UK Agri-Tech Centre

UKRI Innovate UK

Improving the sustainability of lupins through conventional and next generation methodologies

Impact headlines:

- Environmental gains
- Forage success
- Genetic breakthroughs
- Knowledge exchange

UK Agri-Tech Centre contribution:

- Project management
- RegenAg farm machinery
- Dissemination support
- Life cycle assessment support

The challenge

The UK livestock sector relies heavily on imported soya for protein feed with most of it coming from countries like Brazil, Canada and the US. This raises serious concerns about carbon emissions, deforestation and supply chain vulnerability. Lupins, a nitrogen-fixing legume with high protein content, could be a home-grown alternative. But they've struggled to gain traction in the UK due to agronomic hurdles, inconsistent yields and limited market demand.

Accelerating Agri-Tech

The innovation

The Lupin Project, a two-year study funded by Innovate UK and led by the UK Agri-Tech Centre, aimed to tackle these issues head-on. It combined regenerative farming trials with cutting-edge gene-editing research to explore how lupins could be grown more reliably and sustainably in the UK, bringing together researchers and regenerative farmers to trial lupins at scale using both conventional and next-generation methodologies.

This included:

- Field-scale trials using regenerative approaches across four farms.
- Mixed forage trials with triticale (a cereal crop) for ruminant feed.
- Laboratory work to identify genes involved in pod-shatter (premature seed loss).
- A full life cycle assessment (LCA) comparing UK-grown lupins with imported soya.

The project uncovered several practical barriers to lupin cultivation including soil sensitivity, weed control, weather extremes, pests and disease and lupins requiring a late harvest.

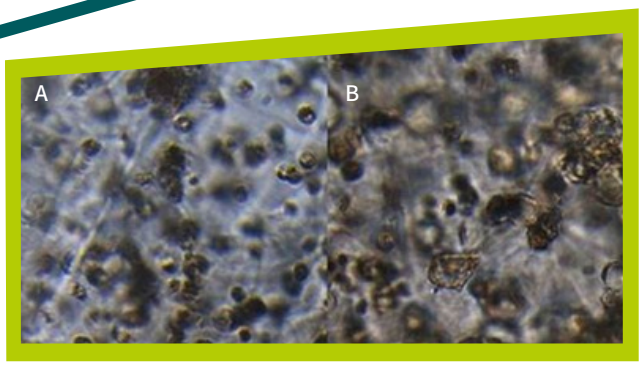
"I first came across lupins during my PhD on the functional properties of proteins from non-conventional crops. Twenty-five years later, I'm proud to have helped lead this project with Dr. Jemma Taylor, bringing together extraordinary collaboration. We're committed to paving the way for lupins to thrive in the UK's food and feed markets as a sustainable, healthy and nutritious option."

Dr Reka Haraszi, Innovation Lead - Food & Drink, the UK Agri-Tech Centre

Findings

The project produced practical recommendations for growers on variety selection, cultivation method and site suitability. It also generated early-stage tools for genetic improvement and presented evidence to support lupin as a low-emissions alternative protein source for livestock feed. The UK Agri-Tech Centre supported with project management, technical equipment, dissemination and support and LCA support. Despite the challenges, the project delivered some promising results:

- Environmental gains: The LCA showed that UK-grown lupins could reduce carbon footprint by up to 80% per kg of protein compared to imported soya, mainly due to avoiding land-use change.
- Forage success: White lupin and triticale mixes yielded up to 35 t/ha fresh weight and were well accepted by dairy cows. These mixes ensiled well and offered high metabolisable protein.
- Genetic breakthroughs: Researchers successfully isolated protoplasts and identified gene targets for future CRISPR editing to reduce pod shatter.
- Knowledge exchange: The project ran over 20 outreach events, a project video and open farm days. These helped build grower confidence and spark interest in lupins.



Protoplast recovery and division in L. luteus (A) and L. angustifolius (B)

What's next?

- Further development of lupin-based forage systems, especially in regions where dry harvesting is difficult.
- Continued gene-editing research to improve pod shatter resistance and yield stability.
- More support for market development, especially feed mill acceptance and food-grade lupin products.
- Better weed management options and region-specific agronomy advice.

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