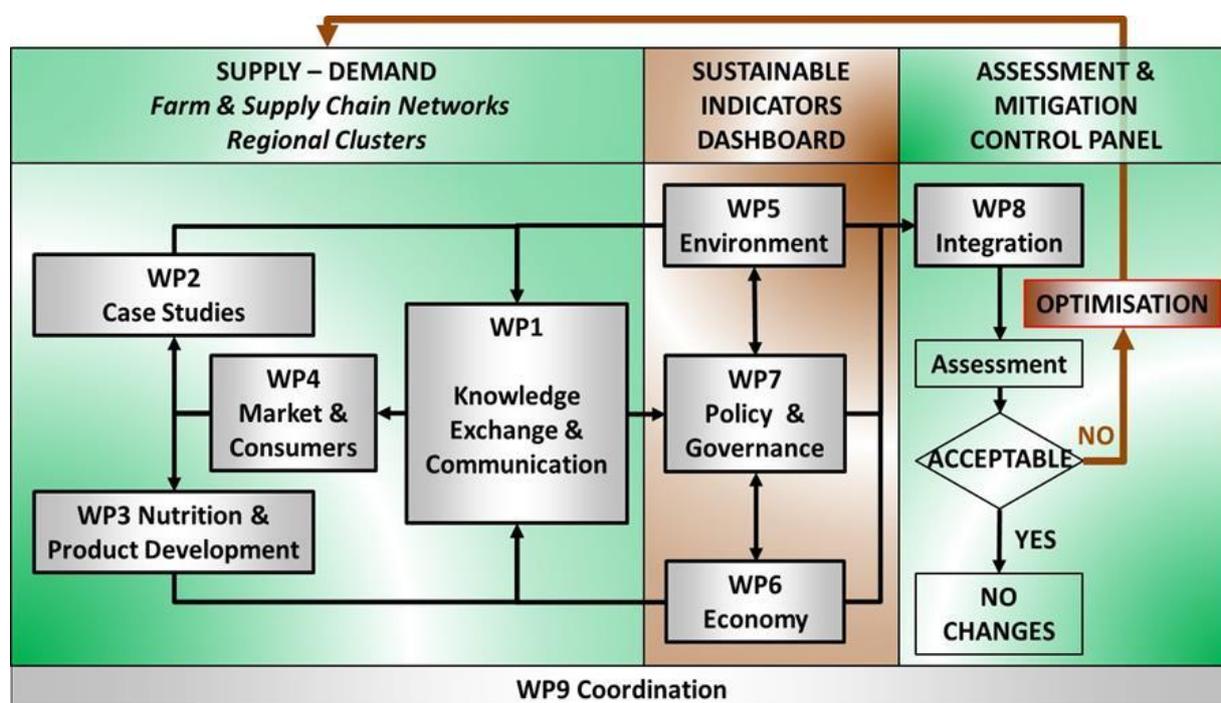




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### 1.2 Work Package Structure

Flow of information and knowledge in TRUE, from definition of the 24 Case Studies (left), quantification of sustainability (centre) and synthesis and decision support (right).





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### 1.3 Project Partners – Table

No	Participant organisation name (and acronym)	Country	Organisation Type
1 (C*)	The James Hutton Institute (JHI)	UK	RTO
2	Coventry University (CU)	UK	University
3	Stockbridge Technology Centre (STC)	UK	SME
4	Scotland's Rural College (SRUC)	UK	HEI
5	Kenya Forestry Research Institute (KEFRI)	KE	RTO
6	Universidade Catolica Portuguesa (UCP)	PT	University
7	Universitaet Hohenheim (UHOH)	DE	University
8	Agricultural University of Athens (AUA)	GR	University
9	IFAU APS (IFAU)	DK	SME
10	Regionalna Razvojna Agencija Medimurje (REDEA)	H <sup>2</sup>	Development Agency
11	Bangor University (BU)	UK	University
12	Trinity College Dublin (TCD)	IE	University
13	Processors and Growers Research Organisation (PGRO)	UK	SME
14	Institut Jozef Stefan (JSI)	SI	HEI
15	IGV Institut Fur Getreideverarbeitung GmbH (IGV)	DE	Commercial SME
16	ESSRG Kft (ESSRG)	HU	SME
17	Agri Kulti Kft (AK)	HU	SME
18	Alfred-Wegener-Institut (AWI)	DE	RTO
19	Slow Food Deutschland e.V. (SF)	DE	Social Enterprise
20	Arbikie Distilling Ltd (ADL)	UK	SME
21	Agriculture And Food Development Authority (TEAG)	IE	RTO
22	Sociedade Agrícola do Freixo do Meio, Lda (FDM)	PT	SME
23	Eurest -Sociedade Europeia De Restaurantes Lda (EUR)	PT	Commercial Enterprise
24	Solintagro SL (SOL)	ES	SME

\*Coordinating institution





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### 1.4 TRUE Objectives (abbreviated)

**Objective 1: Facilitate knowledge exchange (UHOH, WP1)**

- *Develop a blue-print for co-production of knowledge*

**Objective 2: Identify factors that contribute to successful transitions (AUA, WP2)**

- *Relevant and meaningful Sustainable Development Indicators (SDIs)*

**Objective 3: Develop novel food and non-food uses (UCP, WP3)**

- *Develop appropriate food and feed products for regions/cropping systems*

**Objective 4: Investigate international markets and trade (IFAU, WP4)**

- *Publish guidelines of legume consumption for employment and economic growth*
- *EU infrastructure-map for processing and trading*

**Objective 5: Inventory data on environmental intensity of production (TCD, WP5)**

- *Life Cycle Analyses (LCA) -novel legumes rotations and diet change*

**Objective 6: Economic performance - different cropping systems (SRUC & UHOH, WP6)**

- *Accounting yield and price risks of legume-based cropping systems*

**Objective 7: Enable policies, legislation and regulatory systems (ESSRG, WP7)**

- *EU-policy linkages (on nutrition) to inform product development/uptake*

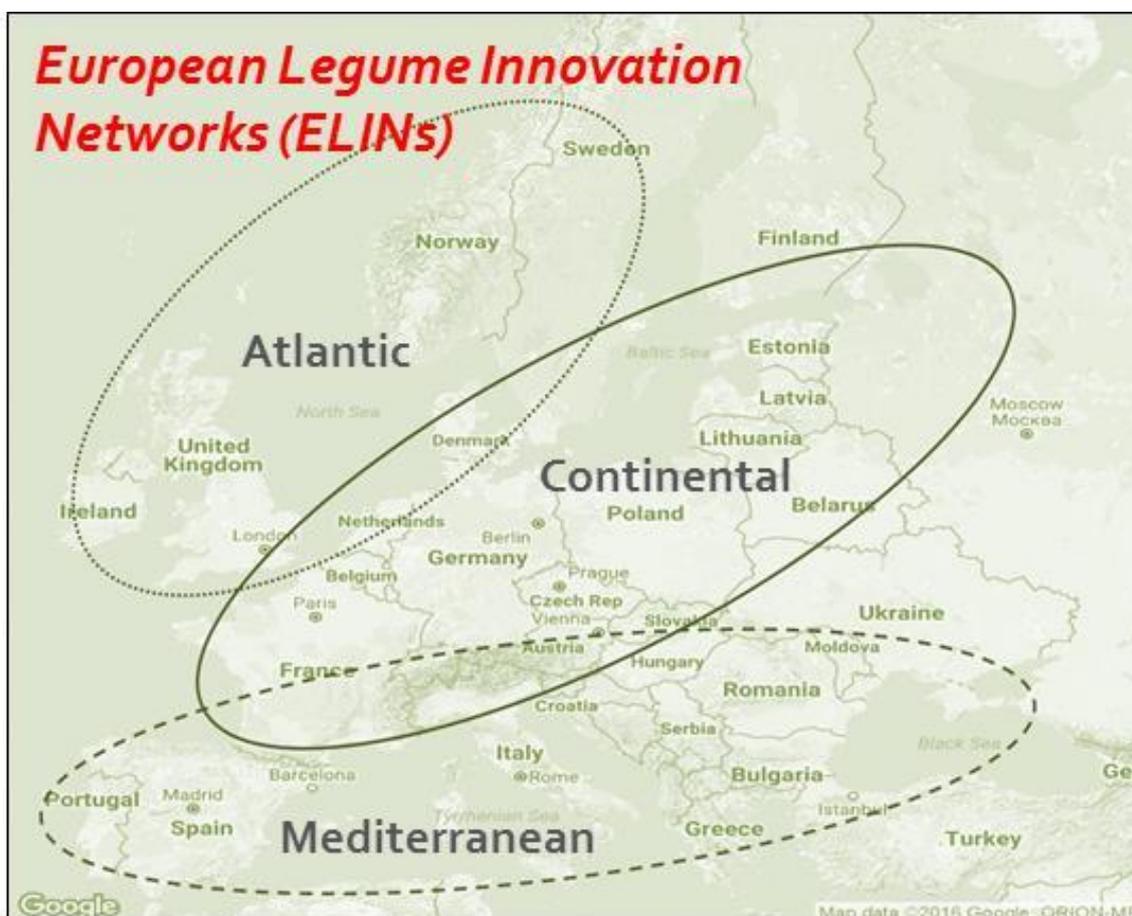
**Objective 8: Develop decision support tools: growers to policy makers (JSI, WP8)**

- *User friendly decision support tools to harmonise sustainability pillars*



## TRansition paths to sUstainable legume-based systems in Europe

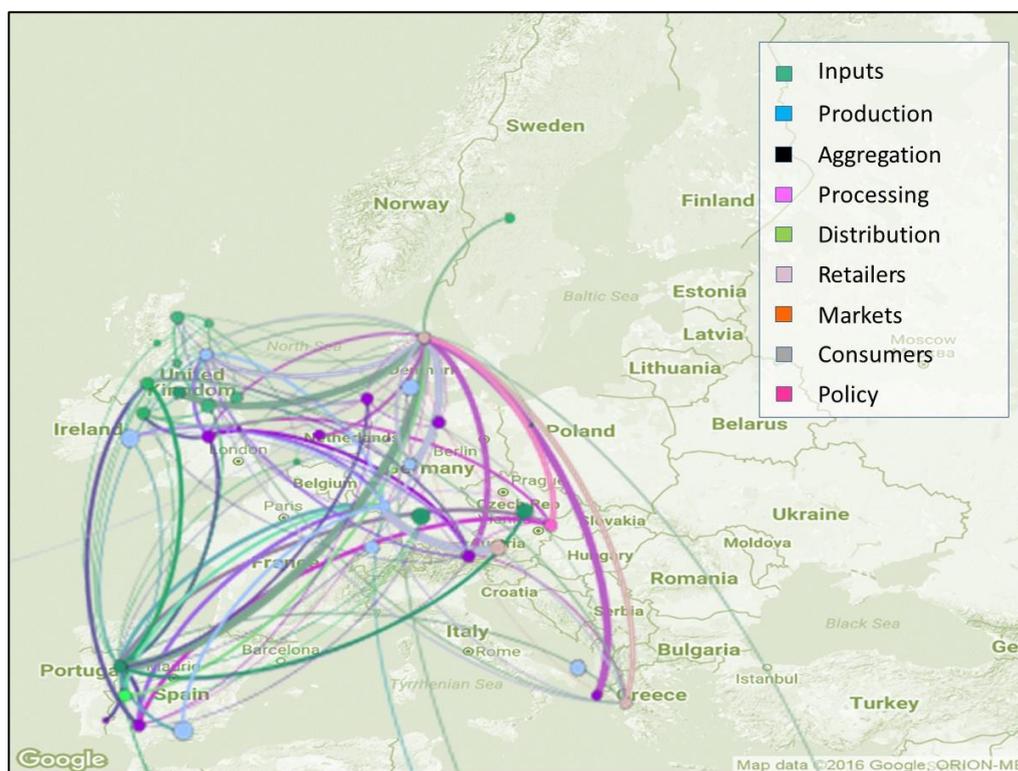
### 1.5 Regional Cluster<sup>1</sup> & Case Studies



TRUE Regional Clusters through which the Knowledge Exchange and Communication (WP1), events and workshops will be carried out with stakeholders. The three Regional Clusters are denoted with full, dashed and dotted lines for Continental, Mediterranean and Atlantic pedo-climatic areas of Europe, respectively.

