

# Plant Breeding Matters

Information from the British Society of Plant Breeders

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## FAIR PLAY SUCCESS BOOSTS BREEDING INCOME

Royalty income to plant breeders was up by 15% in 2007/08, buoyed not only by increased sales of certified seed, but also by reduced levels of farm-saved seed evasion.

Compared with 2006/07, certified seed sales of the main combinable crops were up by 12.3% in volume, and by 13% in value. Despite increased certified seed use, overall income from fss collections also increased by 25%, helped by an estimated 17% reduction in payment evasion.

Commenting on the latest collection figures, BSPB chairman Thomas Jolliffe said:

"This boost to investment in UK breeding is much needed and long overdue. Clearly this performance - which puts an extra £4m into the breeding industry - reflects an overall increase in plantings in response to last season's firmer grain prices and zero set-aside. This level of investment must now be sustained, against a background of escalating costs, to safeguard the future development of improved varieties."

"Perhaps most encouraging, however, is the positive impact of our collaboration with the farming unions to tackle the gap in unpaid royalties on farm-saved seed through the FAIR PLAY campaign. Although evasion remains a major problem, we are detecting a significant improvement in compliance levels across virtually all crops."

"The only clear exception is winter barley, which is showing an increase, rather than a decrease, in evasion levels. That's a cause for genuine concern as the level of breeding investment in winter barley is already at critically low levels. Clearly this crop will now be a focus of our efforts to identify and tackle non-payment of royalties on farm-saved seed," said Dr Jolliffe.

**FAIR PLAY**  
ON FARM- SAVED SEED

## New varieties underpin growth in UK cereal yields - NIAB study

Around 90% of the increase in national average cereal yields over the past 25 years is due to innovation in plant breeding, according to researchers at the National Institute of Agricultural Botany (NIAB).

Statistical analysis of trial yield data over the past 60 years has found that while UK cereal yield increases prior to 1982 were due to a combination of factors, including plant breeding, agronomy and inputs, yield increases in winter wheat, spring barley and winter barley over the past 25 years have been almost exclusively due to improved varieties.

The findings are part of a major new study by researchers at NIAB to assess the contribution of plant breeding to improved crop performance in wheat and barley. The research, co-funded and conducted in collaboration with BSPB, updates and extends previous work carried out by Valerie Silvey,

former Head of Statistics at NIAB.

Silvey's analysis, last updated more than 20 years ago, showed that around half of the total increase in yields of wheat, barley and oats between 1947 and 1986 could be attributed directly to the efforts of plant breeders, rather than the contribution of other factors such as fertilisers, pesticides or machinery.

The results of this new study, covering the period 1948-2007 and applying more advanced statistical methods and computing power, not only bear out Silvey's original analysis but suggest that since 1982, around 90% of all yield increases in wheat and barley have been due to the introduction of new varieties.

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### % Yield increase due to new varieties 1982 - 2007

Winter Wheat 93%

Spring Barley 87%

Winter Barley 92%

# New varieties underpin growth in UK cereal yields - NIAB study

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Dr Ian Mackay, a statistical geneticist at NIAB leading the research, said:

"Winter wheat yields have more than trebled over the past 60 years from around 2.5 tonnes/ha in the mid-1940s to 8 tonnes/ha today."

"Non-varietal factors such as N fertiliser, agrochemicals, plant growth regulators, improved agronomy and machinery have all contributed, and remain an essential component of modern crop production to protect the genetic potential of new varieties."

"But while improved crop varieties have shown consistent genetic yield

gain, decade after decade, our analysis suggests that for the past 25 years the yield-boosting contribution of other, non-genetic factors has remained broadly neutral."

"Even in most recent years when national average wheat yields have been on a plateau, trials data have shown continued genetic yield gain from new varieties."

"It is not clear whether the national picture can be explained by the very variable growing seasons we have experienced recently, whether economic and environmental constraints have



Dr Ian Mackay

forced farmers to cut back on their use of fertilisers and other inputs, or whether there are other reasons why farmers may not be realising the full genetic potential of the varieties available."

"But our research clearly indicates that without continued breeding effort and the contribution of new varieties, UK cereal yields would certainly be static, possibly even in decline" said Dr Mackay.

