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Plant breeding vital for sustainable agriculture – ADAS study

By developing crop varieties with higher yields, improved resource use efficiency and reduced environmental impact, plant breeding is a major contributor to meeting the goals of sustainability in agriculture, according to an independent review published today.

Agricultural consultants ADAS assessed the contribution of modern plant breeding to sustainability in agriculture. With a focus on UK and EU plant breeding in key food and forage crops over the past 10 years, ADAS conducted a systematic review of published scientific literature and other information sources – comprising more than 250 individual citations in total.

The study found that innovation in plant breeding provides a vital foundation to address multiple sustainability goals, and is a major contributor to **raising yields**, increasing **resource use efficiency** and **reducing the negative environmental impacts** of food production.

Presenting the ADAS study, lead author Rebecca Carter said:

“Our review found that the main focus of commercial plant breeding in the past 10 years has been on enhancing and protecting yield in major arable crops, so driving greater production from the same amount of land - a key requirement of sustainable intensification. Alongside selection for physical yield, the development of varieties with improved standing ability, better end-use quality and enhanced pest and disease resistance support this objective by reducing harvest losses and wastage in the supply chain. An emphasis on yield also contributes to sustainability objectives by improving the efficiency of land, input, nutrient and water use per unit of production, as well as delivering important environmental benefits such as reduced greenhouse gas emissions and protection of soil health and water quality.”

Key findings of the ADAS review commissioned by BSPB are summarised in the following table, which highlights breeding advances already delivering impact in the market place (blue boxes), as well as key areas of plant

breeding where research is in the pipeline or where further R&D investment is required (green boxes).

Trait	Wheat	Barley	Oats	Oilseed rape	Field Beans	Field Peas	Forage Maize	Herbage	Sugar beet
Increase harvestable yield	Increase by 0.7t/ha decade since 1980	92% increase in W.B and 87% in S.B since 1982	Improve harvest index and no. grain per sq. metre	0.5t/ha increase per decade since 1980	Little increase seen in last 10 years	Little increase seen in last 10 years	Focus on dry matter and starch yield	Focus on dry matter yield	Faster increase than any UK arable crop since 1980
End use quality	Bread making quality	Low ß-glucan levels, low ß-amylase	Naked oats, oil content	Decrease glucosinolate and fibre	Reduce tannins, amino acid content		Digestibility, energy content	Sugar content	
Resistance to disease	Eyespot Septoria, rust	Mildew, rust, Rhynchosporium, Ramularia, Net blotch	Rust, mildew	Light leaf spot, stem canker	Leaf and pod spot	Pea wilt, Downy mildew	Eyespot	Mildew, Rhynchosporium, rust	Rhizomania
				Verticillium, Alternaria	Ascochyta blight, rust	Powdery mildew, Ascochyta	Fusarium		Beet Mild Yellowing Virus, Beet Yellows Virus
Resistance to pests	Orange wheat blossom midge	Little work	Little work	Turnip Yellows Virus	Stem nematode resistance	Little work carried out	Corn borer resistance	Little work	Beet cyst nematode tolerance
	Aphid, Barley Yellow Dwarf Virus								
Adaption to env. extremes	Drought traits identified	Little work	Little work	Little work	Traits identified	Traits identified	QTLs found	Drought tolerant	Traits identified

Impact in market place | **Work in progress/development required**

Welcoming the study, BSPB chairman Dr Richard Summers said:

“The concept of ‘sustainable intensification’ in agriculture – producing more output per unit of resource and environmental impact – is widely established as the necessary response to Sir John Beddington’s ‘perfect storm’ of population growth, climate change and declining natural resources. Less clear is precisely what this means in practice for different product sectors and farming systems.”

“Unpacking the components of sustainability is the starting point for developing new metrics in agriculture, paving the way for common, agreed definitions of what sustainable intensification means in practical terms – so

that we can benchmark current performance, measure improvements over time, understand the best technologies, farming systems and practices to deliver it, and use all that information to frame the R&D agenda going forward."

"This comprehensive report from ADAS makes a valuable contribution to that process, and clearly demonstrates the role of plant breeding innovation as a major contributor to more sustainable farming systems."

Ends

Note to Editors
A full copy of the ADAS report, entitled *Review of the objectives of modern plant breeding and their relation to agricultural sustainability*, is available to download via the BSPB web-site at www.bspb.co.uk

About BSPB
The British Society of Plant Breeders (BSPB) is the representative body for the UK plant breeding industry. Acting on members' behalf, BSPB licenses, collects and distributes certified seed royalties and farm-saved seed payments on agricultural and horticultural crops. The Society represents members' interests on technical, regulatory and intellectual property matters, and works to promote continued innovation and investment in UK plant breeding. For further information visit: www.bspb.co.uk

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