TRansition paths to sUstainable legume-based systems in Europe

Report of the 2nd Mediterranean Legume Innovation Network (M-LIN) workshop

"Realising the ecological-health approach: consumers' transition to legume-based diets"

9th July 2019, Porto, Portugal

Hosted by Universidade Católica Portuguesa & Eurest

The TRUE-Project has received funding from the European Union´s Horizon 2020 Research and Innovation programme under Grant Agreement number 727973.

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1. Executive Summary

The 2nd Mediterranean Legume Innovation Network (M-LIN) workshop with the title, *"Realising the ecological-health approach: consumers' transition to legume-based diets"* was held on the 9th of July 2019 in Porto, Portugal, hosted by Universidade Católica Portuguesa (UCP) and EUREST. The meeting provided another exceptional opportunity to bring together stakeholders interested in the topic of sustainable diets and to interact with members of the TRUE project.

Previous LIN workshops have done an excellent work on identifying the challenges related to legume breeding and legume production, gathering points of view from farmers and policy makers. Ecology and agricultural production have been important points of discussion and several important conclusions were taken from these events.

For this 2nd M-LIN the main objective was to involve a more representative number of health professionals and dietitians in the discussion, given their close relationship with the consumers and the importance of their knowledge in consumer advisory on diets and lifestyle. Assuming an ecological-health approach, the specific aims of this M-LIN were to understand: the main constraints in legumes inclusion in general diets, with special focus on children; legume policies hindering or enabling legumes consumption; health effects and nutritional status modulation by legumes; new product development and legume-based innovations. Plus, two **group sessions for a participatory discussion** on barriers, drivers and changes needed in "consumption & health and policy" and "marketing and sustainability" were promoted. These included all M-LIN participants to ensure points of view from different stakeholders were accounted for.

The workshop included presentations of members from Portuguese policy makers, dietitians, scholars, and members of the distribution chains.

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The main auditorium of the university provided space for a series of 10-minute keynotes on a variety of topics related to legumes. The **Legume Fair** was displayed in the building entrance for the entire day.

The whole event convened **84 participants**, which included TRUE members and stakeholders across the legume-based value chain. A total of **8 oral presentations, 7 participants in the legume fair** and **2 breakout sessions** were organised to discuss different aspects of legume related topics. The organization of the LIN event started by displaying a video with short statements from **children** of different European countries regarding their **perspectives on legumes** (with parental permission/ethical approval for internal project use only). The main objective was to show to all stakeholders that **education on legume consumption** is a key step to combat myths and misconceptions, as well as to change food habits and preferences.

General **outputs** of these event were four posters with the compilation of the opinions of all participants of the breakout sessions. The main conclusions from these breakout sessions were immediately communicated to the audience at the end of the day, at the closing session.

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2. Introduction

2.1 Background & Objectives

TRUE is funded by the European Commission's Horizon 2020 Programme over four years until March 2021 to explore strategies to reduce the EU's dependency on imported protein food (soy) and synthetic nitrogen fertilisers. In this context, TRUE aims to identify "transition paths" to increase sustainable legume cultivation and consumption across Europe and includes the entire legume feed and food value chains. During the project, **Legume Innovation Network (LIN)** workshops are organised to involve relevant stakeholders in a multi-actor approach. They take place in three geographical regions with different pedo-climatic conditions: Atlantic, Continental, and Mediterranean. In 2020, a final common European Workshop will be organised to build a European Legume Innovation Network. The workshops are intended to help:

- share legume focused activities with other **networks and actors;**
- exchange insights from **legume-based innovations**;
- collate **challenges and needs** regarding legumes across the entire value chain;
- gather stakeholder assessments on **legume markets and policies;** and,
- identify key leverage points for **improving framework conditions for legume-based food- and feed-chains.**

2.2 Workshop framework, participants and methodology

The second Legume Innovation Network (LIN) workshop of the Mediterranean Region was organised by **UCP** (Universidade Católica Portuguesa) and **Eurest**, a restaurant services provider company. The main objective was to understand the main barriers and drivers to legume consumption and how TRUE members can contribute to the shift in diets and public opinion to more sustainable alternatives.

Besides gathering TRUE members from 12 European countries, stakeholders across the legumes' value chain were represented. A special effort to engage nutritionists and other health practitioners was done, due to their important role in advising the population and influencing dietetic trends.

