



Technology Strategy Board  
Driving Innovation

# How the agriculture and food industry profits from innovation

## Analysis of the economic impact of Plant Breeding in the UK



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A report highlighting the benefits to the UK economy of new crop varieties developed by plant breeders was published by DTZ in July 2010. The British Society of Plant Breeders (BSPB) commissioned the study to conduct an independent assessment of the work of its members. The report assessed the impacts of plant breeding relating to three key UK crops: wheat, barley and forage maize.

## Wheat

### Yield impacts

NIAB published a report analysing trial data over the past 60 years for cereal yields<sup>1</sup>. Whilst UK cereal yield increases prior to 1982 were due to a combination of factors (plant breeding, agronomy and inputs) the increase in winter wheat, spring barley and winter barley yields over the past 25 years have been almost exclusively due to improved varieties. This accounts for nearly 90% of the increase in national average cereal yields from 1982.

This yield increase represents an additional 1.9 tonnes per hectare for wheat grown in 2008 compared to 1982. The total wheat area in 2008 was 2.1 million hectares, providing an

additional 3.9 million tonnes of wheat relative to 1982. Wheat prices in 2010 ranged from £97.50/tonne for feed to £114.50/tonne for bread making.

**Therefore, the gross value-add of yield increase attributable to plant breeding since 1982 is £373 - £445 million per annum.**

### Import substitution

The introduction of new hard varieties of wheat suitable to UK growing conditions has helped reduce the milling industry's dependence on imports. Information from the National Association of British and Irish Millers (nabim) indicates that over 80% of UK

grown wheat has been used by millers in recent years. **Improvements to wheat varieties for milling provide an additional 1.7 million tonnes of UK-grown wheat, helping to reduce annual emissions by 113,000 tonnes of CO<sub>2</sub> per annum<sup>2</sup> and transport cost savings of £51 million per annum<sup>3</sup>. This has helped safeguard up to 750 UK milling jobs and £300 million of annual milling turnover.**

## UK provenance

The increase in production of UK milled wheat is supporting British provenance claims by major bread makers. The increase in UK milled wheat is helping to support this growing market sector. Hovis has a growth target of £33 million over the next 3 years, which would not be possible without new wheat varieties developed for this market. **The UK bread market is worth £2.9 billion per annum, but only branded bread is growing in this market and is currently worth £1.39 billion<sup>4</sup>.**

## Barley

### Yield impacts

By developing new higher yielding varieties, plant breeders have provided UK growers with an additional £75.6 million per annum of malting barley. **This has helped to safeguard the UK malting industry with turnover of £511 million and employment of 2,000 people in 2008.**

### Brewing

Information from the AGOUEB<sup>5</sup> project indicate that between 1980 and 2005, breeding programmes for improved hot water extraction of malt have resulted in a potential additional £148 million per annum of beer. However, brewers simply buy less malt as the beer market is declining. This saves £3.9 million per annum in input costs. Lower beta-glucan content in barley also enables significant improvements to processibility, worth £105 million per annum in reduced staff costs to the brewing industry.





Scottish Whisky Distillery interior with stills

## Distilling

The additional alcohol extractable from malting barley as a result of plant breeding provides an extra 17.8 – 66.8 million bottles of whisky with a retail value of £129 - £483 million on the export market. Plant breeders have also helped to safeguard some key export markets (USA and Canada) from future regulatory change by developing low glycosidic nitrile barley varieties.

**These markets were worth £466 million per annum in 2009.**

## Forage Maize

### Yield impacts

New forage maize varieties have enabled the animal feed crop to be grown in increasingly greater areas of the UK towards more northerly latitudes. Information from Defra has shown an increase in the area of forage maize harvested from 26,000 hectares in 1989 to 150,000 hectares in 2008.

The three key benefits of using forage maize as a feed for animals include:

- Higher ration intake
- Lower production costs
- Higher milk yield and quality

Analysis from the Agri-Food and Biosciences Institute (AFBI) has calculated the economic benefit of this increase in use of forage maize as a feed for the industry as £80 per cow benefit per annum. Through new forage maize varieties, plant breeders have supported provision of better feed worth £66 million per annum.



<sup>1</sup> A contemporary analysis of the contribution of breeding to crop improvement, NIAB, June 2009.

<sup>2</sup> Assuming UK-grown wheat replaces imports from North America, and a shipping distance across the Atlantic from North America to west coast UK of 3,300 miles (<http://www.mapcrow.info>). Emissions from long distance shipping are c. 20g CO<sub>2</sub>/mile/kg making the total emissions 66kg/tonne of wheat imported from North America.

<sup>3</sup> Average shipping costs are around £30/tonne (<http://www.openi.co.uk/h070821.htm>) based on average costs and conversion to GBP.

<sup>4</sup> Premier Foods plc and the Federation of Bakers.

<sup>5</sup> <http://germinate.scri.ac.uk/agoueb/>

## Summary of financial benefits to the agriculture and food industry from plant breeding – figures per annum:

Wheat yield for feed	£373 M
Potential additional milling wheat premium	£72 M
Transport cost savings	£51 M
Hovis provenance claims	£10 M
Barley yield	£76 M
Additional beer	£148 M
Brewing processibility	£105 M
Additional whisky	£129-483 M
Forage maize	£66 M
<i>Plus safeguarding:</i>	
UK Maltsters	£511 M
UK Millers	£300 M
Key whisky markets	£466 M

### Total:

**£1 – 1.4 billion** of additional value to the UK economy

**£1.3 billion** of safeguarded economic activity

BSPB member companies invest £25 million per annum in these three crops. The impact highlights described above show gross benefits of £1-1.4 billion to the UK economy plus helping to safeguard a further £1.3 billion. This represents a return on investment of 40 to 1.



Wheat: image courtesy of Syngenta Seeds



Barley: image courtesy of Limagrain



Forage Maize: image courtesy of FrontFoot Communications

# Biosciences Knowledge Transfer Network

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Cover image (barley) courtesy of Syngenta Seeds.

Other images (wheat, forage maize, cattle) were kindly provided by FrontFoot Communications.