<sup>1</sup> The Mediterranean LIN includes Kenya (partner KEFRI). **NB: In response to feedback from stakeholders, the term 'Regional Clusters', has now been replaced by the term, "Legume Innovation Network", or 'LIN' And collectively the LINs are referred to as, 'European Legume Innovation Networks', or 'ELINs'.**

## Transition paths to sustainable legume-based systems in Europe



Network diagram showing diversity of legume species represented across partner countries where point size is related to the number of legume species at each node; colours represent different links in the quality chain; and, thicker lines indicate higher numbers of interactions between partners.



## TRansition paths to sUustainable legume-based systems in Europe

### 1.6 Year 1 Deliverables

Deliverable (D) No.	Title	Lead Beneficiary	Type	Dissemination Level	Due Date (months)
D51	Annual activity plan - Year I	JHI	R	PU	1
D1	Capacity development workshop	UHOH	OTHER	PU	3
D3	Project website	UHOH	DEC	PU	3
D49	Project Management Tools	JHI	OTHER	CO	3
D60	H - POPD - Requirement 3	UCP	ETHICS	CO	3
D11	Creation of Data Resource Centre	JHI	OTHER	CO	4
D12	Submit DMP, database populated annually – for Year I	AUA	R	CO	6
D50	Data Management Plan	JHI	R	CO	6
D59	POPD - H - Requirement 2	UCP	ETHICS	CO	8
D40	Report on co-design of policy analysis	ESSRG	R	PU	9
D4	Scientific, practice and policy publications - Year I	UHOH	R	PU	12
D29	LCA methodology report	BU	R	PU	12





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### Scope of TRUE Deliverable 7.1 (D40)

#### First summary for the 'Co-design of Policy Analysis' (Report, Public)

- Legumes are at the centre of policy debates concerning global food security and sustainable food production systems. Where they exist, policies to realise legume-based food production have failed to increase legume-based diets, and even production over the long term. More effective policy innovations are urgently required to encourage sustainable protein production.
- Early insights from the European Union (EU)-funded project *Transition paths to sustainable legume-based systems in Europe* (TRUE) are presented: on how 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.
- A new science-society-policy interface, putatively named *Pulse Europe*, is also highlighted as a model by which regional transdisciplinary knowledge exchange may be used to identify local solutions to more sustainable, legume-supported, cropped systems and diets. The framework for this new science-society-policy interface has been presented at the FAO Technical Workshop on '*Sustainable diets in the context of sustainable food systems*', 12-13 July, 2017, Rome<sup>2</sup>.
- This deliverable contributes to Objective 7, "*Enable policies, legislation and regulatory systems*", comprising EU-policy linkages (on nutrition) to inform legume-based product development and uptake. It presents a common framework to identify opportunities and propositions to influence pathways for change at the policy level and to engage multiple actors. It also illustrates where there are evidence gaps, and where certain problems are not prioritised by political mechanisms.
- TRUE partners were consulted during the Kick-Off Meeting (Edinburgh UK, April'17) on how to approach the policy content of Innovation Case Studies and Regional Clusters which are now referred to collectively as European Legume Innovation Networks, or ELINs, and individually at LINs). Stakeholders' interests in knowledge exchange will be further elaborated during a series of the Continental-, Atlantic and Mediterranean-ELINs, each held annually in years 1-3 of the project. ELINs have been co-designed with consortium partners.

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<sup>2</sup> <https://www.unscn.org/en/news-events/upcoming-events?idnews=1693>





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- A guideline (template) was prepared to identify policy issues, solutions and stakeholders around ELINs and Case Studies. Interviews are planned within each country to identify policy questions. Policy-Interview Guidelines have been refined through interviews in Hungary. The Guidelines are helpful in gathering narrative statements from stakeholders on an understanding of the role of policy in legume networks and innovations; and needs for policy change. The interviews will continuously add to a database of policy questions, actors and solutions.
- Finally, TRUE will create a curated List of Policies with a short description of the policy and search keywords (metadata tags) to help assess and optimise connectivity between policies, and also re-use by policy makers operating at sub-EU scales.
- **Expected Result(s):** 1) a common understanding on the role of policy in promoting legume supported systems; 2) a common understanding of policy questions, actors and solutions from partners and Case Studies; 3) a list of key policy-interview questions; 4) a template for reports from the policy sessions at the Legume Innovation Network meetings and 5) a curated list of policies with search keywords (tags) to help optimize possibilities for re-use.





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### 2. EU policy and governance perspectives for legume-based systems

#### 2.1 Introduction

##### Legumes and their role in the transitions to an agroecological paradigm

Several science-policy initiatives recently contended that future food systems face enormous problems: The Economics of Ecosystem and Biodiversity for Agriculture and Food (TEEBAgriFood), the International Panel of Experts on Sustainable Food Systems (IPES-Food), and the UN Decade of Action on Nutrition 2016–2025.

The overarching vision for science in these initiatives did not vary a great deal between developed and developing nations. Similarly, the Global Research and Funding Survey on Pulse Productivity and Sustainability claimed that:

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*"There is a strong desire and action across all national and global research and funding agencies to develop genomics tools for breeding programs, to conduct state-of-the-art breeding programs for improvement in genetic gain, pest resistance and quality, to improve crop production and crop protection practices for farmers, to produce food in a sustainable manner, to transfer information in a useable form to farmers, to help make farming profitable, and to develop new resilience in crops to meet the challenges of climate change, largely including drought and heat. In addition, all global funding agencies mention ending chronic hunger, providing nutritional foodstuffs to end malnutrition, and focusing on maternal health and the gender gap. These themes resonate around the world and across economies." (Murell 2016: 5)*

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Legumes therefore feature at the centre of food policy debates concerning global food security and sustainable agri-food systems. The main science-policy dialogue is positioned in the subject area of food and nutrition security (FNS), emphasising the need for innovative policy and research to improve FNS through legumes (See, e.g. the Morocco Declaration on Pulses, Agrawal, 2017). From a policy perspective, legumes are often defined as, "meat analogues" in the context of population growth and a shrinking small-scale farming sector (FAO, 2016). Another type of narrative presents many legume types as 'orphans crops': these crops can compass a diverse set of legume species, often greater in number than the few main traded grain legume commodities and which are also





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often regionally important, though they receive very little if any research attention. There is also the growing evidence base about the prevalence of low-nutrient diets, crowding out effects of monocultures and associated polarised processing capacities, and so a lack of access to diverse foods instead of diversity in production and diet (FAO, 2016). From the policy perspective legumes then may already lead a “*Revolution with Greens*” (Tenkouano 2011) required as part of a balanced diet or grown in small-scale backyards or home/school and community gardens with minimal resource (Keatinge et al., 2012).

Legumes have unique agroecological benefits that raise their profile in policy debates, especially in the context of global food security, Common Agricultural Policy (CAP) reform and European Innovation Partnership (EIP) protein group discussions. Despite the advantages of production as crops and forage, in Europe their cultivation is declining and legumes are underutilised and largely unappreciated for their role in enabling sustainable diets. Nevertheless, there is an agreement in the EU research and policy communities about the overall usefulness of reintroducing protein crops, mainly legumes, to improve the sustainability of European agricultural systems. Also on the EU level, a transition from an agrochemical to an agroecological paradigm has been suggested many times (Hausling, 2011; Helming et al., 2014; Rees et al., 2015; Magrini et al., 2016, IYP, 2016). Bues et al., (2013) explored how to increase the production of protein crops in Europe and identified nine policy solutions: six inside the CAP and three outside. This study contended that an integrated approach would be desirable that combines Greening Measures, investment in research, and constraints on the use of synthetic nitrogen fertilisers. It is important to note though that Greening Measures, as introduced under the last reform of the CAP, in 2013, more and more have been assessed as environmentally ineffective (ECA 2017, Ceeweb 2016)

Another policy study by Topp et al. (2014) also contended that specific policy incentives could change the low level of cultivation of legumes in Europe. For example, in a comparative impact-simulation of six innovative policies for grain-and forage legume-types, the authors contended that the CAP could help by incorporating an integrated package on pulses and that the most significant effects could be reached only through international trade and climate-change mitigation policies. EU policies aim to increase the competitive advantage of EU on the world market, and could be designed to enhance the performance of legume-based systems. The EU does not have a coherent single food policy, and the food policy domain is scattered and disintegrated. It results in conflicting policies: on the one hand it seeks to diminish the environmental footprint of agriculture, and on the other, it would cater for the growing demand for animal protein from the food and feed industries. Another distinctive characteristic of the policy context is that under the current 2020 flagship policy strategy (aiming for jobs and growth) the EU is acknowledging the co-existence of the often





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contradictory needs under the competitive open-market principle. Furthermore, all policies that impact legume systems operate across many levels of governance shaped by international, EU, national and regional agreements. In essence, EU policy goals are controversial, *e.g.* sustainable diets do not connect to agri-business aspects. EU policy foresight documents also highlight the tensions and competition between achieving food security, environmental protection and climate action. However, any mention of legumes or pulses is scarce and indirect.

### 2.2 Legumes and environmental policies

The EU environmental policy is guided by the 7<sup>th</sup> Environment Action Programme to 2020 which created a vision, that:

*"In 2050, we live well, within the planet's ecological limits. Our prosperity and healthy environment stem from an innovative, circular economy where nothing is wasted and where natural resources are managed sustainably, and biodiversity is protected, valued and restored in ways that enhance our society's resilience. Our low-carbon growth has long been decoupled from resource use, setting the pace for a safe and sustainable global society."*

Legume-based systems can have a significant environmental contribution to soil fertility, carbon capture, fertiliser reduction, water quality improvement, and emissions reduction. From a policy perspective, the Nitrates Directive and the Water Framework Directive have the potential to raise the relative economic performance of legume-based systems indirectly. Environmental problems caused by fertilisers and pesticides have been already widely acknowledged in EU policy reports. The implementation of the EU policy on *Sustainable Use of Pesticides* (2009/128/EC) is found "*insufficient*" (COM 2017), and it is similar with the N-fertiliser usage, which accounts for half of the fossil fuel energy in agricultural production systems (EU (2015/2225(INI))). Also, in line with the *Roadmap to a Resource Efficient Europe* (COM (2011) 571) at the levels of production-system and cropping-system, legumes can decrease fertilisers, mitigate GHG, and interrupt the build-up of pest populations.