Besides oral presentations, a **Legume Fair** was organized to display different and innovative applications for legumes and the available market for this commodity. Also, an important vehicle for discussion was provided via four breakout sessions with a random distribution of all stakeholders in different rooms, to allow the identification of barriers and enablers of "consumption and health and policy" and "marketing and sustainability".

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3. Presentations

A copy of all available presentations have been uploaded to the TRUE website here. Direct links to the slides can be found at the end of this report in Annex III.

3.1 Presentations Overview

The **main points** highlighted during the presentations were as follows.

- **Policies** for **reducing meat** consumption and **labelling** products.
- Promotion of legume consumption through **awareness campaigns**.
- The challenge of including **legumes in children's diets** in school catering.
- **Health impact** of legumes consumption.
- **Trends** in legumes consumption and **new pulse-based products developed** in the last years.
- Increasing urban agriculture for **sustainable cities** and life quality improvement.
- How legumes contribute to **fair, clean, and good food** distribution.
- How can **consumers make good knowledge-based choices** despite confused media messages.
- Legumes contribution to **decrease food insecurity**.

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3.2 Presentations' Abstracts

Opening session: Background to the TRUE project

Pietro Iannetta, TRUE coordinator, The James Hutton Institute, UK

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 an *Intercontinental Scientific Advisory Board*. Collectively, these elements present a strategic and gender balanced work-plan through which the role of legumes in determining how the '*three pillars of sustainability*', '*environment'*, '*economics'* and '*society'* may be best resolved.

TRUE realises a genuine multi-actor approach, the basis for which are three *Regional Clusters* managed by WP1 ('*Knowledge Exchange and Communication',* University of Hohenheim, Germany), that span the main pedo-climatic regions of Europe, designated here as: *Continental*, *Mediterranean* and *Atlantic,* and facilitate 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 supplies hitherto unparalleled datasets for the '*sustainability WPs*', WPs 5-7 for '*Environment'*, '*Economics'* and '*Policy and Governance'.* These are led 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 University of Hohenheim), and the Environmental and Social Science Research Group (Hungary), in association with Coventry University, UK), respectively. 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 thresholds (or goals) to which each SDI should aim. Data from the *foundation WPs* (1-4), to and 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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Session 1 – Policy and Health

No 1. Inter-Ministry Strategy for Healthy Eating (EIPAS)

Pedro Graça, Dean of Faculty of Nutritional Sciences, University of Porto

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No 2. Promotion of legume consumption: an example of an awareness campaign from the Portuguese Association of Nutrition

Célia Craveiro, President of the Portuguese Association of Nutrition

During 2016 – International Year of Pulses – Portuguese Association of Nutrition developed an awareness campaign to promote the consumption of legumes among the Portuguese population. This campaign, named "1 portion of pulses per day", mostly occurred from May to September. It was followed by support given to professionals, so that they tackle this theme at their workplaces. Initiatives included supporting in activity organizing teams and bookmark offers. In fact, Portuguese population presented a very low consumption of pulses, despite this food being present in its culture and gastronomic tradition. Thus, main goals were promoting consumption of at least one portion of pulses per day, across all stage of life cycle, and acknowledging the health benefits associated with this type of food.

For this initiative, various technical-scientific materials were developed and adapted to multiple audiences (for instance, e-books, posters with described recipes based on pulses, educational games), so that trustworthy information on the subject was made available. Over this campaign, we successfully distributed bookmarks to over 15 thousand people, raising awareness for how much is a portion of pulses. This was achieved by offering a 25 g bag with dried pulses, which means that over 100 kg of pulses were offered all over the country. In parallel, over 50 awareness events were developed across the nation, and more than 30 participations were registered in the media. In 3 cooking workshops, nutritionists and chefs helped presenting how to prepare healthy legume-based meals in simple steps. Children games were also made to stimulate the younger generation's interest for pulses and to encourage their consumption, as well as their parents'.

Thus, all these approaches helped us promoting the consumption of pulses, highlighting their nutritional and environmental advantages. We demystified concepts, reinforced, and clarified every consumption recommendation. It was, indeed, a campaign which raised consciousness in the community – among the children, healthcare professionals and official entities alike. We feel that there was undoubtedly an awakening towards the importance of pulses and a reflection of its impact in daily nutrition and on the planet's sustainability.

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No 3. School meal guidelines that promote inclusion of legumes

Rui Lima, National Education Directorate

The Ministry of Education of Portugal has a long history of guidelines for meals.