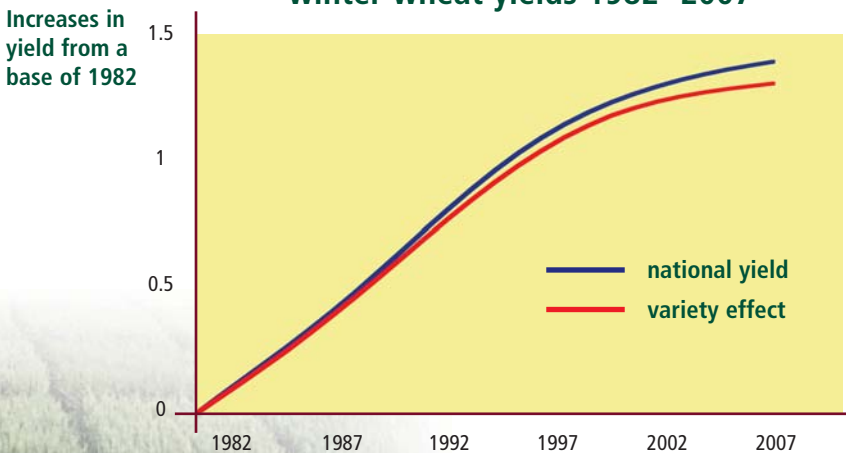
For winter wheat yields, the NIAB study found no evidence of a reduction in genetic variation across UK breeding programmes. Analysis of the contribution of new varieties to yield improvements confirmed that as yields have increased, genetic diversity - the essential platform for future varietal improvement - has been maintained.

BSPB chairman Dr Thomas Jolliffe welcomed the findings as a categorical demonstration of the need for continued investment in UK-based plant breeding.

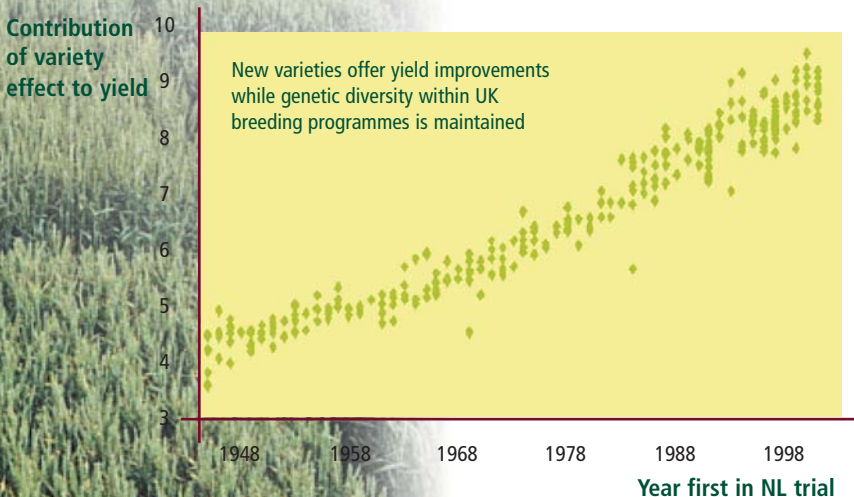
"This updated study confirms that since Valerie Silvey's original analysis, plant breeders have continued to deliver major improvements in genetic yield potential. While other inputs have a crucial role to play in helping farmers realise that potential, this research is quite clear that genetic improvement is now the single most important source of yield increases."