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### 2.3 Legumes and climate change mitigation policies

The climate mitigation potential of legumes has most often been studied in the context of policies addressing the EU 2 °C target temperature reduction: which is much dependent on GHG mitigation estimates in agriculture, technological advancements and dietary changes. Estimation of the impacts of changing technology and consumer demand on food-related GHG reduction calls for radical decreases in meat consumption (increase in demitarianism<sup>3</sup>), and a compensatory increase in legume cropping (c.f. Bryngelsson et al., 2016).

The mitigation potential of legume crops is preferred for its low cost of implementation. A recent French study (Dequiedt and Moran, 2015) claims that legumes could decrease 7 % of chemical fertiliser emissions and at the cost of € 77 million. Thus, carbon pricing in agriculture may be more efficient than a uniform regulatory requirement for including the crop in arable systems. An increase in the cost of carbon emissions by taxing greenhouse gas (GHG) emissions at a relatively high rate would make nitrogen fertiliser more expensive, and thus legumes more attractive. The 'Report EU AGRICULTURAL OUTLOOK - Prospect for the EU agricultural markets and income 2016-2026' only mentions legumes linked to climate contexts as a GHG mitigation policy option by which the high GHG costs of the EU meat market may be offset.

For example, a policy introducing a 15 % compulsory GHG emission reduction obligation introduced for the EU livestock sector could have negative effects upon production assuming no additional support is given to farmers. However, pulses were mentioned only once as a nitrogen-fixing crop, and are reduced to a minor role in Greening Measures on ecological focus areas (EFAs). The overall mitigation achievement and contribution by new technologies such as anaerobic digestion and improving nitrification inhibitors (million t CO<sub>2</sub> eq mitigated, EU 28, 2030) identified only a marginal role for legumes.

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<sup>3</sup> Demitarianism is the practice of making a conscious effort to reduce meat consumption largely for environmental reasons. The term originates from the "Barsac Declaration: Environmental Sustainability and the Demitarian Diet" in 2009 identifying the large-scale animal farming as a primary contributor to disruptions in the nitrogen cycle and the subsequent effects on air, land, water, climate and biodiversity. URL: <http://www.nine-esf.org/node/281/index.html>





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### 2.4 Legumes and their potential role to improve nutrition, diet and health

Policy studies of consumption by the EU food legislative framework have also highlighted the need for policy coherence (see, '*Scoping Study – Delivering on EU Food Safety and Nutrition in 2050*', 2013). 'The Europe 2020 Strategy, '*A resource-efficient Europe*', also pressed for policy incentives for healthier and more sustainable consumption of food. Lowering the environmental impact of food production and consumption patterns have been a primary concern for the EU sustainable food/diet policies. According to the, '*European Food and Nutrition Action Plan, 2015–2020*', dietary factors are crucial for the health and well-being of European societies. In Europe, non-communicable illnesses such as cardiovascular disease, diabetes, cancer and respiratory diseases together account for 77 % of the burden of disease and almost 86 % of premature mortality (see EUR/RC67/9 Roadmap). Nutritionists press for sustainable diets based on high consumption of fresh vegetables, fruits, nuts and legumes. From the Scoping Study '*Delivering on EU food safety and nutrition in 2050*' (Mylona et al., 2016) and from scenarios considering future climatic changes and policy responses (EC, 2013), authors concluded that cross-cutting policy measures would be vital for the future of EU food safety and nutritional qualities. Therefore, EU level policies need to strengthen cross-cutting collaboration among policy Directorate Generals (SANCO, Agriculture, Environment, Trade and Research).

The study also pointed out that policy measures and research programmes and projects to address both consumer and producer behaviour jointly are needed, particularly education and communication. Notably, a range of incentives to induce behavioural change can potentially be applied at all levels of the food chain, from primary production (*e.g.* concerning more sustainable production methods), to marketing and pricing of products (*e.g.* better nutrition labelling, possible fees, charges or taxes on unhealthy or unsustainable products) and on to consumption (*e.g.* measures to reduce meat consumption). These would need to be complemented by relevant education and communication measures (*e.g.* concerning nutrition-related knowledge, information and education to emphasise the advantages and lifestyle value of a more plant-based diet, but also cooking skills and elementary food safety rules), as a lack in these increases the need to consume processed foods.

The interlinkages of food, nutrition and health, as essential components of food security, entered the policy discussions at the World Food Summit in Rome, in 1996 (see *e.g.* [http://www.fao.org/monitoringprogress/index\\_en.html](http://www.fao.org/monitoringprogress/index_en.html)). Ever since, nutrition policy has lagged behind nutrition science, but that position has started to change. In health, the EU extended its policy reach through the European Food Safety Authority (EFSA) and DG SANTE which commissioned a foresight analysis on, "*Delivering on EU Food Safety and Nutrition in 2050* -





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*Scenarios of future change and policy responses*". The report acknowledged that the supply of animal protein for human consumption (meat and milk) may become increasingly difficult due to significantly higher demand for feed protein, largely as a function of population increases, and especially in developing regions of the world where living standards are increasing (Food Chain Evaluation Consortium, FCEC 2013). Member state governments also started cooperation in the *EU Platform on Diet, Physical Activity and Health (EUPDPAH)*, with currently 32 European-level umbrella organisations as members<sup>4</sup>. The EC also launched an EU-level Research & Innovation Policy Framework to future-proof our nutrition and food systems, called *FOOD 2030 - EU Research & Innovation for tomorrow's nutrition and food systems*<sup>5</sup>.

The conventional food system is a critical determinant of diets and nutrition, malnutrition and obesity. A recent World Bank report clearly states that fruits, vegetables and legumes should be supported at the expense of cereals, palm oil and sugar, while the subsidies and price support mechanisms for unhealthy ingredients should be abandoned. Furthermore, to find pathways to new more sustainable food systems and innovative policy solutions (e.g. dietary guidelines) greater civil society engagement and more effective public-sector research and education efforts are required (Abarca-Gómez et al., 2017).

Healthy, that is nutritionally adequate and environmentally sustainable diets, and sustainable nutrition security is a new research and policy agenda that has recently gained considerably acknowledgement from academics, public policy and civil society groups (van Dooren et al., 2014; Gustafson et al., 2016; Haddad et al., 2016; Mason and Lang, 2017). Nevertheless, legumes and pulses are relatively invisible actors in health policy. A 2015 JRC policy foresight assessing the role of EU policies for global food security calls for a, '*Common Food Systems Policy*', but failed to even mention the protein crops, pulses or legumes (Global food security, 2030).

Food systems affect health through multiple, interconnected pathways (IPES-Food 2017). Although diet is the most obvious link through which food and farming systems affect health, the role of legumes to provide solutions to the double burden of inadequate dietary intake (undernutrition) and excess food intake (over nutrition) in an unequal world is not widely considered or understood.<sup>6</sup>

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<sup>4</sup> [https://ec.europa.eu/health/nutrition\\_physical\\_activity/platform\\_en](https://ec.europa.eu/health/nutrition_physical_activity/platform_en)

<sup>5</sup> <http://ec.europa.eu/research/bioeconomy/index.cfm?pg=policy&lib=food2030>

<sup>6</sup> More than half of EU adults (52%) are considered overweight and one seventh of the EU population are obese (body mass index greater than 30), with national figures ranging from Romania (9%) and Italy (11%) to Hungary (21%), Latvia (21%) and Malta (26%). See e.g. EUROSTAT - 203/2016 European Health Interview Survey: <http://ec.europa.eu/eurostat/documents/2995521/7700898/3-20102016-BP-EN.pdf/c26b037b-d5f3-4c05-89c1-00bf0b98d646>.





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To enable the EU to meet Sustainable Development Goals (SDGs) Dora et al. (2015) argues that a range of health-related indicators would be helpful to raise awareness of the health gains from sustainable development policies, thus making them more attractive to decision makers. Aligned with agroecology principles, Rööös et al. (2016) introduced the concept of '*ecological leftovers*' for livestock production, *i.e.* that arable land should primarily be used to produce plant-based food for humans, and that livestock should be fed biomass unsuitable to, or not wanted by, humans. They argue that any increase in demand for animal products should be avoided, while diets that fulfil nutritional recommendations and reduce the environmental impact require reduction of meat consumption.

There seems to be a consensus, therefore, on a sustainable and nutrient-rich diet (semi-vegetarian and pescatarian) that may provide optimal synergy between health and sustainability (Springmann et al., 2016; van Dooren et al., 2017). However, without appropriate and careful reframing, science-based health and sustainability arguments in favour of a diet-change will not be sufficient to engage stakeholders and beneficiaries (*c.f.* de Boer and Aiking, 2017). Still, markets for plant-based diets are growing (Logatcheva and Galen, 2015).

### 2.5 Policies to encourage legume use in agriculture

The Common Agricultural Policy (CAP) still dominates EU expenditure. The CAP is focused on stable food supply coupled with environmental protection and animal welfare, but other aspects (*e.g.* nutrition or health) are not incorporated (Kanter et al., 2014). Cereal crops which are high-yielding under high-inputs and intensive farming get priority through policies which encourage inputs (subsidies, price interventions) and production (crop breeding/fertilisation practises). The agricultural policy cycle is completed by trade instruments (import quotas, tariffs, export incentives).

The importance of increasing production of grain legume crops (*e.g.* Hausling, 2011) has been stressed for two specific reasons:





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- The EU protein deficit (due to GATT 1947, Blair House Agreement 1992): reducing the deficit urgently requires reducing EU's dependency on non-taxable soybean imports from the Americas. The primary driver of protein imports in Europe is the growth in poultry and pig meat consumption.
- Adverse environmental impacts of intense cereal production: reversing such impacts would increase farm-level biodiversity and on-farm benefits through the regulating and supporting ecosystem services provided by legumes and associated good-practice.

Previous research on hindering and enabling policies also contended that cross-cutting EU policies such as the CAP as currently implemented are unlikely to reverse the trend of declining legume cultivation in Europe and would not be able to increase the production of protein crops significantly (Bues et al., 2013; Topp et al., 2014). In this respect, several policy options within and beyond the CAP has been investigated for supporting protein crops, and some areas for legume-friendly policy innovations have been considered, including:

- 1) Greening and crop diversification, but these as they stand are not expected to result in significant changes in cropping patterns.
- 2) Introducing specific legume crops areas to qualify as EFAs, as they would add to the crop mosaic, and support a greater and different wild arable plant flora.
- 3) Special support (voluntary coupled support schemes) for protein crops is limited by WTO agreements and expensive on a *per* hectare basis. Regional support schemes could be beneficial.
- 4) Organic, and similarly principled integrated-farming systems could be expanded.
- 5) Policy initiatives to promote the growing of legumes (*e.g.* Danube Soya Association; French initiative launched in December 2014, Plan Protéines Végétales pour la France 2014–2020) to help farmers in protein production by research and training; or the German protein crop strategy that describes measures to support knowledge dissemination among legume producers. The EIP supports research on legumes and its application to local conditions under the CAP.