In the last document – Circular 3097/DGE/2018 (http://www.dge.mec.pt/sites/default/files/Esaude/oere.pdf), we can see nutrition guidelines, but also another kind of concerns: economic, environment, sustainability, social, or, Mediterranean's diet promotion. The promotion of legumes is one of the main strategies to congregate all those concerns.

We recognize that legumes, beyond the nutritional value, have an important role to sustainable diet, to tasty meals and to approach school's meals to home's meals.

For all those reasons, is compulsory the inclusion of legumes as the principal issue of the main course at least, once a week, and also once a week, the soup have to be done with legumes.

The inclusion of legumes as the main component of the vegetarian's diet is also an evidence of the recognition the importance of legumes for the student's health, but also for sustainability meals.

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No 4. Legume breeding for better nutrition and climate change mitigation

Albert Vandenberg, University of Saskatchewan, Canada

The production and consumption of nutritious seeds of grain and forage legumes for use as a protein source for humans and domesticated animals is as old as agriculture when hunter-gatherers first settled in what is now known as southern Turkey. That is really when the concept of sustainable crop rotation using legumes for improving soil, plant, and human started. Just over a hundred years ago, the Haber-Bosch process for production of nitrogen fertilizer was developed. The world population was under 2 billion. The rapid increase in the extraction and exploitation of ancient sources of gaseous and liquid hydrocarbons stored in the earth's crust resulted in the creation of many new materials including fertilizers, fuels, and plastics. We are now approaching 8 billion people, many of whom have been vigorously and rapidly expanding their atmospheric carbon footprint. The environmental and health consequences of the animal-based protein supply have now become a concern for both atmospheric, terrestrial and human health. The demand for plant protein in the global food system is expanding rapidly. Further diversification and expansion of the supply of diversified plant protein is required. This presents both challenges and opportunities for legume-based plant breeders everywhere, in every agricultural ecosystem. The global food system's reliance on a limited number of crops to feed the human population has likely diminished its ability to reliable provide diversified sources of legume-based plant protein sources. There are signs of renewed interest in investment in the genetic improvement to increase productivity and diversity of legume seeds across a wider range of agricultural ecosystems. The plant-based protein supply and demand will become an increasingly important part of the processed food ecosystem. A systematic and deeper exploration of genetics and genomics of grain legumes will lead to improvements in the quality and quantity of proteins and many other important nutritional components available through plant-based diets. Areas of genetic research will include the diversity, bioactivity, quantity and processing qualities of vitamins, antioxidants, specific proteins, and bioactive peptides, and in some cases the reduction and elimination of antinutritional factors.

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No 5. The impact of a pulse-based partial-replacement diet on metabolome and health

Helena Ferreira, Faculty of Biotechnology, Universidade Católica Portuguesa

Worldwide academic community and reference international organizations have acknowledged that current eating patterns where animal products remain as main protein food sources endangers our planet's sustainability, arising environmental, economic, even social impairments. As so, shifting to more eco-friendly plant-based diets appears as an important solution to solve these problems and keep the 2030 Sustainable Development Goals within humanity's grasp. Though, there is a health matter that must be taken into the equation as well. Scientific evidence strongly suggests that diets featuring high intakes of animal products, especially red and processed meats, may increase the risk of disease development, including cancer and rise total mortality rates. On the other hand, plant-based diets have shown to be able to promote more favourable health status and even act at the level of disease prevention and treatment. In this context, the EAT-Lancet Commission has published early this year scientific targets for achieving healthy diets from sustainable food systems stating, among other central recommendations, that protein dietary needs should be primarily satisfied from plant sources. In the last years, pulses have taken the lead in becoming one of the best options combining significant environmental and health-related advantages. In relation to the latter, their unique nutrient-dense profile, especially their high fibre, mineral and phytochemical contents, have been associated with the decline of several chronic diseases and diets containing grain legumes have been shown to positively contribute to the therapeutic management of highly prevalent health conditions such as obesity, diabetes and many cardiovascular disease risk factors. Numerous physiological explanations have been put forward taking into consideration the nutritional richness of these foods. However, a need to unveil the biochemical pathways supporting the underlying relationship between pulse intake and health remains and expected metabolic improvements as ultimate meat replacements stay unclear. New nutritional research approaches have emerged to gain mechanistic insight into nutrition and metabolomic techniques have proven very promising. IMPULSE aims to study the use of NMR-based metabolomic analysis to investigate the health impact of an 8-week intervention study, where a typical omnivorous lunch meal will be replaced by a vegetarian pulse-based meal in a group of Portuguese healthy young adults. NMR-based metabolomics will be combined with nutritional status, disease biomarkers and gut microbiota evaluations, thus providing thorough scientific evidence on individuals' overall health adaptations to the anticipated change towards a more plant-based diet. The IMPULSE project in currently in data collection and requires data consolidation. Nonetheless, preliminary results point out to general good acceptance by participants to the proposed diet, to an overall maintenance of anthropometric parameters and to a maintenance (e.g. iron) or slight improvement in few health indicators (e.g. blood lipid profile). We expect our findings to contribute to the generation of new health biomarker patterns and insights in the understanding of the interactions between plant-based diets and human metabolism. In the frame of the TRUE project (TRansition paths to sUstainable legume-based systems in Europe), our results will help support both international and national programs on the promotion of pulses and plant-based diets.

