

TOPIC B2: Trade-offs and synergies between climate mitigation and food security

Re-establishing legumes as a socio-economic necessity for sustainable and resilient agri-food systems

P. Iannetta¹, B. Balazs², M. Debeljak³, A. Gomes⁴, K. Hamann⁵, B. Howard⁶, E. Kelemen², A. Kolmans⁷, H. Maass⁷, G. Ntatsi^{8, 9}, D. Savvas⁸, S. Shrestha¹⁰, D. Styles¹¹, F. Tran¹, L. Toma¹⁰, A. Trajanov³, M. Vasconcelos⁴, R. Vickers⁶, M. Williams¹², G. Squire¹

¹James Hutton Institute, Ecological Sciences, Dundee, United Kingdom, ²Environmental Social Science Research Group (ESSRG), Budapest, Hungary, ³Jozef Stefan Institute, Ljubljana, Slovenia, ⁴Universidade Católica Portuguesa, Centro de Biotecnologia e Química Fina (CBQF), Laboratório Associado, Escola Superior de Biotecnologia, Porto, Portugal, ⁵Institute for Food Studies & Agroindustrial Development (IFAU), Hoersholm, Denmark, ⁶Processors & Growers Research Organisation (PGRO), Thornhaugh, Peterborough, United Kingdom, ⁷University of Hohenheim, Research Centre for Global Food Security and Ecosystems (GFE), Stuttgart, Germany, ⁸Agricultural University of Athens, Department of Crop Science, Laboratory of Vegetable Production, Athens, Greece, ⁹Institute of Plant Breeding and Genetic Resources, ELGO-DEMETER, Themi, Thessaloniki, Greece, ¹⁰Scotland's Rural College (SRUC), Edinburgh, United Kingdom, ¹¹Bangor University, School of Environment, Natural Resources and Geography (SENRGy), Bangor, United Kingdom, ¹²Trinity College Dublin, School of Natural Sciences, Department of Botany, Dublin, Ireland

Objectives

Legume crops can help underpin the necessary paradigm shift towards more sustainable agri-food systems. Legume crops deliver nutritious food and feed, and can be among the most profitable crops of diversified crop rotations. Critically, legumes need little or no nitrogenous fertiliser, as this requirement is met by biological nitrogen fixation. Legumes can also encourage natural nitrogen cycling, enhance soil qualities and provide for beneficial insects. Yet, EU policies to increase legume production have failed: legume inclusion in European cropping systems averages 3%, while the EU imports around 70% of its protein requirement.

Methods

We present a range of tools spanning enabling- and disruptive-technologies, -supply chain structures and analytical approaches that may enhance the role of legumes as agents of sustainable economic development. We demonstrate the potential of various legume-centred approaches from a socio-economic perspective gained via a series of European Legume Innovation Network (ELIN) workshops.

Results

The low production of legumes (and reliance on imports) is not due to biophysical constraints of soil and climate, but to a disconnection between producers and consumers that in turn has led to diminished capacity for local processing and a low variety of high value products. The trends can only be reversed by effective policies that support legumes through increasing consumer awareness of their benefits and developing the technological infrastructure to increase efficiency and innovation at local- and regional-scales.

Conclusion

Legumes can be defined as 'facilitative cash crops', or 'net-givers' to food systems which can improve the resilience of society and the environment, including mitigating climate change and its impact. Holistic approaches need embodied within strategies to expand legume production and use, such as the emerging 'protein plan for Europe'. Such strategies should ensure reliance on a greater array of

legume types, and develop diverse approaches to realise ‘sustainable consumption’ over the long-term, and for the well-being of all sectors of society as well as the environment.

Acknowledgements: The James Hutton Institute is supported by the Scottish Government and this abstract is informed by EU-H2020 Sustainable Food Systems projects www.true-project.eu, DIVERSify (www.plant-teams.eu) and TOMRES (www.TOMRES.eu) funded under Grant Agreements 727973, 727284 and 727929, respectively.

Understanding the variability in diet-related environmental sustainability

E. Mertens^{1, 2}, A. Kuijsten^{2, 3}, H. van Zanten⁴, G. Kaptijn¹, M. Dofková⁵, L. Mistura⁶, L. D’Addezio⁶, A. Turrini⁶, C. Dubuisson⁷, S. Havard⁷, E. Trolle⁸, J. M. Geleijnse^{2, 3}, P. van ’t Veer²

¹Wageningen University, Human nutrition and health, Wageningen, Netherlands, ²Wageningen University, Human Nutrition and Health, Wageningen, Netherlands, ³Top Institute Food and Nutrition, Wageningen, Netherlands, ⁴Wageningen University, Animal Production Systems groups, Wageningen, Netherlands, ⁵Center for Health Nutrition and Food, National Institute of Public Health, Brno, Czech Republic, ⁶Council for Agricultural Research and Economics, Research Centre for Food and Nutrition, Rome, Italy, ⁷French Agency for Food, Environmental and Occupational Health and Safety (ANSES), Maisons-Alfort Cedex, France, ⁸National Food Institute, Technical University of Denmark, Soborg, Denmark

Objectives

The aim of this study is to assess greenhouse gas emissions (GHGE) and land use (LU) associated with dietary intake across four European countries, and to identify sources of variation in GHGE and LU between and within these countries.

Methods

Consumption data assessed at the individual level were obtained from nationally-representative dietary survey from France and Denmark (seven-day food record), Czech Republic (two replicates of 24-hour recall), and Italy (three-day food record), and were linked to a similar food-item LCA database to quantify the GHGE and LU of each individual diet using the mean of two randomly selected days and calculated for a 2,000 kcal diet. Multi-level models were used to explore associations with individual-level demographical variables, such as age, gender, educational level and overweight status, across the countries under study.

Results

There was clear geographical variability in diet-related GHGE and LU, whereby 17% of the variation in GHGE and 11% of the variation in LU was accounted for by the countries under study. Mean daily GHGE ranged from 4.4 to 6.4 kg CO₂-eq, and LU from 5.7 to 7.8 m²*year for a 2,000 kcal diet, with the lowest values for Czech Republic and the highest for France. Being female was consistently associated with a lower diet-related environmental impact. In all population (sub)groups, animal-based products were the main contributor to GHGE and LU, however considerable variation existed in the share of the different animal-based products to total GHGE and LU between and within countries related to differences in consumption quantity and food choice.

Conclusion

This data based on individual-level assessment showed that variation in GHGE and LU between and within countries is clearly related to cultural differences in food choice and consumption quantities.