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- 6) Private sector initiatives such as breeding companies' field trials and certification schemes for animal production based on regional feed production (*e.g.* Neuland brand in Germany and the "Mutterkuh" in Switzerland)

Previous subsidies to promote legume cultivation failed, and production continues to fall due to technological lock-in. The effectiveness of legume cultivation policy interventions is limited by crop yield levels and market prices. Magrini et al. (2016) showed that in France, the average gross margin for grain legumes is 2-6 times lower than major non-legume crops. In contrast, the unsustainability of European agro-food system according to Annicchiarico (2017) may change by a drastic increase of legume cultivation in regions where its products will be consumed.

CAP Greening, within the framework of the 2014–2020 reform, conditions some supports to rotation diversification (*i.e.* increase the range of cropped species cultivated), and hoped to encourage absolute levels of legume production also. While the cultivated area of legumes since the Greening of the CAP (2014) slightly increased, it was mainly through organic farmers increasing the proportion of legumes in their crop rotations. Only conventional farmers can initiate additional growth of the production area. In the EFAs a higher weighting factor of nitrogen-fixing crops (1:1 instead of 0.7:1) may further encourage farmers to grow more grain and forage legumes.

Agricultural trade and legume imports and access to EU markets are shaped by the World Trade Organisation (WTO) through rules on agriculture and food safety standards<sup>7</sup>. Similarly, the Transatlantic Trade and Investment Partnership (TTIP) has created regulatory convergence that impacts EU regulations on food. As a result, there is also a recent push towards more incentives for the substitution of imported soy by use of grain legumes from the EU.

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<sup>7</sup> According to the WTO, production subsidies (aka. 'price support') lead to over-production and export subsidies, squeeze out imports and encourage low-priced dumping on world markets. (See: <https://www.wto.org>) In essence, only measures with minimal impact on trade can be used freely ("green box") - *e.g.* government services such as research, disease control, infrastructure and food security. Payments directly to farmers that do not stimulate production (direct income support, assistance to help farmers restructure agriculture, and direct payments under environmental and regional assistance programmes). Certain direct payments to farmers are also permitted where the farmers are required to limit production ("blue box"), as well as certain government assistance programmes that encourage agricultural and rural development in developing countries, and other support on a small scale ("*de minimis*") when compared with the total value of the product or products supported (5% or less in the case of developed countries and 10% or less for developing countries).





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Policies for legume-based farming systems (such as hectare premiums, EFAs, incentives for increased pulse consumption) have not had the expected positive impact. Ongoing reliance on imported genetically modified (GM) leads the supply of animal feed and this supply is open to external trade disruption. One significant policy challenge is to avoid reliance on a very low number of key (imported) commodities such as soybean, which is also indicative of an approach that encourages the continued over-simplification of cropping systems, upstream supply chains and equally polarised (meat-based) diets. In this context, cereal monocultures have a comparative advantage that would be difficult to erase. A policy that increases indigenous legume cultivation in Europe through price support would be strictly constrained by trade agreements in the World Trade Organisation (WTO) which facilitate imports through price reductions as well as the EU consensus on decoupled support systems (in 16 member states voluntary coupled support exists for protein crops). Although policy studies positively appraise legume-based farming systems, previous policy interventions (*e.g.* subsidies to promote grain-legume cultivation) have failed to increase the areas of legumes cultivated.





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### 2.5.1 Why are legumes not the protagonists<sup>8</sup>?

Legumes have been rendered marginal for a combination of reasons in the EU. Annicchiarico (2017) argues that the major ones were:

- the availability of N fertilisers and energy at a low cost;
- the relentless simplification, specialisation and intensification of our agricultural systems;
- much higher support for cereal production than for legume-based cropping systems (through EU production aids, funded public research, etc.);
- the established role of imported soybean as the primary protein source, along with lack of public research on this crop (as dictated by Kennedy round and Blair House agreements between Europe and the USA); and,
- the systematic oblivion of environmental and social costs associated with our feed-animal production systems.

Similarly, Magrini et al. (2016) suggest that the marginalisation of grain-legumes in the agri-food system is rooted in the following:

- path dependency: the historical preference for cereals;
- learning effects and investment choices: the gap in grain-legume yields compared to cereals; and,
- industry interdependence upstream and downstream in the supply chain: preferring cereals for food and imported soybeans for feed.

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<sup>8</sup> A protagonist has the central role, as presents the essential (not simply supporting) attributes which underpin a specific aim. Thus, here the protagonists are legumes for sustainable food systems.





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### 3. Policy prospects for a transition to legume-based system

Recently, policy analysts claimed that no single simple policy change could alter the current status of legumes (Topp et al., 2014). A suite of policy innovations are required to circumvent technological lock-in, to promote legumes, increase their commercial competitiveness and move towards more sustainable food security. The Final Report of the EIP-AGRI Focus Group on *Protein Crops* (Schreuder and De Visser, 2014) contended that a step-by-step approach would be desirable in an attempt to increase Europe's self-sufficiency of protein crop production. The report correctly underlined the creation of knowledge arenas between farmers, advisors and researchers to improve shared understanding of legume-based farming systems.

Previous projects such as Legumes Futures ([www.legumefutures.eu](http://www.legumefutures.eu)) and Legato ([www.legato-fp7.eu](http://www.legato-fp7.eu)) also demonstrated that there is a lack of understanding of long-term benefits *versus* short-term gains regarding policy change. However, the primary challenges were presented as the high interannual yield variability of legumes, and the lack of knowledge exchange among stakeholders that could lead to a shared understanding of pathways to sustainability. Any development is much dependent on coordinated, complementary policy measures rooted in an understanding of the agroecological processes governing the benefits.

Bottom-up (consumer) food policy initiatives, free from the routines and lock-ins of the dominant system, are drivers of a transition towards more sustainable food systems and thus are relevant locations for looking at transition pathways towards legume-based systems. Local value chains are directly confronted with a policy bias toward large-scale, conventional agri-food systems. Yet bottom-up initiatives may collectively engage influential and less powerful actors of the agri-food system, businesses, public sector researchers, policymakers and the public. Aligned with the principles of agroecology and globally, numerous institutions and innovations aimed to integrate local production, processing and access ('local and regional food systems') have already been created<sup>9</sup>, though a database or cooperative of such facilities remains to be established at the various scales. Initiatives that are drawing attention to the dysfunctions of the food market or malign production and consumption patterns can also provide legume-based alternatives.

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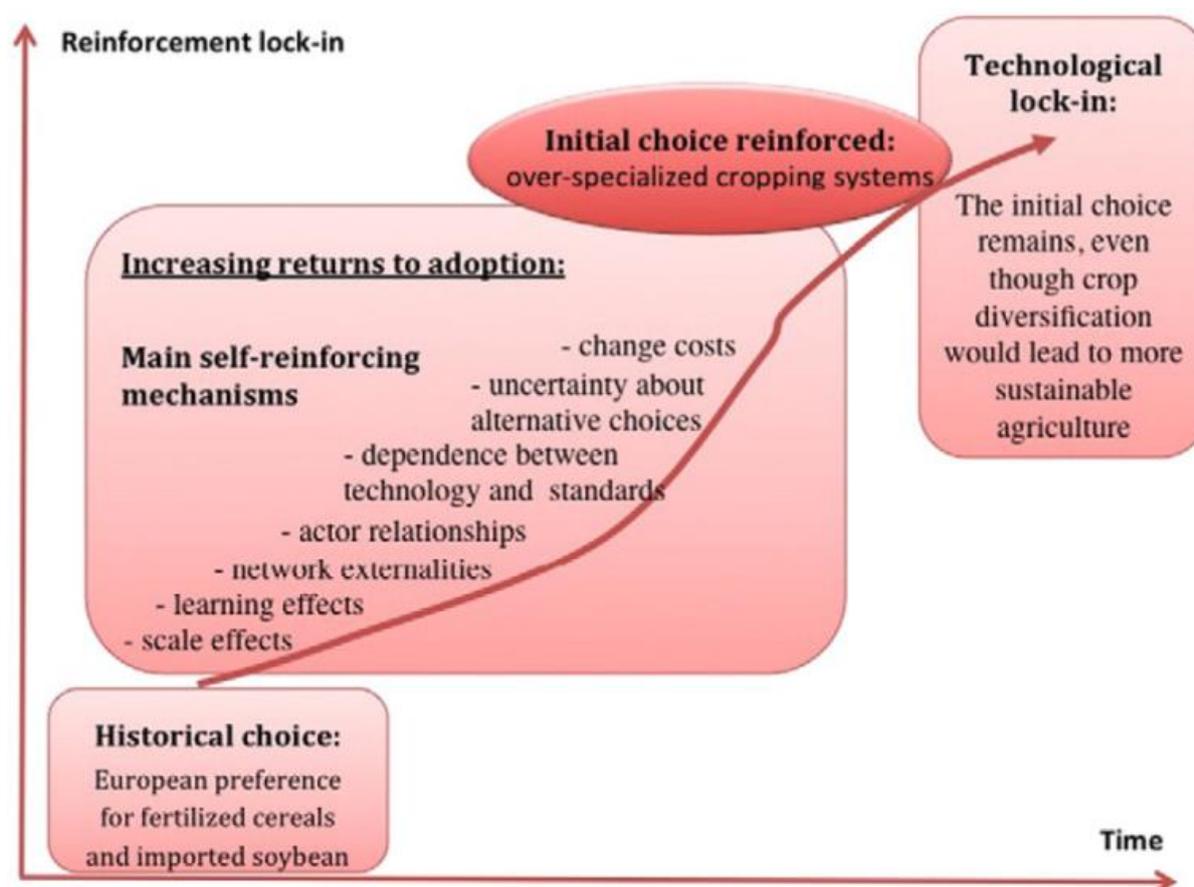
<sup>9</sup> Example: <https://foodtank.com/news/2013/05/forty-organizations-that-are-shaking-up-the-food-system/>





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Community supported agriculture, short, values-based or place-based supply chains are building on the growing interest of consumers and producers to value local craft-scale production produced and processed. This “*new ethical foodscape*”, has a limited outreach, and is presently more appealing to already privileged social groups. Nevertheless, these niche markets with higher added value maintain an economically attractive space for producers and consumers which help transitions happen. The increasingly recognised ecological and economic pressures on agro-ecosystems might further push grain legumes into a significant position. Furthermore, several small-scale policy initiatives can help the maintenance of these initiatives and support the availability of nutrient-rich foods. Also, some support for the promotion of new value chains for innovative foods has become more available in the recent years.



Source: Magrini et al. 2016, Figure 4, Lock-in of the agri-food production systems and the marginalisation of grain legumes





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Where they exist, local and national level policies to support legume-based food production have failed to increase legume-based diets. More efficient policy innovations are urgently required to realise sustainable protein production. Some of the progressive examples include the following.