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Session 2 – Legume Marketing and Sustainability

No 6. Legume grains in Portugal: market tendencies

Carla Teixeira, Knowledge Division of PortugalFoods

The International Year of Pulses, which was proclaimed by the Food and Agriculture Organization of the United Nations in 2016, sought to increase public awareness of the benefits of legumes/pulses concerning health, sustainable development and food security. The growing consumer concerns in matters such as health and environment, encouraged the Food Industry to focus its new product development in line with these interests. Other trends like convenience, focus on protein, meat consumption reduction, sustainability and plant-based diets are driving food innovation across the global market in several food categories.

During the presentation, PortugalFoods will present a brief New Product Development analysis focused on pulses/legume-based products placed on the markets worldwide and it will be possible to understand the major trends and product examples involving pulses and legumes as ingredient. For example, meat substitutes have showed a considerable growth in terms of new product launches on the market. It was possible to see that food industries are using pulses and legumes in their product formulations, appealing to a consumer increasingly worried about health and sustainability issues.

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No 7. The role of legumes and urban farms in promoting well-being

Paulo Nova, Faculty of Biotechnology, Universidade Católica Portuguesa

Currently, 54% of the world's population lives in urban areas. Continued urbanization, coupled with population growth, will mean an additional 2.5 billion people living in cities by 2050, with about 90% of those spread throughout Asia and Africa. Worldwide, urban population is expected to reach 66% in the same year. The way in which cities have grown, with heavy air and noise pollution, reduced green spaces, a long distance and out of season food-based system and limited sunshine access has led to multiple public health challenges. Urban agriculture is one of the answers available to counter such negative trends, as it allows to produce healthy and diversified food closer to home and through natural methods of fertilization and pest control. In addition, by creating green areas, environmental balance and public well-being are improved. Furthermore, it doubles as a green zone, contributing to the broader environmental and social balance. Green spaces help regulate greenhouse gases, promote noise reduction, balance rainwater drainage (preventing floods), lessen the organic waste going to landfills, preserve soil and biodiversity, regulate the local temperature and even impart cultural and green values. Because of the globally positive perception towards urban gardens the interest of the scientific community on evaluating their actual effects on urban users are clearly growing and several studies have shown benefits of gardening in symptoms of anxiety and depression in adults with psychological issues, generally improved health, quality of life, strength, endurance, flexibility, increased cognitive ability and socialization in institutionalized elderly people, improvements of physical and psychological health in patients with chronic pain, improvements in patients with mental illness regarding their psychic status and progress in learning and socialization skills and benefits on active aging and stress in horticulturists. In short, urban farms could benefit both the environment and the well-being and health of urbanites. In Portugal, urban farms are a recent but clearly expanding phenomenon and its impact in citizens have not been yet studied. Following this premise, a research was performed with 115 participants that engaged in a recent urban farming activity in an urban biological garden in Oporto city with the objective of characterize this participants in terms of their current state of health and health behaviors (at gardening beginning) and to evaluate the effect of horticulture practice on health behaviors and quality of life (after a six month gardening stretch). This research showed significant behavioral changes among its users, including positive outcomes in anthropometric parameters, physical activity, smoking habits, eating habits, health status and overall quality of life and despite a short follow-up period, it could be shown that gardening did influence health and quality of life behaviors.