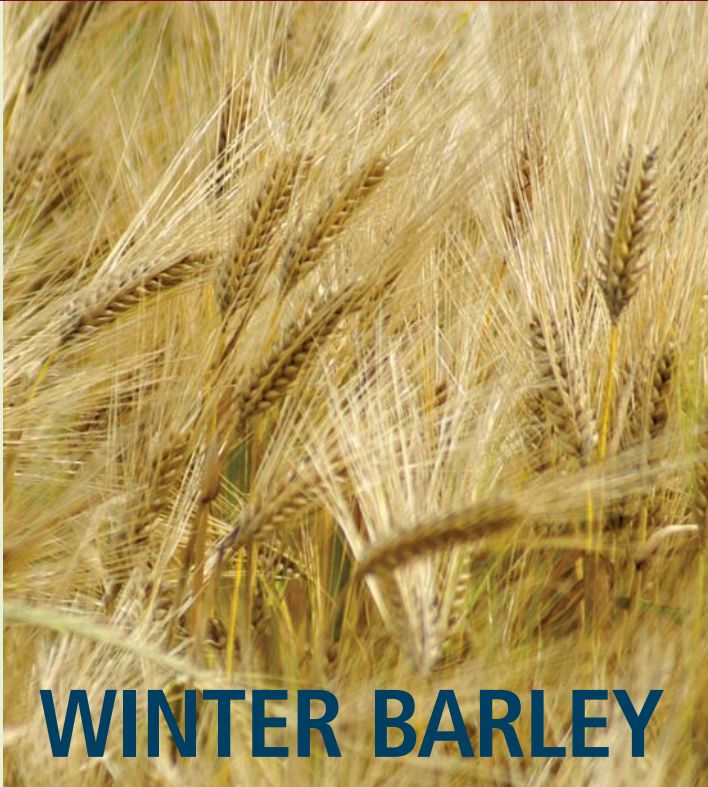
"As environmental and other regulatory influences look set to exert yet more constraints on farmers' input use, the challenge for breeders is to close the gap between treated and untreated yield by continuing to develop varieties more resilient to the impact of changing climate, disease and pest pressures," said Dr Jolliffe.

## Contribution of new varieties to winter wheat yields 1982 -2007



## National List trials data 1948-2007





# WINTER BARLEY

Encouraging progress has been made through the FAIR PLAY campaign to improve overall levels of compliance with farm-saved seed payments. However, while evasion rates across most crop species have seen a marked reduction, non-payment in winter barley appears to be on the increase. This is an extremely worrying development, says BSPB Board Member Robert Hiles, since UK breeding investment in winter barley has already fallen to precariously low levels.

In the UK, winter barley is mainly grown for animal feed, although quality varieties still provide a significant tonnage to the malting industry. Some 500,000 tonnes of winter barley - virtually all grown in England - are used by UK maltsters each year (around 25% of their total raw material requirements) with the balance almost exclusively provided by home-grown spring barley.

### Consumption of malting barley by UK maltsters - 2007

	England	Scotland
Winter barley	470,825 tonnes (25.8%)	54,517 tonnes (3.0%)
Spring barley	563,842 tonnes (30.9%)	734,584 tonnes (40.3%)
<b>Total</b>	<b>1,034,667 tonnes (56.7%)</b>	<b>789,101 tonnes (43.3%)</b>

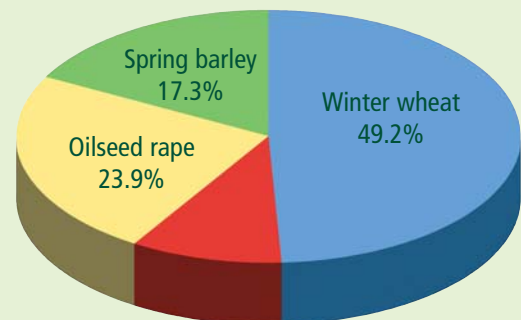
Source: MAGB

In recent years, however, the UK winter barley crop has faced fierce competition for acreage against escalating demand for other commodities, particularly wheat and oilseeds. On the quality side, there has been a marked shift in preference among maltsters for spring malting barley varieties. Both factors have contributed to a gradual decline in the winter barley area.

As a result, royalty income to breeders from winter barley has reached an all-time low in relation to other major UK combinable crops. Three breeders remain active in maintaining UK-based winter barley programmes, but with total income from certified and farm-saved seed royalties on the crop now less than £3m per year, this level of activity will be difficult to sustain.

That represents a major concern, because the UK's unique maritime climate and disease spectrum means British growers are heavily reliant on barley varieties from UK-based breeding programmes. UK-bred varieties currently account for around 90% of the UK winter barley area. As a rule, varieties bred in mainland Europe are poorly suited to our growing conditions, tending to result in poor yields, lodging and susceptibility to disease.