- Mandatory inclusion of a vegetarian option in every public canteen, starting in June 2017 (<https://www.sns.gov.pt/noticias/2017/04/17/menu-vegetariano-obrigatorio/>) (Portugal).
- Addition of a separate section for legume grains in our food pyramid (wheel) (<http://www.alimentacaosaudavel.dgs.pt/roda-dos-alimentos-mediterranica/>) (Portugal).
- Creation of a legume-focused recipe book, using species from across Europe, with Slow Food (Germany), 2020.
- Use of faba beans to brew craft beer for the Edinburgh Science Festival (<http://www.solid-liquids.co.uk/single-post/2017/03/30/Beer-Science-with-Barneys>), and neutral spirits (<http://beans4feeds.hutton.ac.uk/sites/www.beans4feeds.net/files/files/Neutral%20spirit%20distilled%20ofrom%20ofaba%20bean%20starch.pdf>) (United Kingdom).
- Developing high-protein co-products for use in food and feeds (*c.f.* <https://beans4feeds.hutton.ac.uk/projectreports>: Germany and United Kingdom).
- Hodmedods – Britain’s Pulse & Grain Pioneers: a range of top quality ingredients and delicious foods (fava bean, black badger peas) from British farms (<https://hodmedods.co.uk>).
- Using home-grown, Scottish, faba bean to make “ScoFu”, or “Scottish tofu”. (<http://www.livingfield.co.uk/2017/06/>) (United Kingdom).

We therefore conclude that there is an increasing need for an active science-policy interface to support legume-based cropping systems and food and feed supply chains. TRUE aims to enable co-innovative environments to help realise policies which will adequately support current and future, food and nutritional security challenges *via* the use of legumes. There must be various entry points - there is no “silver bullet”<sup>10</sup>. However, Shiffman and Smith (2007) created a helpful framework for analysing the factor and issues which determine more-effective policy ascendance.

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<sup>10</sup> *i.e.* a seemingly simple and solution to a complex and interrelated issues.





## TRansition paths to sUstainable legume-based systems in Europe

	Description	Factors shaping political priority
Actor power	The strength of the individuals and organisations concerned with the issue	<ol style="list-style-type: none"> <li>1 Policy community cohesion: the degree of coalescence among the network of individuals and organisations that are centrally involved with the issue at the global level</li> <li>2 Leadership: the presence of individuals capable of uniting the policy community and acknowledged as particularly strong champions for the cause</li> <li>3 Guiding institutions: the effectiveness of organisations or coordinating mechanisms with a mandate to lead the initiative</li> <li>4 Civil society mobilisation: the extent to which grassroots organisations have mobilised to press international and national political authorities to address the issue at the global level</li> </ol>
Ideas	The ways in which those involved with the issue understand and portray it	<ol style="list-style-type: none"> <li>5 Internal frame: the degree to which the policy community agrees on the definition of, causes of, and solutions to the problem</li> <li>6 External frame: public portrayals of the issue in ways that resonate with external audiences, especially the political leaders who control resources</li> </ol>
Political contexts	The environments in which actors operate	<ol style="list-style-type: none"> <li>7 Policy windows: political moments when global conditions align favourably for an issue, presenting opportunities for advocates to influence decisionmakers</li> <li>8 Global governance structure: the degree to which norms and institutions operating in a sector provide a platform for effective collective action</li> </ol>
Issue characteristics	Features of the problem	<ol style="list-style-type: none"> <li>9 Credible indicators: clear measures that show the severity of the problem and that can be used to monitor progress</li> <li>10 Severity: the size of the burden relative to other problems, as indicated by objective measures such as mortality levels</li> <li>11 Effective interventions: the extent to which proposed means of addressing the problem are clearly explained, cost effective, backed by scientific evidence, simple to implement, and inexpensive</li> </ol>

*Table: The four categories for the framework on determinants of political priority for global initiatives*

Source: *Shiffmann and Smith (2007), p 1371.*

Pathways towards more sustainable legume-based systems therefore require multi-sectoral policy-making and governance. One of the few opportunities for better policy orchestration could be located at the *European Institute of Innovation and Technology (EIT; <https://eit.europa.eu/>)*, involving several Knowledge Innovation Communities (KICS). The *EIT Food* community regards innovation and sustainability as mutually supportive policy objectives. *EIT Food* aims to become the leading European initiative that empowers innovators and entrepreneurs to develop world-class solutions to create growth and jobs. *EIT Food* comprises of a consortium of 50 partners from the public and private sectors in 13 countries, addressing issues of consumer trust, healthier nutrition, sustainability, and education in food systems, with the aim of developing food entrepreneurship and innovation.





## TRansition paths to sUstainable legume-based systems in Europe

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### Summary

Price support or other economic incentives can no longer counterbalance the low profitability of legumes. Magrini et al. (2016) suggested creating new socio-technical innovations to foster crop diversity. Furthermore, they argue both state and non-state actors should be mobilised to engage in purposive transition. Such engagement would be desirable with four priority actions: increase genetic research; improve farmers' knowledge in managing rotations with legumes and especially using less mineral fertiliser; develop accounting tools to better assess the ecological benefits of legumes in monetary terms; and support supply chain capacities and food innovations at the local or regional scales to develop new outlets for grain and forage legumes.

Also, legumes require an enabling policy environment to meet current and future food and nutritional security challenges as their consumption increases. Understanding these policy constraints is the first step in engaging multiple stakeholders and decision-makers in the creation of a more favourable policy and governance context. Therefore, a wide range of interested parties such as farmers, advisors, breeding businesses, non-governmental organisations, and including both the conventional and the organic sector, require representation within 'Pulse Europe', a science-society-policy interface to be established by the TRUE project.





## TRansition paths to sUustainable legume-based systems in Europe

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### 4. TRUE Work package 7 activities

#### 4.1 Major steps in data-gathering and analysis in WP7

TRUE is proposing the concept of a new science-policy interface, *Pulse Europe*, to be launched in 2021, which will function on four principles:

- 1) Co-design in the elaboration of the **research agenda**, identifying societal and scientific research needs. We invite a range of stakeholders, beyond the partners, to Legume Innovation Network workshops to incorporate a wide variety of knowledge areas. Co-design is understood as a joint creation with these stakeholders of targeted outputs, processes, aims and structures of collaboration.
- 2) Co-production of **joint knowledge generation at various levels**. Data and information will be collected during field and site visits to inform real-world perspectives and to inform decisions on sustainable solutions. Joint interpretation of results will be undertaken by different actors to reveal different value systems. Co-production will encourage analysis at regional and national levels, policy interviews at the EU level, will be documented including joint reports, publications, conferences and socio-technical innovations.
- 3) **Co-creation of new governance solutions**. A Delphi survey will be carried out with a broad range of stakeholders. Co-creation is an overarching concept, implying the application of various types of collaboration processes among scientific and non-scientific actors toward the creation of new knowledge and practices aligned to responsible research and innovation.
- 4) **Co-dissemination and synthesis reflection workshops**. Co-dissemination here refers to our continuous effort to invite stakeholders to joint synthesis exercises. Aims are to facilitate the validation, application and reception of the results, and to decide how results are implemented.





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	M1-6	M7-18	M19-30	M31-48
	<b>7.1 co-design phase</b>	<b>7.2 co-produce phase</b>	<b>7.3 Delphi phase<sup>11</sup></b>	<b>7.4 recommend phase to help implement</b>
	develop science policy interface in 4 Legume Innovation Networks			
		state of the art analysis documents - regional and national level field visit – regional and national level interviews – EU level		
			new governance solutions Delphi survey with a broad range of SHs	
				synthesis: validation at reflection workshops and EU level dialogue
<b>Deliverables</b>	<b>M9 D7.1</b>	<b>M20 D7.2</b>	<b>M32 D7.3</b>	<b>M48 D7.4</b>
<b>Contributions needed from partners</b>	bring in national and regional stakeholders	relevant document and key informants' analysis at national languages	delegate Delphi partners	delegate EU level dialogue partners

One primary challenge for Pulse Europe is to develop mechanisms that enable policies, legislation and regulatory systems to inform capacity building, product development and uptake. Pulse Europe, perhaps should also scope the possibilities to align temporally the development and deployment EU policies, to help ensure co-development of policies and so enhance the opportunity for more-effective impact.

<sup>11</sup> [https://en.wikipedia.org/wiki/Delphi\\_method](https://en.wikipedia.org/wiki/Delphi_method)





## TRansition paths to sUstainable legume-based systems in Europe

As a first step in the co-design process, specific research needs and stakeholders' interests in knowledge exchange have been identified. TRUE partners compiled their experiences around three central questions:

- What are the policy problems that need urgent solution?
- Who are the policy decision-makers?
- How can actionable, reliable policy-relevant knowledge be created?



TRUE will initiate stakeholder engagement for legume-based food system policy development in the following topics, which include: production, diet, nutrition, consumption, health, finance; environment, conservation; culture, behaviour, awareness, policy incentives, trade, integrative policy, sustainability and value chains.





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### 4.2 TRUE Case Studies and European Legume Innovation workshops

The series of European Legume Innovation (ELINs; see page 11) workshops will provide the means to gather regional, transdisciplinary knowledge to identify local solutions towards more sustainable, legume-supported, crop systems and diets. TRUE partners will initiate legume-policy assessments through ELINs and Innovation Case Studies.

The proposed science–policy interface will foster multi-actor participation across relevant quality chains throughout Europe, using state-of-the-art social engagement tools. The ELINs span major pedo-climatic regions of Europe, designated here as Continental, Mediterranean and Atlantic. Network meetings will be held annually in each region between 2017 and 2020. In a process engineered to encourage co-innovation, this Legume Innovation Network framework facilitates the alignment of stakeholders' knowledge with the approaches and insight gathered from the suite of 24 Case Studies, which represent the quality chains associated with a range of indigenous legumes used for food and feed. The ELINs will act as incubators for co-development of innovations. For a range of legume species grown in various systems, TRUE will develop novel food and feed applications, create new uses for legumes that are palatable, appealing and tested in real-life scenarios, enhance the EU's innovation capacity and develop global markets. TRUE aims to generate ten mini-business plans for small and medium enterprises involved in the ELINs; these plans will promote the use of legumes, and produce a guidance document of best practices for commercialisation of a range of species. From this experience, TRUE will also create a minimum of five policy briefs based on research findings, to present to policy-makers.

Data gathering in WP7 will focus on favourable, policy incentives and governance innovations to shed light on limiting and enabling factors. Examples of activities include the following.

1. **Teagasc Clover Group** - initiated in 2005 by farmers working with Teagasc to promote the wider use of white clover on neighbouring farms through membership of the national network of discussion groups ([www.teagasc.ie](http://www.teagasc.ie)).
2. **Organic pig production** Denmark<sup>12</sup> has already agreed on a voluntary scheme for organic pig production where only 100 % organic feed can be used. This decision pre-empts forthcoming EU legislation<sup>13</sup>.

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<sup>12</sup> <https://foodrevolution.org/blog/denmark-organic-country/>

<sup>13</sup> <https://www.feednavigator.com/Article/2017/11/23/EU-Commission-has-moved-to-extend-5-non-organic-feed-protein-rule>





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3. **Danish Organic Cuisine Label** - promoting organic food in the private and public food service markets and stimulating demand for legumes in public food procurement and inducing healthy eating habits (<http://organicdenmark.com/organics-in-denmark/organic-cuisine-label>).
4. **Peas and processed pea-products trade** in local and international markets and potentials for new value chains.
5. **Revival of lentil growing and consumption in Germany** for the last ten years as an example for the reintroduction and expansion of lentil in modern farming.
6. **Introduction of soybean in temperate regions of Europe** notably in some regions of Germany, Eastern France, Austria and Switzerland, where soybean has been integrated into temperate farming systems.
7. **Enhance traditional and new legume varieties into urban gastronomy in Hungary**– study on the future consumption patterns in the light urban gastronomic trends for healthy, tasty food from a traceable origin.
8. **Grafting experiments between different landraces of common bean in Greece** - developing management practices for sustainable production
9. **Herdade do Freixo do Meio**, a multifunctional farm in the Alentejo's montado in Portugal will provide data on sustainable farming systems, with a short supply chain that incorporates legumes.
10. **Choose Beans**<sup>14</sup>: consumers education and marketing actions on legumes at Eurest foods services of 1155 units, serving over 113,000 meals per day were undertaken.