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No 8. Slow food's initiatives to promote sustainable diets

Claudia Nathansohn, Slow Foods Germany

Founded in Italy in 1989 to prevent the disappearance of local food cultures and traditions and to counteract the rise of the fast food culture, Slow Food has grown into a global movement involving millions of people in over 160 countries, working to ensure that everyone has access to good, clean, and fair food. Food should be produced without negatively impacting the climate, the environment or animal welfare and allow its producers to secure their livelihoods through fair prices. Slow Food argues that a paradigm shift associated with a holistic approach towards the food system is needed. The main goals are increasing public awareness to bring about change of consumers' eating and consumption habits and the adoption of more sustainable and ecologically friendly diets, changing the food production system and promoting the transition to diversified agroecological food production practices. Finally, the organization's focus is also on changing the policies connected to food on an international, national, and local level, as well as improving food policy coherence. To achieve these goals, Slow Food does advocacy work, organizes events, and offers educational programs directed at bringing about the necessary paradigm shift on the consumer- and policy-level. Some of the main Slow Food Germany activities are education programs like "Understanding Soil", which aims at giving students an understanding of the importance of the finite resource of soil in the context of food production; "Iss-Fair-netzt", which aims at giving young people an understanding of how the food production chain works; the "Slow Food Youth Academy", which is an interactive, educational project consisting of seven theme weekends either dedicated to food categories (fish, grains etc.) or to a topic (agroecology, global trade etc.) and a study trip. There is also a series of activities focusing on pulses. Slow Food Germany is one of 24 project partners from practice and science involved in the EU project TRUE (TRansition paths to sUstainable legume-based systems in Europe). Slow Food's job within the project is to create a cookbook containing legume recipes from various European regions. These are complemented by historical background information on the used pulses and dishes. The project partners then provide additional details about their ecological footprints and nutritional values. Furthermore, legumes also played a major role during our Slow Food Germany events including the Biofach-Fair in Nürnberg, the Slow Food fairs in Stuttgart and Turin, the environmental festival, or different events of local groups or our event format "On the discovery of the roots of our food" as well as many more projects around the world like the "Ark of Taste" and "Chef Alliance".

All Slow Food actions, events and programs showcase how food production and trade as well as our daily consumption habits are connected to broader global topics, such as the climate, biodiversity loss, environmental issues and the state of local habitats. In addition, the holistic approach means allowing participants during the events and activities to experience food with all senses and making the connection between pleasure and responsibility, thus showing how one can consume good, clean and fair food with joy and at the same time with respect towards the environment and the farmers.

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4. Legume Fair

A legume fair was held in the entrance of the main building of Catholic University and consisted in new plant-based products/services demonstration.

Products were available for tasting and sample sized products were distributed, e.g. PlantCakes, BBDonuts.

Services demonstration was also available, e.g. Eurest, SlowFoods, Prozis.

Stakeholders were invited to engage a for TRUE activity

"Plantcakes" – Development of a new lentil-based, vegan-friendly, pancake mix

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"BBDonuts" – Donuts enriched with faba bean, almonds and olive oil for Portuguese traditional foods valorisation

"Easy peasy legume recipes for kids across the globe" – Child friendly book with legume-based recipes

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5. Outputs of discussions

5.1 Summary

The main identified barriers to consumption and health and policy were consumers ignorance and misconceptions to legumes nutrition. Lack of availability of genetic resources and of knowledge of recipes and cuisine are also hindering consumption. Lobbies from industry and lack of collaboration between the scientific community and politics are also a major barrier.
To promote legumes consumption, legume-based products should be made easier to eat and more convenient. Stakeholders that could promote the shift in current diets are food technologists, processing equipment manufacturers, marketing specialists. Subsidies should be made available to farmers to promote cultivation and policies should promote legumes inclusion in canteens and school meals. Knowledge on legumes should be taught to parents, children and educators.
Cooking guidelines should be made available for schools and public infrastructures and National campaigns should be developed to show the potential of legumes and their nutritional value. Labelling of products should be clearer and government, universities and farmers should work together.

In regard to innovation, marketing and sustainability, yield consistency is a major concern, as well as limited commercial markets and gross value. Price on meat-alternatives are too high compared to other meat products, which limits diets shift. In the case of producers, more knowledge is needed to grow the legumes, especially for lentils, chickpeas and lupins, and subsidies should be made available to promote cultivation.

More science-based knowledge is urgently needed in order to demonstrate to policy makers and other stakeholders' legumes value to the supply chain.