### Major UK combinable crops Share of royalty income - 2007/08



Winter barley 9.6%

Indications that the decline in investment income has been compounded by an increase in non-payment on farm-saved seed should be of concern to farmers and breeders alike. Winter barley varieties offer an important cropping option for farmers to spread risk - especially as conditions around harvest time appear to be getting more variable.

This season was a case in point, with most winter barley crops safely in the barn before the wet weather disrupted the rest of the harvest period on a national scale. For many farmers, including winter barley in the rotation also provides an opportunity to spread farming operations more evenly throughout the year.

To retain these benefits, UK farmers need to see continued investment in improved winter barley varieties, tailored to our unique growing conditions and quality requirements. Ensuring all farmers play fair on farm-saved seed payments for winter barley must be an essential first step.

# BSPB highlights urgent need to plug gaps in R&D funding



**Plant breeders have added their weight to renewed calls for chronic Government underfunding of agricultural research to be reversed.**

Responding to a major inquiry by the Royal Society into how to boost food-crop production to meet global needs, BSPB has highlighted the role of improved plant genetics - delivered to the market through commercial plant breeding programmes - as the single most important factor in raising agricultural productivity.

But BSPB warns that the limited revenue streams available to plant breeders from seed royalties mean that the current market-based approach to financing near-market and applied R&D is not working. Breeders simply do not have the resources available to invest in speculative or long-term targets.

Despite an explosion in our basic understanding of the genes controlling many aspects of plant growth, development, metabolism and response

to pest and environmental pressures, opportunities to transfer that new knowledge into crops and products of value to UK farmers and consumers are being lost.

"There is an acknowledged crisis in global food production," says BSPB chief executive Dr Penny Maplestone. "Demand is beginning to outstrip supply, and with limited land available to bring into agricultural production, the only realistic prospect of producing enough food for a rapidly increasing world population is through productivity growth - producing



Dr Penny Maplestone

more crop per hectare."

"There is an urgent need to bridge the current hiatus in research activity. Significant new public investment in translational

**"We need to undertake research to explore technological solutions to improve the security and consistency of [food] supply. We must take the initiative to further develop higher-yielding and climate resilient varieties of crop."**

**Rt Hon Gordon Brown MP,  
UK Prime Minister, 10 April 2008**

crop science is needed to ensure public benefit - through increased food crop productivity - is derived from current taxpayer spending on basic scientific research. BSPB members have a pivotal role to play in providing the route to market through improved varieties and crop production systems."

"Earlier this year, in a letter to leaders of G8 nations, Gordon Brown highlighted the importance of agricultural research in tackling global food security. We fully agree, but his words must now be backed up by action focused on the needs of UK farmers," said Dr Maplestone.

## ILLEGAL SEED TRADING 'ON THE RADAR'

**Measures introduced as part of the FAIR PLAY campaign have greatly improved BSPB's ability to ensure compliance with farm-saved seed payments and so protect future investment in plant breeding.**

In particular, more regular contact with individual growers, improved intelligence through the BSPB database, and access to information from seed merchants and processors have all combined to increase the risk of detection for farmers who break the rules.

Twelve months into his role as Farm Saved Seed Investigator at BSPB, Keith Brown is detecting - and dealing with - more cases involving the illegal trade and use of uncertified seed.

"I don't believe this kind of activity is on the increase," says Keith. "It's just

that BSPB is now in a much stronger position to track down discrepancies in the information we receive from farmers, merchants and processors."

"A case in point is so-called 'over the hedge' trading, in which farm-saved seed is sold or exchanged between farmers. Most often this involves a farmer selling a few surplus tonnes of farm-saved seed, but it is also taking place on a business scale. BSPB is currently dealing with a major case in which a single farmer had a significant quantity of his own farm-saved seed processed and sold it on to a number of other farmers. Either way, it is against the law to trade in farm-saved seed and BSPB is determined to stop this practice to ensure a level playing-field for all farmers."

"It's also important that farmers

understand that grain bought in as feed from outside cannot then be used for planting as seed. The rules are very clear on this. It is against the law to sell, barter, exchange or otherwise transfer grain from another business for subsequent re-planting. If a farmer is in any doubt about his individual circumstances he should contact BSPB for advice," says Keith.

"My message to any growers tempted to abuse the system is - don't take the risk, these practices are well and truly on the radar."



Keith Brown