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<sup>14</sup> This initiative is led by EUREST, a TRUE project partner, see: <http://eurest-news.blogspot.co.uk/2012/05/eurestlancou-o-projecto-choose-beans.html>





## TRansition paths to sUustainable legume-based systems in Europe

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### Data analysis phase

An Interpretive Policy Analysis framework (Yanow 2000, and 2006) will provide an understanding of the governance and policy context for legumes. In the analysis of the dialogues between scientists with various policy actors, TRUE will extract and compare meanings that stakeholders attach to policy and governmentality to improve legume-based farming systems in Europe. This process will identify the significant 'carriers of meaning' (arguments, values, beliefs) perceived by policy actors, identify specific meanings, points of conflict that reflect different interpretations and the implication of different meanings for policy formulation.

**In summary:** the ELINs and the innovation Case Studies will help TRUE to:

- understand reward and punishment, and action and inaction in current policy, including laws, regulations, public programmes, standards and governance frameworks, and explore the processes of policy-making for the benefit of legumes;
- identify drivers of policy change and innovation at national and EU levels;
- supply policy decision-makers with reliable, practice-based, policy-relevant knowledge about encouraging legume-based food systems; and,
- draw on a social learning process that brings together industry, research and government agencies to imagine desirable future scenarios (circa 50 years) and to devise a range of alternative pathways or solutions to achieve them from current circumstances.





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Policy co-design workshops at the ELINs will invite experts annually (from 2017 to 2020) from various policy domains (*i.e.* agricultural policy, dietetics and nutrition, sustainable consumption and diet, food system planning). This stakeholder dialogue process will link scientists with various policy actors to create a critical understanding of hindering and facilitating factors that shape the development of legume-based systems. As agricultural policy (*e.g.* direct subsidies in CAP or Greening of crop sequences, agri-environmental schemes, organic policy) has failed to reverse the decline in legume crop production, it is possible that many other policy areas can help a structural change in the competitiveness of grain legumes, such as climate policies, biodiversity conservation and nutrient policies. A Delphi survey will iteratively create recommendations for the lifting of barriers and the development of favourable policies and transition pathways to sustainable legume-based agri-feed and -food chains. The governance context will be further explored by identifying the desirable development pathways for legume-dependent systems.

Annexes I-III detailed at the end of this initial report highlight initial raw outputs from the stakeholder analysis progressed via the 1<sup>st</sup> Continental ELIN (Annex I). Allied to this, draft resources developed for on-going work with stakeholders is highlighted in Annexes II and III.





## TRansition paths to sUustainable legume-based systems in Europe

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### 5. Preliminary framework on a new science-policy interface, 'Pulse Europe'

The main output of WP7 will be a science-policy interface to support legume supported cropping systems and food and feed supply chains. It will define specific learning techniques for policy assessment. It will contain a summary of specific research and information needs, an outline of stakeholders' interests in knowledge exchange, and also the identification of desired communication tools to advance the project, especially with a view to effective policy impact.

- Co-design in the elaboration of the research agenda
- Co-production as joint knowledge generation in various levels
- Co-creation of new governance solutions
- Co-dissemination and synthesis for facilitating the validation, application and reception of the results

● ESSRG

a new science-policy interface  
*'Pulse Europe'*





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### References

- Abarca-Gómez, L., Abdeen, Z. A., Hamid, Z. A., Abu-Rmeileh, N. M., Acosta-Cazares, B., Acuin, C., ... & Agyemang, C. (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. *The Lancet*, 390/10113, 2627-2642. URL: <https://www.ncbi.nlm.nih.gov/pubmed/29029897>
- Agrawal, S. K. (2017). Morocco declaration – Pulses: solutions to food and nutrition security agricultural sustainability and climate change adaptation.
- Annicchiarico, P. (2017). Feed legumes for truly sustainable crop-animal systems. *Italian Journal of Agronomy*, 12(2), 151-160. URL: <http://agronomy.it/index.php/agro/article/download/880/887>
- Barling, D.; Vorley, B.; Smith, J. (2014) Glamur: Policy Analysis Report (EU Funded Framework 7 Project. Deliverable 6.1); City University London & IIED: London, UK; URL: <http://glamur.eu/wp-content/uploads/2014/11/d-6.1-policy-analysis-report.pdf>
- Bryngelsson, D., Wirsenius, S., Hedenus, F., & Sonesson, U. (2016). How can the EU climate targets be met? A combined analysis of technological and demand-side changes in food and agriculture. *Food Policy*, 59, 152-164. URL: <http://www.sciencedirect.com/science/article/pii/S0306919216000129>
- Bues, A., Kuhlmann, T., Lindstrom, K., Murphy-Bokern, D., Preissel, S., Reckling, M., Stoddard, F.L., Topp, K., Watson, C. & Zander, P. 2013. The environmental role of protein crops in the new common agricultural policy. The European Parliament. No. 2012-067.
- CeeWeb (2016) 12bn/year on greening: the results? URL: <http://www.ceeweb.org/17993/12bnyear-on-greening-the-results/>
- COM(2017) 587 REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL On Member State National Action Plans and on progress in the implementation of Directive 2009/128/EC on the sustainable use of pesticides. URL: <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2017:587:FIN>
- de Boer, J., & Aiking, H. (2017). Pursuing a Low Meat Diet to Improve Both Health and Sustainability: How Can We Use the Frames that Shape Our Meals?. *Ecological Economics*, 142, 238-248. URL: <http://www.sciencedirect.com/science/article/pii/S0921800917303701>
- de Boer, J., Helms, M., Aiking, H., 2006. Protein consumption and sustainability: Diet diversity in EU-15. *Ecol. Econ.* 59, 267–274. URL: <https://www.sciencedirect.com/science/article/pii/S0921800905004994>





## TRansition paths to sUustainable legume-based systems in Europe

---

- Dequiedt, B., & Moran, D. (2015). The cost of emission mitigation by legume crops in French agriculture. *Ecological Economics*, 110, 51-60. URL: <http://openaccess.sruc.ac.uk/handle/11262/10577>
- Dora C et al. (2015). Indicators linking health and sustainability in the post-2015 development agenda. *Lancet* 385, 380–391. URL: [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(14\)60605-X/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)60605-X/fulltext)
- ECA (2017) Special Report of the European Court of Auditors n°21/2017: Greening: a more complex income support scheme, not yet environmentally effective. URL: <https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=44179>
- EU (2015/2225(INI)) Report on technological solutions for sustainable agriculture in the EU. Committee on Agriculture and Rural Development. URL: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+REPORT+A8-2016-0174+0+DOC+XML+V0//EN>
- EU AGRICULTURAL OUTLOOK - Prospect for the EU agricultural markets and income 2016-2026 (December 2016) URL: [https://ec.europa.eu/agriculture/markets-and-prices/medium-term-outlook\\_hu](https://ec.europa.eu/agriculture/markets-and-prices/medium-term-outlook_hu)
- EUR/RC67/9 Roadmap to implement the 2030 Agenda for Sustainable Development, building on Health 2020, the European policy for health and well-being. URL: <http://www.euro.who.int/en/about-us/governance/regional-committee-for-europe/67th-session/documentation/working-documents/eurrc679-roadmap-to-implement-the-2030-agenda-for-sustainable-development,-building-on-health-2020,-the-european-policy-for-health-and-well-being>
- FAO (2016) 2016 International Year of Pulses – Frequently Asked Questions. Rome, Italy. URL: <http://www.fao.org/pulses-2016/faq/en/>
- FAO. 2016. Diversifying production and diets. Easier said than done. Rome.
- FCEC (2013) Scoping Study – Delivering on EU Food safety and Nutrition in 2050: Final report - Scenarios of future change and policy responses. DG SANCO Framework Contract on Evaluation, Impact Assessment and Related Services. URL: [https://ec.europa.eu/food/sites/food/files/safety/docs/final\\_report\\_scoping\\_study\\_en.pdf](https://ec.europa.eu/food/sites/food/files/safety/docs/final_report_scoping_study_en.pdf)
- Global food security 2030 – assessing trends in view of guiding future EU policies. URL: <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/global-food-security-2030-assessing-trends-view-guiding-future-eu-policies>
- Gustafson, D., Gutman, A., Leet, W., Drewnowski, A., Fanzo, J., & Ingram, J. (2016). Seven Food System Metrics of Sustainable Nutrition Security. *Sustainability*, 8(3), 1-17. URL: <http://www.mdpi.com/2071-1050/8/3/196>





## TRansition paths to sUstainable legume-based systems in Europe

---

- Haddad L et al. (2016). A new global research agenda for food. *Nature* 540, 30–32. URL: <https://www.nature.com/news/a-new-global-research-agenda-for-food-1.21052>
- Häusling, M. 2011. The EU protein deficit: what solution for a long-standing problem? Procedure 2010/2111(INI). (available at <http://www.europarl.europa.eu/sides/getDoc.do?type=REPORT&reference=A7-2011-0026&language=EN>).
- Hawkes, C.; Turner, R.; Waage, J. Current and planned research on agriculture for improved nutrition: a mapping and a gap analysis. A report for DFID. 21st August 2012. Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK (2012) 48 pp.
- Helming, J., Kuhlman, T., Linderhof, V. & Oudendag, D. 2014. Impacts of legume scenarios. Legume Futures Report 4.5 (available at [www.legumefutures.de](http://www.legumefutures.de)).
- IPES-Food. 2017. Unravelling the Food–Health Nexus: Addressing practices, political economy, and power relations to build healthier food systems. The Global Alliance for the Future of Food and IPES-Food. URL: [http://www.ipes-food.org/images/Reports/Health\\_FullReport.pdf](http://www.ipes-food.org/images/Reports/Health_FullReport.pdf)
- IYP, 2016. The Food and Agriculture Organisation of the United Nations, International year of Pulses (IYOP), 2016. (available at <http://www.fao.org/pulses-2016/en/>).
- Kanter R et al. (2014). 4th annual conference of the Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), agri-food policy and governance for nutrition and health, London 3–4 June 2014. *Food Security* 6, 747–753.
- Keatinge, J. D., Chadha, M. L., Hughes, J. D. A., Easdown, W. J., Holmer, R. J., Tenkouano, A., ... & Luther, G. (2012). Vegetable gardens and their impact on the attainment of the Millennium Development Goals. *Biological agriculture & horticulture*, 28(2), 71-85.
- Logatcheva, K. and M.A. van Galen, 2015. Primary Food Processing; Cornerstone of plant-based food production and the bio-economy in Europe. Wageningen, LEI Wageningen UR (University & Research centre), LEI Report 2015-121. 42 pp. URL: [www.edepot.wur.nl/361495](http://www.edepot.wur.nl/361495)
- Magrini, M.B., Anton, M., Cholez, C., Corre-Hellou, G., Duc, G., Jeuffroy, M. H. & Walrand, S. 2016. Why are grain-legumes rarely present in cropping systems despite their environmental and nutritional benefits? Analyzing lock-in in the French agrifood system. *Ecological Economics*, 126: 152–162.
- Mason, P., & Lang, T. (2017). Sustainable Diets: How Ecological Nutrition Can Transform Consumption and the Food System. Taylor & Francis. URL: [https://books.google.hu/books/about/Sustainable\\_Diets.html](https://books.google.hu/books/about/Sustainable_Diets.html)
- Mylona, K., Maragkoudakis, P., Bock, A.-K., Wollgast, J., Caldeira, S. and Ulberth, F., Delivering on EU Food Safety and Nutrition in 2050 – Future challenges and policy preparedness,