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5.2 Report from the breakout sessions

The Breakout sessions took place in 4 rooms (with 25 participants per room). Each room had one facilitator and one rapporteur and groups were divided in three subgroups, with the concern that at least two different nationalities were represented per group.

Each room produced one poster that compiled the opinions of all participants in the room and the results were presented orally to the plenary, at the closing session, by the facilitators Ana Gomes, Elisete Varandas, Bálint Balázs and Georgia Ntatsi.

The two matrixes of each room are included here.

Breakout session 1: Policy and Health

Supporting questions

1. What are the drivers, barriers and changes needed to increase legume consumption?
2. Who are the most important partners / stakeholders / organisations to work with for legume-based products to change policy and consumption? How can your work / unit contribute to this?
3. What policies promote/hinder legume consumption in your country and how could these be improved?
4. Are there any regulatory challenges for policy to address?
5. In what way could policies be outlined to promote investments in processing of legumes?

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Table 1: Breakout session 1 – Policy and Health – Barriers/hindrances, Drivers/promoters, Changes needed/how to improve

	Consumption/ health	Policy
Barriers/ hindrances	• Long cooking time • Lack of cooking skills and knowledge on cuisine • Taste and texture • Attitudes towards legumes (old fashioned food) • Lack of awareness about the health benefits and nutritional facts • Lack of availability of genetic resources • Production versus price • Perceptions of weight gain and associated gastric problems • Protein versus carbohydrates • Packaging • Boring and unattractive products • Food intolerance or food allergies • Environmental constraints for legume cultivation	• Price • Categorization of products • Meat and milk industry competition • Lack of collaboration between politics and research • Lobbies from industry • Low infrastructure of the supply chain • Policies hindering consumption • Promotion of 'green' beef and dairy in Ireland • Meat is too cheap • Legume illiteracy amongst the National Organizations
Drivers/ promoters	• Low cost, low fat, high fibre, vegan, carbohydrates alternative • Make legumes easier to eat and more convenient products • Snack foods • Media • Green farming and sustainability • Recipes combo with meat to start the transition • Show people how to use • Create easy cooking ideas (hummus and dips) • Link pulse-based foods with social events • Add to traditional recipes (spaghetti sauce/lasagne) • Health and environmental consciousness • Economic and sociocultural aspects • Stakeholders: food technologists, processing equipment manufacturers, marketing specialists • Finance trends and health • Supermarkets • Farmers associations	• Good food culture • Younger consumers could be more aware of environment and health trends • Development of products that taste as good as the animal-source alternative • Vegetarian option in school canteens • Subsidies for food not feed • Rewarding carbon emission reduction in farming • Ministry of Education and Health • Food industry • University/Schools education • Influential people who share the view • CAP/Post-Brexit • Promotion of diets in schools of Portugal • State promoting campaign • Health policies • Government Advisory Bodies • Promote valorisation of local varieties • National guideline for meat free Monday • Partnerships with municipalities for urban farms

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	Consumption/ health	Policy
Changes needed/how to improve	• Social occasions targeting • Think different: kind of consumers; ready to cook products; family cooking • Change market: availability of fresh, frozen local varieties of legumes • Making traditional food trends • Cooking guidelines for nutrient availability • Increase education at schools for children, parents and advisors • Marketing Policy • Perceptions of nutritive value • Information for consumers • Sustainable marketing • New products with variety, adapted to consumer's preferences • Information to change habits • Education of cooks and chefs • More scientific evidences • Targeted message and adapted to specific population • More scientific evidences	• New cuisines and recipes • School campaigns and guidelines for school meals • Improve taste • Transfer traditional recipes across countries • Legume Food Workshops • TV programs for nutrition • Organic farming with pulses for soil N • Reduce taxes on pulse products and on vegetarian restaurants • Require all restaurants to offer vegetarian meals • Government, universities, and farmers should work together • Increase evidence for policy makers • Partnerships between environmental campaign groups, lobbyists with good population dynamics and food technologists • Subsidies needed for legumes • More public funding for farmers to promote the cultivation of legumes • Meat free Monday on canteens • National campaigns showing the potential of legumes

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Breakout session 2: Innovation, Marketing and Sustainability

Supporting questions

1. How do you see legumes supporting the sustainability of the food chain?
2. What are the most important characteristics of legume-based products with regards to sustainability?
3. What would it take to move legume-based products from the niche segment to the mainstream market segment?
4. What are the most important marketing claims for purchasing legume-based products?
5. How can we make legumes more fashionable and trendier or should focus be on legume-based products?
6. How could more legume-based products become available in the market?
7. Which actors should take the big steps forward for having more legume-based products in the market?

