Science *for* Sustainable Agriculture

World-leading UK research and innovation at the heart of more sustainable food and farming policies

May 2022

Science *for* Sustainable Agriculture

Science for Sustainable Agriculture is a new policy and communications platform, providing a focal point for debate around modern, sustainable agriculture and food production.

Our aim is to promote a conversation rooted in scientific evidence, rather than ideology.

We bring together like-minded individuals and organisations to champion and explain the vital role of science and technology in safeguarding our food supply, tackling climate change and protecting the natural environment.

We also stand ready to expose, comment on and challenge unscientific positions or policy decisions in relation to sustainable agriculture.

Science for Sustainable Agriculture is supported by an independent advisory group bringing together relevant expertise from a range of sectors and backgrounds.

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Foreword

On 22 February 2022, Julian Sturdy MP introduced a Westminster Hall debate[1] in Parliament entitled 'Sustainable intensification and metrics in agriculture'.

He issued a stark reminder that the 'perfect storm' of population growth, climate change and finite natural resources of land, water and energy remains as threatening as ever to the security of global food supplies.

Two days after the debate, Russia invaded Ukraine.

This terrible conflict has underscored the precarious balance which exists between global food supply and demand, with already record-high food prices which the UN's Food and Agriculture Organisation has said could rise by a further 8-22%[2].

For years, many of us have warned that we cannot afford to be complacent with something as fundamental as food security.

Britain is well-placed to improve its own food production capacity, and to help deliver technological solutions to others, in response to the global food security challenge, while at the same time better protecting natural ecosystems and tackling the climate crisis.

However, as this prospectus sets out, there is an urgent need to put scientific rigour and evidence back at the heart of our food and farming agenda.

We must also restore the policy focus on sustainable intensification in agriculture - using scientific knowledge and innovation to help optimise the balance between food production, resource use and environmental impact.

The future for agriculture does not lie in turning back the clock, as some believe, but in embracing high-tech solutions, applying scientific data and evidence, and combining innovation with established best practice and knowledge from a range of farming systems.

Guided by the science, rather than doctrine and ideology, we have the best chance of feeding an increasingly hungry, warming planet in the most sustainable way.

Advisory Group
Science for Sustainable Agriculture

Summary of recommendations:

- **Put scientific rigour and evidence at the heart of UK regulations, policy development and R&D investment in food and agriculture;**

- **Restore the strategic policy focus on sustainable intensification in UK agriculture** - using scientific knowledge and innovation to help optimise the balance between food production, resource use and environmental impact, and re-focusing on the outputs of the four year, Defra-funded Sustainable Intensification Research Programme (SIP);

- **Confirm the UK as a signatory to the global Coalition on Sustainable Productivity Growth for Food Security and Resource Conservation (SPG),** signalling a recognition that science and innovation can help farmers adopt environmentally friendly and climate-smart farming practices without sacrificing productivity;

- **Recognise the importance of genetic innovation as the single main driver of productivity gains in agriculture, and establish a long-term, strategic Crop Genetic Innovation Research Fund** in response to UKRI's 2021 review of UK plant science, which warned that major opportunities to translate early-stage genetic discoveries from lab to field are being lost;

- **Move further and faster to make UK regulation of new genetic technologies in agriculture more proportionate and enabling;**

- **Adopt meaningful, science-based metrics for sustainable agriculture** as a critical evidence-base to drive best practice at farm level and frame the policy, R&D and regulatory agenda, focused on measuring resource use and environmental impact per functional unit of output, and building on the metrics and sustainability indicator work already funded by Defra as part of the SIP programme.

Science for Sustainable Agriculture

It is more than a decade since Professor Sir John Beddington and fellow scientists warned of the 'perfect storm' awaiting a society that fails to take sufficient action both to secure its food and energy supplies and to protect the natural resources that supply it[3]. The recent outbreak of war in Ukraine, involving two of the world's largest producers and exporters of grains and oilseed crops, has highlighted the fragility of our food system.