## Transition paths to sustainable legume-based systems in Europe

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- EUR27957 EN, Publications Office of the European Union, Luxembourg, 2016. URL: <http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101971/delivering%20on%20e%20of%20food%20safety%20and%20nutrition%20in%20o%2050.pdf>
- Rees, R.M., Stoddard, F., Iannetta, P., Williams, M., Zander, P., Murphy-Bokern, D., Topp, C.F.E. & Watson, C.A. 2015. Legume futures: legume-supported cropping systems for Europe. Paper presented at the Global Science Conference, Montpellier, France.
- Röös, E., Patel, M., Spångberg, J., Carlsson, G., & Rydhmer, L. (2016). Limiting livestock production to pasture and by-products in a search for sustainable diets. *Food policy*, 58, 1-13. URL: <http://www.sciencedirect.com/science/article/pii/S0306919215001244>
- Schreuder, R. & de Visser, C.L.M. 2014. EIP-AGRI Focus Group. Protein crops. Final Report. EIP-AGRI (available at <https://ec.europa.eu/eip/agriculture/en/publications/eip-agri-focus-group-protein-crops-final-report>).
- Shiffman, J., & Smith, S. (2007). Generation of political priority for global health initiatives: a framework and case study of maternal mortality. *The lancet*, 370(9595), 1370-1379. URL: <http://www.who.int/entity/pmnch/topics/advocacy/JShiffman-globalsmarticle-Lancet.pdf>
- Springmann, M., Godfray, H. C. J., Rayner, M., & Scarborough, P. (2016). Analysis and valuation of the health and climate change cobenefits of dietary change. *Proceedings of the National Academy of Sciences*, 113(15), 4146-4151. URL: <http://www.pnas.org/content/113/15/4146.full>
- Tenkouano, A. (2011). The nutritional and economic potential of vegetables. *State of the World*, 27-38.
- Topp, K., Watson, C., Papa, V. Williams, M., Stout, J., Cass, S., Fischer, J., Böhm, H., Murphy-Bokern, D., Kuhlman, T., Stoddard, F.L. Lindström, K., Reckling, M., Preißel, S., Bues, B., Zander, P., Knudsen, M.T., Olesen, J.E., Hermansen, J.E.M. & Schelde, K. 2014. Policy implications of the environmental and resource effects of legume cropping. *Legume Futures Report 3.8/6.6* (available at [www.legumefutures.de](http://www.legumefutures.de)).
- van Dooren, C., Douma, A., Aiking, H., & Vellinga, P. (2017). Proposing a novel index reflecting both climate impact and nutritional impact of food products. *Ecological Economics*, 131, 389-398. URL: <http://www.sciencedirect.com/science/article/pii/S0921800916300830>
- van Dooren, C., Marinussen, M., Blonk, H., Aiking, H., & Vellinga, P. (2014). Exploring dietary guidelines based on ecological and nutritional values: A comparison of six dietary patterns. *Food Policy*, 44, 36-46. URL: <http://www.sciencedirect.com/science/article/pii/S0306919213001620>
- Voisin, A. S., Guéguen, J., Huyghe, C., Jeuffroy, M. H., Magrini, M. B., Meynard, J. M., ... & Pelzer, E. (2014). Legumes for feed, food, biomaterials and bioenergy in Europe: a review. *Agronomy*





## TRansition paths to sUstainable legume-based systems in Europe

---

for Sustainable Development, 34(2), 361-380. URL: <https://hal.archives-ouvertes.fr/hal-00956058>

Walls, H. L., Cornelsen, L., Lock, K., & Smith, R. D. (2016). How much priority is given to nutrition and health in the EU Common Agricultural Policy? *Food Policy*, 59, 12-23. URL: <http://www.sciencedirect.com/science/article/pii/S0306919215001451>

Westhoek, H., Rood, T., van den Berg, M., Janse, J., Nijdam, D., Reudink, M., ... & Woltjer, G. B. (2011). The protein puzzle: the consumption and production of meat, dairy and fish in the European Union (No. 500166001). Netherlands Environmental Assessment Agency. URL: <http://library.wur.nl/WebQuery/wurpubs/406619>





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## TRansition paths to sUstainable legume-based systems in Europe

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### ANNEX I: output from the 1<sup>st</sup> European Legume Innovation Network (ELIN) workshop





## TRansition paths to sUustainable legume-based systems in Europe

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Initial raw insight from the 1<sup>st</sup> Continental ELIN workshop  
University of Hohenheim, Nov. 21<sup>st</sup> 2017

Markets World Café, elaborated by Karen Hamann, IFAU

Round 1-2: Q1, Which current circumstances hinder and or promote legume use in your part of the legume food and feed chains?

- ***Factors hindering legumes in the supply chains and markets:***
  - Lack of (quality) standards is a barrier to broad volume purchasing in the foodservice market and probably also for the procurement of the food industry companies.
  - There is a lack of cooking skills among professionals within the foodservice industry. Therefore, menus with legumes are not developing as rapidly as required.
  - Many suppliers only provide only relatively small quantities of legumes for processing. This means that many lots are too small for processing, and this leads to a disconnected supply chain.
  - Some European countries have the cropping history (experience), practice and capacity for large-scale cropping and processing of pulses, such as faba bean. For example, Croatia can produce more legumes, but no processor is asking for legumes (due to lack of technology or ?).
  - There is a price issue related to organic legumes: certified organic pulses are not easily available locally, and therefore they are more expensive than locally produced non-organic pulses. Therefore, and despite local demand, Croatian consumers cannot afford to buy organic pulses. Still, organic producers (in Croatia) have to fulfil the internationally recognised standards for organic production and this is very expensive for a Croatian producer. How can this be solved?
  
- ***Most critical hindering factors for more legumes in food supply chains and food markets.***





## TRansition paths to sUustainable legume-based systems in Europe

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- Low volumes
  - Inconsistent quality and lack of quality standards
  - Lack of knowledge (about processing, cooking and use)
  - Bad taste and texture (linked to the lack of handling technologies and skills, as above)
  - Inconsistent supply chain
- **Factors promoting legumes in the food supply chains and markets.**
- In Germany, there is a market for pre-cooked legumes targeted at the Arab population, but also making pre-cooked legumes available to the general public.
  - A new market for legume (plant) protein is sports nutrition. Other innovations in the legume-based assortment are lupin-bread and lupine- and lentil-pastas and new extrusion technologies for processing yellow peas into varied products.
  - The trend towards “flexitarian diets” can promote the use and consumption of legumes.
  - This company (participant) imported hand-picked beans from North Africa, and sold the beans in Germany. The company also marketed regionally home-grown pulses in the country of origin (i.e. Africa). The challenge of a supply chain for such imported foods was the lack of connection/links between the international traders and retailers.
  - This big retailer has a sustainability agenda and has implemented an own label “Bio Suisse” for organic products. The retailer sources organic products within the shortest possible distance (to the shop or distributor). Key customers of such products sourced their supply under a ‘sustainability scheme’, as the purchasers are health conscious and affluent consumers in Switzerland.





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- There is a strong interest in “regional” and “traditional” products, but there a challenge in defining what is “regional” or “traditional”? A suggestion is to focus on reducing transportation distance, and allow the consumer to feel connected with the producer (farmer) – fostering the sense of “food community”.
- **Regarding the feed market.**
- There is a need to explore with farmers how we might include more home-grown (or locally traded) legumes into animal-feed rations, and the price consequences of this.
  - There is a strong demand for alternative proteins to soybeans, particularly for organic livestock production, since imported soybean are usually GM. Legumes-based protein feeds form a natural part of organic farming, and especially in dairy farming, regimes.
  - Current policies such as CAP Greening have had little impact upon large scale import markets for animal feed. This is mainly in the form of soybeans. Such policies do not appear to have impacted upon production (or processing) for human food. Therefore, it appears that there is a need for incentives to stimulate the demand for (European) legume processing and consumption in the EU feed *and* food markets. Also, that this should not be linked to simply increasing production of home-grown soybean, but a diverse array of feed and food legume types.
  - There is a need for investment in machinery of a wide-range of scales for the processing of harvested legumes, especially for feed manufacturing: such as either on a farm to encourage feed self-sufficiency, or for large-scale industrial processing).
  - The demand for legumes by the feed sector is highly price-sensitive, new systems might offer some measures to buffer against such stochasticity.
  - It is not possible to offer locally produced legumes into local feed context – there is simply not grown enough volumes. If there were, is there the necessary infrastructure to aggregate and mechanised capacity to process.





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- Legumes cultivated locally within the EU, do have the potential as a profitable non-GMO protein source - as part of a short supply chain.
- Using legumes for feed offers an opportunity to explore new markets for European legume crops.

### Round 3: Q2, Which future changes are needed? Which actions to be undertaken now and which actions are needed in the future?

- Croatia will stimulate local projects and facilitate bridge-building along the supply chain.
- Portugal: menus in food service are a good entry point for making a change. Here you find volumes, and demand for standardised products. Enough volumes (*i.e.* supplies of legumes) are essential for creating a real impact. Policy actions have contributed to promoting healthy eating in public food service, and this has included promotion of legumes as part of the menus.
- It is necessary to include the small-scale producers (and processors), into the supply chains by linking them up with market actors (distributors and retailers?).
- There is a need to include cooking skills in projects targeted at increasing the use and consumption of legumes, mainly dried legumes. Also, consider working with children as they are the future consumers by providing education about legumes in schools.
- Improved processing technologies are needed to inhibit the anti-nutritional factors of pulses (this technology could be enzyme-treatment based).
- There is a need for a (price) competitive alternative to soybeans and soya-based food.
- If health is a key argument in the marketing of the legume-based product, then information on the packaging needs to be evidence-based.





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- Transparency is a key issue in production and through the supply chain. Transparency, authenticity and quality attributes of regional products are fundamental for a price difference compared to mass-produced legumes.
- **Most significant changes needed for more legumes in food and feed supply chains and markets.**
  - To make a change: find the big volumes in food and feed, and develop the infrastructure and capacities to ensure a continuous demand in the market (especially possible in the feed industry).
  - This would justify an increase in production and establish a reliable and consistent supply.
  - Increase quality of the production.
  - Create better links between the actors of the supply chain (in local, national and international views), and include industry, retailers, food service, logistics and consumers. (This is also true for the feed sector).
  - Increase public (potential consumer) awareness of the potential of legumes to help address the major human- and environmental-health issues.
  - Provide better, more appealing and affordable products with improved taste and texture.
  - Provide better marketing, recipes and more education to convince consumers about legumes.
  - Improved technologies and more processing are needed to provide better food products.