Table 2: Breakout session 2 – Innovation, Marketing and Sustainability – Barriers/hindrances, Drivers/promoters, Changes needed/how to improve

	Producers	Consumers	Marketing
Barriers/ hindrances	• Land availability • Awareness of farmers • Tradition (demand) • Infrastructure (farmer's networks) • Production systems • Cash crop value • Yield consistency • Limited commercial markers (so far) • High demand of soybean for animal feed • Not enough facilities to process legumes • Producers need more knowledge to grow the legumes, especially for lentils, chickpeas and lupins • Price on meat-alternatives too high compared to other meat products • Bloating and abdominal pain that is believed to come after eating legumes • Food lobbies • Lack of incentive for farmers	• Lack of information • Lack of awareness • Negative perception from consumers • High price per processed • Nutritional changes during cooking • Educating all children • Eating habits in family • Tradition/eating habits	• Food unattractiveness • Education (focus on negative sides of legume digestion) • Bad image of legumes • Localization to specific areas in the markets

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	Producers	Consumers	Marketing
Drivers/ promoters	• Demand • Money • Agricultural advisory service • Heritage varieties • Catering services for using legumes • Lower carbon footprint • Reduce fertilizer use • Can replace animal protein • Health • Soil quality • Disease break • High protein and fibre • Weight loss • Gluten free • Side dishes • Bakery substitutes • Government grants for entrepreneurs • Higher gross margins	• Demand • Influencers • Versatility • Social media • Celebrity-endorsed products • Environmentally/health - friendly products • Millennials • Consumer curiosity for new foods and food cultures • Incorporate pulses into several food products • Appealing new legume products • Lower environment footprint • More accessible to everyone • Low greenhouse gas emission • Good for biodiversity • Price • Taste • Social value/lifestyle statement • Pollution reduction (N runoff) • High nutritional profile	• Cost • Health • Environmental • Fashion • Packaging (eco-friendly) • Attractiveness

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	Producers	Consumers	Marketing
Changes needed/how to improve	• Policy • Education • Marketing strategies • Support grants for farmers • Environmental label • Traceability • Small-scale cooking shows • Introduce in cooking TV shows • Taste improvement • More affordable • Innovation • Investment • Increase processing facilities • More rotations • Educate farmers on proper cultivation practices • Detach from US soybean and go towards locally-produced legumes • Profitable production • Policies to stimulate legumes production • More grower's networks • Legumes need to have more value returning to growers • Contracts for production for multi-year harvests • More processing facilities • Clearly indicate country of origin (mixed food packages) • Double-source products • Thorough labelling regarding products (organic/ natural/ environmental, etc.)	• Professional marketing campaigns • Transfer of scientific knowledge to the non-scientific community • Ingredient substitution • Grants or tax breaks for industry in legume processing plant/factories • Subsidise development of supply chain capacities for processing • Increase awareness about importance of legumes	• Recreate the perception of legumes • Circular economy • Education • Positions of legumes in supermarkets • More LCA/evidence science on various benefits • More small scale processing equipment (affordable) • The concept of the environmental value of legumes needs to be quantified and spread into policy makers so regulation can drive their delivery • Sustainable non-polluting packaging • Weight control promotion • Celebrity endorsement • Options for creating alternative marketing channels • Marketing needs to span the whole chain

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5. Annex

Annex I – M-LIN programme

July 9th 2019 – Universidade Católica Portuguesa

8.30 **Registration**
9.00 **Welcome from the organisers –** Célia Manaia, Manuela Pintado & Marta Vasconcelos (Universidade Católica Portuguesa)
9.10 **Background of the TRUE project –** Pete Iannetta (TRUE coordinator, James Hutton Institute)
9.25 **Short video on children perspective on legumes**

Session1 - Policy and Health
Facilitators: Bálint Balázs and Ana Gomes

9.30 **Inter-ministry strategy for healthy eating (EIPAS) –** Pedro Graça (Dean of Faculty of Nutritional Sciences, University of Porto)
9.50 **Promotion of legume consumption: an example of an awareness campaign from the Portuguese Association of Nutrition –** Célia Craveiro (Portuguese Association of Nutrition)
10.10 **School meal guidelines that promote inclusion of legumes** – Rui Lima (National Education Directorate)