Estimates from the UN Food and Agriculture Organisation[4] suggest that the world needs to increase food production and availability by up to 70% by 2050 to keep pace with the food needs of a rapidly expanding global population, in the face of an escalating climate crisis, biodiversity loss and pressure on finite natural resources of land, energy and water.

The recent invasion of Ukraine by Russia has underscored the precarious balance between global food supply and demand, with already record-high food prices which the UN's Food and Agriculture Organisation has said could rise by a further 8-22%[2].

It is a wake-up call to nations all around the world.

With its good soils, temperate climate, highly equipped and professional farming sector, and a world-leading science base, Britain is well placed to increase its food production capability in response to the global food security challenge, while at the same time mitigating and adapting to climate change, protecting biodiversity and conserving precious natural resources.

But it can also go further - freed from the restrictive influence of over-precautionary EU regulations, Britain has the opportunity to establish itself as an international hub for agri-science excellence and innovation: exporting technological solutions, attracting inward investment and fostering international research collaboration.

Science-based decision-making

For Britain to realise its potential in terms of balancing food production, environmental protection and climate change objectives, scientific rigour and evidence must guide the UK's approach, not only in ensuring the regulation of new agricultural technologies is proportionate and enabling, but also in framing the future policy agenda, for example in relation to farm support and R&D funding.

Early action by the Government to diverge from restrictive EU rules on gene editing techniques, so re-aligning our approach with other non-EU countries such as Australia, Japan, Brazil, Argentina, Canada and the US, is a positive and welcome first step.

But we must move further and faster to make UK regulation of new genetic technologies in agriculture more science-based and enabling, in line with the Prime Minister's commitment to liberate our world-leading biosciences sector.

Crucially, a science-based agenda should extend to all future policy at farm level. As Julian Sturdy MP observed recently in Parliament[1], the UK's current 'Path to Sustainable Agriculture' risks sleep-walking the nation into its own food crisis, because it disregards the advice of its own scientists, and policy development is overly reliant on campaigning and voluntary NGOs.

Sustainable intensification

Of fundamental importance is a return to the clear-sighted recommendations of Professor Sir John Beddington's Foresight report on *The Future of Food and Farming*[3], compiled by a team of leading UK scientists and as relevant today as it was when published more than 11 years ago in January 2011.

Faced with a 'perfect storm' of population growth, climate change and pressure on finite natural resources, the Foresight report's central recommendation was for governments to embed sustainable intensification of agriculture - using scientific knowledge and innovation to help optimise the balance between food production, resource use and environmental impact - as a core policy objective to feed the world sustainably.

While the UK Government initially embraced this approach, and Defra funded a four-year, multi-partner Sustainable Intensification Research Programme (SIP)[5] from 2014-18, the outputs of this research now appear to have been quietly shelved in favour of a policy shift towards less productive systems.

There are serious concerns that domestic food production is of secondary importance on the Government's current policy agenda. In a highly critical report[6] on the Environmental Land Management Scheme (ELMS) - set to frame much of the future support available to farmers - the House of Commons Public Accounts Committee (January 2022) said Defra had failed to set out a clear plan for land use and food production, to explain how productivity increases would be achieved, or how the ELMS scheme would offset the financial impact of cutting current subsidies by more than half by 2024/25.

This was despite Defra claiming in its Health and Harmony White Paper (2018)[7], setting out the future direction for agricultural policy in England, that: *"There is clear evidence showing that the scope for productivity improvement would enable farms, on average, to remain profitable following a withdrawal of Direct Payments."*

In February 2022, NFU President Minette Batters went further, accusing the Government of being 'focused on anything other than food production' in the countryside[8].

More recently, reported in *Farmers Weekly*[9], consultant agronomist Sean Sparling said:

"The government has failed to understand or, even worse, is ignoring the growing food crisis situation. Instead, its policies are encouraging farmers to quit, put in solar panels or adopt lower yielding practices. We've got the land, the knowledge and the capability, but we are abandoning food security and placing greater emphasis on the environment. So, when you ask, 'Are we heading into a food crisis?' I'd say, no. We're already in one."