## TRansition paths to sUstainable legume-based systems in Europe

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### - A few comments about the Market sessions:

- Most participants were interested in the food chains, so mainly food-related aspects were discussed.
- Most of the suggested changes were short-term actions, and no ideas were presented to encourage long-term embedded cultural shifts. Therefore, there was a feeling of I, *“looking for an elephant in the room, and one found how to push it out into the open space”*.
- However, there is (still) the issue that there is an over-focus on production as a potential remedy to greater market uptake. In fact, changed consumption patterns (*via* personal choice) are very difficult to encourage in the short-term, and public-education initiatives must be married to aligned action by processors and retailers. Thus, the possibility of rapidly mainstreaming legume inclusion in staple foods (and feeds) could help greater market uptake. This may be achieved by law, subsidies and/or policy initiatives. For example, by adjuncting commonly consumed non-legume based products (such as bread). This may be justified on environmental and health grounds, this is akin to what currently is done using biofuel in petrol for example.
- The market sessions had between 15 and 25 participants.





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Policy World Café, elaborated by Eszter Kelemen, ESSRG

Round 1-2: Which factors hinder/stimulate legumes systems in Europe from a policy perspective? (What is the critical issue)?

- **Hindering**

- External costs of agriculture are not internalised currently.
- CAP is focused on production but there is a lack of capacity and funding across the supply chain, and no focus is put on the demand side.
- Compartmentalisation of policy is an issue (shared responsibilities across ministries and regional actors), no coherence in policies; policy initiatives do not converge.
- Polarisation: relevant policies operate at different levels (e.g. health policy, environmental policy, agricultural policy is driven from different decision-making levels, i.e. EU is a stronger player in one policy field, and national/regional authorities might be influential players in other fields).
- E.g. health policy: risks of eating meat is not communicated in Hungary, too frequent meat eating is the recommendation: there is therefore a necessity to ensure fair flow of information and improve dietary strategies.
- Time frames are critical: policy cycle needs aligned with time needed for education time needed to transform (building infrastructure and capacity) in the supply chain.
- Children are not educated on how to eat/use legumes, this includes the gardening and/or agronomic aspects, lined domestic-science such as cooking etc.. Therefore, the whole topic of legume related sciences needs embedded into the whole education system, and from the earliest possible stages.
- Many farmers lack knowledge on how best to cultivate and process legumes. Therefore, education efforts for legume-science must extend beyond the regular curriculum, into tertiary agricultural education.





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- Even in tertiary education, agricultural students *may* receive teaching in organic production but not necessarily other agroecological management strategies. Therefore, even the legume-focused which is provided may need re-appraised.
- Anti-nutrients inactivated during cooking and have a positive effect on human health, which should be promoted.
- The potential of legumes extends well beyond the provision of sustainable protein to essential minerals, health promoting starches and secondary metabolites. Not enough of this potential is available as general knowledge among the public – it should be.

### - Stimulating

- Incentivising legumes production by reducing the nitrogen use (focus on the promotion of natural nitrogen cycling) → issue stronger restrictions, this makes water and agricultural (n use) policies also relevant.
- Incentivise the processing of legumes → and differences in economic-scales need to be accommodated.
- Trade policies: it is alleged that we have free markets. Is this true? Also, and if so, is it good or bad, and, should there be a tariff on imported protein to encourage greater levels of self-sufficiency?
- Adaptation of legal standards for Greening (e.g. harvesting time).
- To be open-minded to other sources of animal protein sources, and combine them with legumes.
- System effects of farming: greenhouse gas emission and climate change adaptation should be used as arguments for a shift towards more legume production (CAP reform needed), subsidies could be lined up.
- Generating more demand.





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- The cost side of production: legume cropping may decrease the CO<sub>2</sub> emission of farming which makes farming more cost-effective. Therefore, what about a 'environmental cost of production certification scheme' (Co<sub>2</sub>e?), for food production would help consumers to choose food products on better information bases.
  - Better chances for organic farming.
- **Who is a responsible/powerful actor to issue policy changes?**
- Relevant policy sectors at each level: environmental policies, health policies, nitrogen directive, conservation policy (Natura 2000), protein policies (where they exist)?
  - EU Commission is vital to engage as well as national/federal governments.
  - Policymakers (and their interplay – interlinkages) at different scales, from regional to national and to EU level (considering the polarisation of policies).
  - Association and extension services (esp. in the organic sector) & consultation is a vital policy actor, also paying attention to info on marketing possibilities (which products can be sold at a high price on the market).
  - Organic farmers & small-scale farmers – bottom-up initiatives to policy change, good examples, and small-scale farmers are an ideal group to test new varieties and production/processing methods.
  - The policy should incentivise research institutes and gene banks to test alternative legume varieties → key players who control research funding to make legumes research a priority.
  - Final users (consumers), to encourage for example Payment for Ecosystem Services ('PES') incentive, the final users could contribute financially to the support of farmers to grow.





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- Consumers (cannot be easily influenced by policy) – keywords should be adopted such as “traditional” versus “new food”; they need information on the ethical differences in methods of production to help nudge them into change (c.f. Thaler et al.,)

### - Gaps not addressed in rounds 1 and 2

- Emerging technologies.
- Direct sale from farmer (as producers and or processor) to the consumer.
- Policies to support domestic markets – regulating capitalism to generate sustainable businesses.
- Jobs and growth – how to link this to legume production?
- Linkages of suggested foci to Sustainable Development Goals.

### Round 3: which changes are needed in short and long-term to have more legumes in the EU agrifood system?

- CAP Greening: ban the production of soybean in EFAs, or ban the intensive production methods typically used for soybean production.
- More legume varieties for production.
- Changes in the education of nutrient habits: a broader range of policy instruments to use (going beyond providing information but also use other incentives, “nudges” or “role model” – e.g. akin to the Slovenian policy change encouraging use of wood as a required material for public buildings.
- Encouraging changing to people’s diets from the governmental level *i.e.* through public food production and catering (government to encourage minimum quotas (proportions) for legume based products in school foods.





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- Results-based agri-environmental payment system, instead of hectare based subsidies  
→ more money should be spent encouraging delivery of public goods (not simply just production).
- Focus on protein quality as whole meal, not as a simple (protein) ingredient or meat-substitute.
- Fight against nutritional hoaxes
- We should show that legumes are not as good as meat, but even better!





## TRansition paths to sUstainable legume-based systems in Europe

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### ANNEX II: draft guidelines and template for national level studies





## TRansition paths to sUstainable legume-based systems in Europe

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### Policy questions (interview template) for the Case Studies

<b>Name (of the interviewee)</b>	
<b>Organisation</b>	
<b>Role in the Organisation</b>	

#### Organisation

- What is the link of the organisation and the theme?
- In what ways the organisation is focussing on legume-based systems?
- Which legumes are they most concerned with?
- Are they members or owners of any of the community initiatives, market enterprise professional organisation?

#### Challenges

- To what extent and which aspects of this topic they see relevant?
- What challenges did they identify in promoting the production, processing and consumption of legumes?

#### Actors and Networks

- What are the organisations they know in this field?
- How would they draw the value chain of legumes?
- Which are the central stakeholders? Who are the key figures?
- What are the primary policy documents in this field? Which policies are helpful?
- What exemplary projects or initiatives they know on this topic?
- What types of cooperation they see in the promotion or development of value chain of legumes? *e.g.* in production, processing and consumption?

#### Solutions, potential for innovation

- How could we improve the state of legumes in the EU?
- Are you aware of any policy solutions?
- What policies you would like to see?
- What would be needed to develop the value chains?





## TRansition paths to sUustainable legume-based systems in Europe

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### Any personal notes, ideas inspired by the interview

**Stakeholder analysis tool: account will be made of** the various stakeholder types (interviewees) with respect to their potential role in influencing operations within value chain.

### Analytical points for consideration by interviews

- Benefits from EU policies to support innovation processes.
- Contexts that are conducive to legume based systems success.
- Characteristics, strengths and weaknesses of initiatives.
- Emerging new arrangements.
- Positioning of new arrangements and initiatives.
- Actors and organisations and networks involved.
- Factors of stabilisation.
- Beneficial governance processes, institutional arrangements, political or social support.





## TRansition paths to sUstainable legume-based systems in Europe

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### ANNEX III: a draft framework for policy solutions: the Hungarian national feed program as a model approach





## TRansition paths to sUustainable legume-based systems in Europe

### Example of a policy data template for TRUE innovation Case Studies

<b>Exact title of policy/instrument:</b>	
<b>National language:</b>	Nemzeti fehérje takarmány program
<b>English:</b>	National protein feed program
<b>Description:</b>	
<b>Decision-making body of policy:</b>	Government of Hungary
<b>Type of legal document:</b>	Government decree, Ministry of Ag
<b>Scale (int.-EU-nat.-reg.-loc.)</b>	National
<b>Focus</b>	<input checked="" type="checkbox"/> Food/feed innovation – social/market and technological aspects (e.g. new raw materials) <input checked="" type="checkbox"/> food/feed research <input type="checkbox"/> CAP and agricultural economy (land use, rural development, organic farming, internal production market) <input type="checkbox"/> Health policies <input type="checkbox"/> Consumption policies promoting sustainable food/diet <input type="checkbox"/> Climate policy <input type="checkbox"/> Water, Soil, Environment (pesticide use) <input type="checkbox"/> Habitats and biodiversity policies <input type="checkbox"/> Rest of the world (trade agreements, development aid) <input type="checkbox"/> other: .....
<b>coming into effect:</b>	Oct 2017
<b>Policy objective:</b>	
replace feed from genetically modified soybean imports	
<b>Relevance and importance for TRUE (goals to support a legume-based transition):</b>	
<ul style="list-style-type: none"> <li>• What is the policy problem that needs an urgent solution? Substitute GMO soy from feed</li> <li>• Who are the policy decision-makers? Members of Parliament</li> <li>• How to create actionable, reliable policy-relevant knowledge?</li> </ul>	





## TRansition paths to sUstainable legume-based systems in Europe

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part of a three-year 8 billion HUF research and development plan
<b>Possible Operational Criteria – if information is available</b>
<b>INDICATORS</b>
In implementation
<b>IMPACTS</b>
Any evaluation studies? Pilots?
<b>EQUITY</b>
Stakeholder involvement?
Support scheme?
<b>TRANSPARENCY</b>
How transparency is supported?
<b>LEGITIMACY</b>
How legitimacy is supported?
<b>FLEXIBILITY</b>
<b>EFFECTIVENESS</b>
<b>PREDICTABILITY</b>
<b>PERSISTENCE</b>
<b>Action plan for the desired policy change (if any):</b>
<b>Supporting information – references, websites, contact/s.</b>





## TRansition paths to sUstainable legume-based systems in Europe

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### Rapid Stakeholder Mapping

For each policy innovation case partners will be asked to list all key stakeholders in the following table first, and then make a judgement on the 'importance', 'legitimacy' and 'influence' for various stakeholders as: 1, low to 5, high.

<b>Policy-makers or beneficiaries</b>	importance	legitimacy	Influence
Crop Breeders			
Seed suppliers			
Farm equipment manufacturers			
Agrochemical suppliers			
Agronomists			
Farmers			
Seed traders / Aggregators			
Processors			
etc			

*Record data for 'importance', 'legitimacy' and 'influence' for various stakeholders as: 1, low to 5, high.*