10.30 **Refreshment Break and Legume Fair**

11.00 **Legume breeding for better nutrition and climate change mitigation** – Albert Vandenberg (University of Saskatchewan, Canada)
11.20 **The impact of a pulse-based partial-replacement diet on metabolome and health** – Helena Ferreira (Faculty of Biotechnology, Universidade Católica Portuguesa)
11.40 **Breakout Session 1** – Discussion on policy, consumption and health

13.00 **Lunch Break and Legume Fair**

Session 2 – Legume Marketing and Sustainability
Facilitators: Elisete Varandas and Georgia Ntatsi

14.30 **Legume grains in Portugal: market tendencies** – Carla Teixeira (PortugalFoods)
14.50 **The role of legumes and urban farms in promoting well-being**– Paulo Nova (Faculty of Biotechnology, Universidade Católica Portuguesa)
15.10 **Slow food's initiative to promote sustainable diets** – Claudia Nathansohn (Slow Foods Germany)
15.30 **Breakout Session 2** – Discussion on innovation and marketing and sustainability

16.30 **Refreshment Break and Legume Fair**

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17.00 Wrap up of breakout sessions and final discussion
17.30 Closing Remarks – Pete Iannetta (TRUE coordinator, James Hutton Institute)

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Annex II - Participants

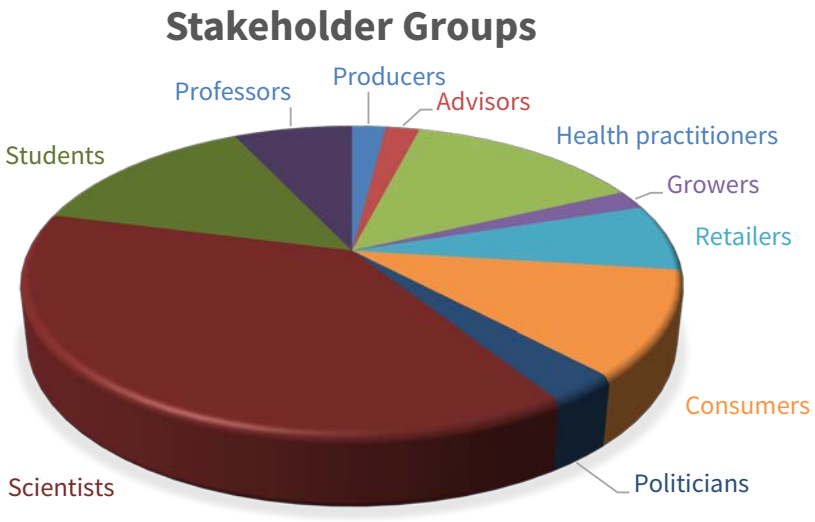

Figure 1: Distribution of participants by stakeholder group

List of Participants

1. Ada Rocha
FCNAUP
Stakeholder group: Health practitioner (Nutritionist)

2. Adalgisa Correia
Eurest
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3. Albert Vandenberg
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Annex III - Presentations pdfs

All available presentations and the posters have been uploaded to the TRUE website here.

Presentations (direct links)**:**

- **Background to the TRUE project** - Pete Iannetta, TRUE-Coordinator, James Hutton Institute, United Kingdom
- **Inter-ministry strategy for healthy eating (EIPAS)** – Pedro Graça, Dean of Faculty of Nutritional Sciences, University of Porto
- **Promotion of legume consumption: an example of an awareness campaign from the Portuguese Association of Nutrition** – Célia Craveiro, President of Portuguese Association of Nutrition
- **School meal guidelines that promote inclusion of legumes** – Rui Lima, National Education Directorate.
- **Legume breeding for better nutrition and climate change mitigation** – Albert Vandenberg, University of Saskatchewan, Canada
- **The impact of a pulse-based partial-replacement diet on metabolome and health** – Helena Ferreira, Faculty of Biotechnology, Universidade Católica Portuguesa
- **Legume grains in Portugal: market tendencies** – Carla Teixeira, PortugalFoods
- **The role of legumes and urban farms in promoting well-being** – Paulo Nova, Faculty of Biotechnology, Universidade Católica Portuguesa
- **Slow food's initiative to promote sustainable diets** – Claudia Nathansohn (Slow Foods Germany)

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Annex III – Results of discussions (pictures)

Acknowledgement

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Disclaimer

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