It is notable that the current list of ELMS test and trial projects[10] includes strategically significant projects led by voluntary and campaigning e-NGOs such as the Soil Association, Sustainable Food Trust, RSPB, Green Alliance and BugLife, as well as a myriad of local wildlife trusts.

These are not scientific organisations, and many of them campaign actively against aspects of modern, productive agriculture, including the Government's policies on innovations such as genome editing.

By contrast, the Defra Sustainable Intensification Research Programme was led by a consortium of many of our leading scientific organisations - NIAB, Rothamsted Research and Fera, as well as agricultural universities such as Exeter, Nottingham and Bangor.

In line with the Foresight recommendations on sustainable intensification in agriculture, the weight of scientific evidence continues to point to a need to use scientific and technological innovation to help optimise production on existing farmland.

This was comprehensively illustrated by a global, 10-year study[11] published in *Nature* in 2018, led by Professor Andrew Balmford, a conservation scientist at Cambridge University.

This research, conducted across a range of farming systems, concluded that the most effective way to keep pace with increasing human demands for food while protecting habitats and preventing further bio-diversity loss is through high-tech, high-yield production on land that is already farmed, mirrored by explicit policy incentives and regulations to make sure other land is set-aside for nature and carbon sequestration or storage.

Drawing on this work in a UK context, Professor Balmford's creative vision of a three-compartment model for land use - allowing room for a combination of natural habitat, low-intensity farming and high-yield, high-tech farming - follows the science and, if properly implemented, could deliver a more sustainable balance in terms of food production, environmental protection and climate impact.

In this context, recent research[12] from the Centre for Ecology and Hydrology (CEH), published in *Nature*, has also highlighted the importance of applying scientific rigour to the management of land set aside to natural habitat. This largest ever study of protected areas - places "set aside" ostensibly for nature - revealed that most do not actively benefit wildlife, with the authors warning that an obsession with reaching certain area-based targets without a focus on improving the condition of existing protected areas will actually achieve very little.

This prospectus therefore calls on the UK Government to restore the strategic policy focus on sustainable intensification in UK agriculture - using scientific knowledge and innovation to help optimise the balance between food production, resource use and environmental impact.

Pro-innovation policies

Valuable pointers can also be drawn from comparisons between the strikingly different policy approaches taken by the EU and the United States.

Writing in the journal *Food Policy*[13], Professor Robert Paarlberg of the Harvard Kennedy School recently highlighted these transatlantic policy tensions over "green" farming. He contrasted the EU's Farm to Fork (F2F) Strategy, including plans to expand organic farming, reduce synthetic chemical and fertiliser use and reject modern biotechnology, with the USDA's Agricultural Innovation Agenda, which emphasises the use of agricultural innovations based on the latest science.

Paarlberg suggests that Europe's plan to reject GMOs and scale up organic farming is anything but 'green', since more land would need to be converted to food production, with damaging results for wildlife habitat and the climate.

A recent impact assessment by Wageningen University[14] also concluded that, as a result of the F2F Strategy, EU agricultural production would fall, food prices would increase and emissions and other negative environmental impacts would be externalised to countries outside the EU due to increased food imports.

The Wageningen study pointed to other potentially damaging impacts of an increase in Europe's organically farmed area, noting that EU crop yields under organic systems are up to 47% lower than conventional and, perhaps counter-intuitively, that a switch to organic in some crops would be detrimental to the EU's targets for reduced use and associated risk of pesticides, mainly due to the organic sector's reliance on copper-based active ingredients in high volumes to control disease:

"In some cases, especially in Mediterranean countries, the values of the HRI I can be even higher than in conventional production. This is mainly caused by the use of copper based active ingredients [..] in high volumes to control disease. In those cases, a shift to organic production will have adverse consequences in terms of meeting the F2F and BD strategy target of reducing the use and risk of pesticides." (p37)

In stark contrast, US policies emphasise the use of agricultural science and innovation, with a stated aim to increase production by 40%, while cutting the environmental footprint of US agriculture in half, by 2050.

