Researching Resilience: The Science of Food Security

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The Rowett Institute

As a country, how can we protect our supply of nutritious, sustainable food against the risks posed by climate change, conflict and other global and domestic pressures on our system?

This is one of the major questions that nutrition-based research carried out at the Rowett Institute is helping to answer.

Among the most promising solutions we have identified is hemp.

By growing more of this environmentally-beneficial crop for use in animal feed, growing media and as a healthy ingredient in baked goods, we can reduce reliance on imports of soya, palm oil and coir and protect our important natural peat resource.

Read on to learn more about the evidence base we have established to underpin a revival of this traditional staple and the benefits it can bring to public health, climate, nature and the economy.

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Hemp Cake - Replacing Soya in Livestock Feed

PROBLEM: Scotland's over-reliance on imported soya at a time of significant risk

SOLUTION: Hemp cake as a home-grown alternative to soya cake, offering multiple benefits

The UK is a major importer of soya cake (approx. 1.9 million tonnes in 2023), mainly from Argentina and Brazil.[1] This is used predominantly as livestock feed for the poultry (54%) and pig (13.5%) sectors.[2] There are several risks to this supply chain, namely: dependence on a limited number of countries, deforestation legislation, price volatility, political instability, trade agreements, climate change and the influence of China's demand on the global market (>100 million tonnes in 2023).[1]

In collaboration with Duncan Farms in a trial with 19,000 chickens, hemp successfully replaced imported soya cake in poultry feed (up to 20% of the total feed) with no detriment to hen welfare, egg production or taste. Natural biofortification, with hemp cake significantly increased the nutrient content of eggs (doubling omega-3 fatty acids and vitamin E, as well as significantly increasing vitamin A). This will contribute towards meeting important dietary recommendations, as well as delivering a lower carbon footprint product with increased economic value.

1. ITC Trade Map 2023
2. Resilience of the UK food system regarding demand for soy. Report by Resilience of the UK Food System in a Global Context Programme

Summary:

- hemp cake-based poultry feed delivered eggs with increased nutrient content
- replacing soya with hemp in livestock feed will reduce emissions
- scaled-up hemp production will bring wider environmental, societal and economic benefits
- all parts of the hemp plant can be used for a range of high-value products and carbon offset solutions
- hemp cake as a livestock feed will increase availability of hemp oil, which is nutritionally superior to rapeseed and olive oil improving population health
- decreasing reliance on soya will increase Scotland's food security
- investment in processing infrastructure and support for farmers is required to scale production of hemp to meet this timely need

DUNCAN FARMS

Biofortification Hub

SCOTTISH HEMP GROWERS

Hemp Hearts - Replacing Palm Fat in Baked Goods

PROBLEM: Palm fat is high in saturated fat and is difficult to source sustainably

SOLUTION: Hemp hearts are a home-grown healthy replacement for palm fat

The UK is a major importer of palm oil and its fractions (373,403 tonnes in 2024) mainly from Papua New Guinea, Malaysia and Indonesia.[1] The bakery sector finds it increasingly hard to responsibly source palm fat from countries not involved in deforestation. Palm fat is also a major factor to raising LDL-cholesterol (bad cholesterol) which is a contributor to obesity and associated diseases costing the NHS £31 billion.[2]

In collaboration with Murdoch Allan Ltd (supplier of several major supermarkets) imported palm fat was replaced with hemp hearts (produced by dehulling Scottish-grown hemp seeds) in several consumer acceptable baked goods. Replacing palm fat with hemp hearts substantially reduced saturated fat and significantly increased the omega-3 fatty acid, fibre and micronutrient content. This offers substantial societal benefits, contributing to reducing obesity and improving heart health. It will reduce Scotland's dependency on imports and improve food security. It will provide opportunities for the bakery sector to reformulate to healthier options and reduce their scope 3 emissions, while providing wider environmental benefits

1. ITC Trade Map 2024
2. NESTA 2025

Summary:

- hemp is a versatile low-input, carbon capturing plant that benefits soil health and off-farm biodiversity
- hemp can be produced in Scotland
- hemp hearts are the dehulled product of hemp seeds
- hemp hearts are low in saturated fat and have the ideal ratio of omega fatty acids for human health
- hemp hearts could replace palm fat in baked goods substantially reducing the saturated fat content with exceptional benefits for human health
- decreasing reliance on palm fat will increase Scotland's food security and reduce agricultural and scope 3 emissions

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Hemp - Replacing Coir and Peat-Based Growing Media

PROBLEM: **Scotland's heavy dependence on imported coir for food production poses economic, environmental, and supply chain risks**

SOLUTION: **Locally produced hemp-based growing media offers a sustainable, homegrown alternative to both coir and peat-based compost**

As peat use declines, coconut fibre (coir) has emerged as the preferred growing medium for Scotland's strawberry industry, which occupies around 1,100 hectares.[1] However, the rising demand for coir, limited supply, and fluctuating shipping costs have significantly increased production expenses. Additionally, the environmental impact of importing coir from Asia, combined with the labour involved in handling and disposing of used material, presents further challenges for growers.

Hemp is a highly versatile, low-input crop with powerful carbon-capturing abilities, known for enhancing soil health and supporting biodiversity beyond the farm. In collaboration with Pictish Worms, hemp straw (the by-product of hemp seed production) was shown to be a sustainable substrate for vermiculture to create a high-performance alternative to coir for the soft fruit industry. Trials with Castleton Farm demonstrated excellent results in strawberry cultivation, achieving yields comparable to those produced using traditional coir-based media. Importantly, the strawberries grown in hemp media maintained their sensory qualities and nutritional value. Hemp-based media has potential to support many sectors currently dependent on coir and peat. Our research has now been expanded to include the tree nursery and mushroom sectors.

1. Scottish Agricultural census 2024

Summary:

- hemp-based growing media was proven to be effective for strawberry cultivation, maintaining high yields and nutritional quality
- substituting coir for hemp-based alternatives can significantly lower the carbon footprint of soft fruit production
- hemp-based media reduces Scotland's dependence on imported coir enhancing the resilience of domestic food production
- hemp-based media also offers a sustainable alternative to peat-based compost
- expanding hemp-based media production supports a circular, greener hemp food and fibre industry reducing waste and adding value to by-products
- reducing reliance on coir and peat supports a climate conscious and nature-based food system

Castleton Farm

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