

Increasing UK Food Security through development of improved legume crops

Optimising the yield to protein content of new legume varieties to increase economic benefits for UK growers and the feed industry, whilst also reducing the environment impact of agriculture

The need

The EU is only 30% self-sufficient in high protein commodities and c. 3Mt of non-EU soya is imported into the UK annually. Future security of supply is under pressure from emerging economies to meet demands for meat and dairy products. There is a real need to increase production of home-grown 'protein' crops to meet the demands of the feed industry and to reduce our current dependence on international markets. To help overcome this challenge, farmers need a high yielding, protein rich crop that can be readily integrated into current agricultural practice. Legume crops are already grown, predominantly as a break crop, and help increase sustainability in cereal rotations by fixing nitrogen in soils. The development of new legume crops with improved protein yield and quality will help increase domestic production of protein commodities to secure food provision for future generations.

The results

The Biosciences KTN helped secure funding for two projects that are developing new legume varieties through the Technology Strategy Board 'Sustainable Protein Production' competition, as part of the Sustainable Agriculture and Food Innovation Platform. Wherry & Sons Ltd lead both projects, which target the market expansion of home produced legume protein to the feed industry. The ultimate goal is to reduce dependence on soya protein imports by increasing domestic production of vegetable protein to help ensure future food security.

Pulses are economically valuable legume crops, with high protein content, which are typically grown in cereal rotations as a break crop. The projects will develop new varieties with higher yields and better agronomic characteristics to generate extra revenues for farmers. Establishing the protein requirements of feed compounders will help identify genetic markers for the development of improved varieties for the animal feed industry. This will increase UK and European food security through the development of improved legume

crops, better agronomy and increased incorporation of domestic vegetable protein by the animal feed industry. The association with PGRO will ensure these new varieties are quickly adopted by end users, helping to spark future investment in legume crops.

In addition, the projects could also help improve socio-economic impacts of agriculture. Legume crops fix nitrogen during their life-cycle which is returned to the soil, reducing the need for inorganic fertilisers. Increasing domestic production of vegetable protein could also provide social benefits by cutting reliance on soya imports and so helping alleviate pressure on the ecology and social structures of producer countries.

The projects will focus on:

- 1) maximising yield potential of faba beans for use in monogastric and aquaculture feed applications;
- 2) increasing crop viability and protein quantity and quality of pea for animal feed applications.

See overleaf for details of the predicted economic and environmental benefits.

Improving the availability of UK protein feed through new faba bean varieties

Economic and environmental impact:

1. Displacing £36M p.a. soya import costs through increased use of UK-grown faba bean - targeting a 10-fold increase from 1% to 10% incorporation in feed formulation.
2. Increasing sales of faba bean seed through improved varieties to meet feed market requirements - initial market worth £5.3M p.a.
3. Developing new supply chains and secure markets for UK growers worth approximately £1.2M p.a.
4. Improved agronomy and yield of new varieties will help increase the use of faba bean as a break crop, providing much needed diversity for arable rotations whose future sustainability is challenged by emerging weed and disease pressures.
5. Increased cultivation of faba bean could reduce UK nitrous emissions by 1% and the reduced need for application of inorganic nitrogen (through N-fixing in soils) would save UK farmers c. £5.9M p.a.

Protein content vs yield in legumes: releasing the constraints

Economic and environmental impact:

1. Increasing pea yields will improve their viability as a break crop, helping to diversify arable rotations and reduce weed and disease pressure on cereal crops.
2. International uptake of pea varieties in France and Scandinavia will generate new markets for UK industry – a conservative 50% growth rate in the UK and France alone would provide a royalty income of £2.5M and seed sale revenues of £8M p.a.
3. Developing new pea varieties will benefit UK growers through improved value and yield of legume crops; a 10% increase in current crop value will provide UK farmers with £15.2M p.a. extra returns.
4. Diversifying protein raw material sources through new formulations that use domestic crops will help the UK animal feed industry to remain competitive.
5. Increasing the sustainability of agriculture through a reduction in nitrogen (N) pollution. Pulses provide up to 100kg/ha of residual N to soils for following crops, equivalent to £100/ha at current market prices, which would save UK growers £10M p.a. if the pea crop growing area increases to 100,000 ha.

'The help and advice that the Bioscience KTN Plant Sector team have given me has always been of good practical use, particularly through the application stages of the current TSB projects. The work we are taking forward with our consortium partners will develop new legume crops that will benefit UK growers and the feed industry, increase the autonomy of UK food supply chains and reduce the environmental impact of agriculture.'

Peter Smith, Arable Crops Director, Wherry & Sons Ltd.



Project Details

Improving the availability of UK protein feed through new faba bean varieties, production and utilization system.

Project partners:

Wherry & Sons Ltd, PGRO, NIAB, Daleheads Foods Ltd, Aquascot Ltd, Moy Park Ltd, Stonegate Farmers Ltd, Lincs Turkeys Ltd, Green Label Foods Ltd, Garford Farm Machinery Ltd.

Project investment:

Consortium partners: £989,475
Technology Strategy Board: £952,350
Total project investment: £1,941,825

Protein content vs yield in legumes: releasing the constraints.

Project partners:

Wherry & Sons Ltd, John Innes Centre, iDna Genetics Ltd, FERA, William Thomson (Ltd), IBERS, Marks & Spencer plc, PGRO.

Project investment:

Consortium partners: £482,854
Technology Strategy Board: £466,268
Total project investment: £949,122

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