This ambition is articulated through the US-led Global Coalition on Sustainable Productivity Growth (SPG)[15], established by US Agriculture Secretary Tom Vilsack as a counter to the F2F Strategy, by demonstrating that farmers can adopt environmentally friendly and climate-smart farming practices without sacrificing productivity. "We think it's possible and appropriate for science and innovation to play a significant role in helping farmers be more productive and more sustainable," explained Vilsack, adding that "biotechnology, gene editing, research and development, new precision agriculture are all strategies and techniques and technologies that can be used."

It is worth noting that the impact of the conflict in Ukraine is already prompting the EU to backtrack on its F2F commitments, with recent decisions to boost production by allowing cultivation and pesticide use on land previously designated as fallow land in environmentally protected areas.

President Emmanuel Macron went so far as to suggest that the F2F Strategy should be fundamentally reviewed, acknowledging that it would reduce European food production by 13% and that the policy was "based on a pre-Ukraine war world".[16]

Perhaps even more bizarre was the decision[17] announced by the EU on 23 March 2022 to sign up to the US-led Global Coalition on Sustainable Productivity Growth, which as described above was originally conceived by Tom Vilsack as an alternative policy response to the production-limiting measures of the F2F Strategy.

Set in this context, it is genuinely puzzling that the UK Government has so far resisted and/or ignored repeated calls[1,18] to join the SPG Coalition.

This prospectus therefore calls on the UK Government to join many other countries - now including the EU - in signing up to the US-led Global Coalition on Sustainable Productivity Growth, signalling a recognition that science and innovation can help farmers adopt environmentally friendly and climate-smart farming practices without sacrificing productivity.

Importance of genetic research and innovation

A commitment to science-based policy and regulation must also be backed by more strategically targeted support for R&D investment to deliver more sustainable and productive UK agriculture.

Access to genetic innovation - in both crops and livestock - is more critical than ever.

In relation to crops, recent research has quantified the pivotal role of genetic improvement in meeting future food security, climate change and sustainable development goals.

In May 2021, a study[19] by HFFA Research GmbH concluded that, since 2000, progress in plant breeding has accounted for two-thirds of the productivity gains in UK arable crops. An earlier peer-reviewed study, led by NIAB scientists in 2011, found that for the UK's main cereal crops (wheat and barley), the contribution of genetic improvement to yield gain was closer to 90%[20].

Without the contribution of improved varieties over the past 20 years, the HFFA study found that UK crop yields would be 19% lower, and 1.8 million hectares of additional land would be needed in other parts of the world to meet our food needs, placing additional pressure on scarce global resources and causing more than 300 million tonnes of additional GHG emissions.

The HFFA study also highlighted the challenges of maintaining current rates of yield improvement. It underlined the critical importance of access to new breeding techniques, such as gene editing, with the potential to accelerate the rate of progress in crop innovation, supported by coherent regulatory and R&D frameworks.

In March 2021, a new UKRI plant science strategy[21] led and authored by Professor Jane Langdale CBE FRS, University of Oxford, reached a similar conclusion in relation to the need for a more enabling regulatory framework, as well as a more joined-up R&D pipeline for crop genetic innovation to transfer early-stage genetic discoveries from lab to field.

Professor Langdale said: "The modest and relatively inelastic income from seed royalties limits commercial plant breeders' ability to invest in more speculative or long-term targets. Because of this, and the lengthy timescales involved, the current system for financing near-market and applied R&D is not working, and opportunities to exploit major advances in our understanding of plant science are being lost."

This same hiatus in research funding, often termed the 'Valley of Death', was identified in a similar review of UK plant science led by Professor Chris Gilligan for BBSRC more than 17 years ago. This 2004 review advised (Recommendation 14) that: "BBSRC should take the lead to establish a national plant breeding initiative ... that would promote public good breeding by establishing crop genetic improvement programmes with the aim of providing improved germplasm and technology for the development of new varieties".[22]

In September 2021, Julian Sturdy MP wrote to Defra Ministers in his capacity as

chair of the All-Party Parliamentary Group on Science and Technology in Agriculture to highlight these concerns. The response received from farming minister Victoria Prentis MP offered little encouragement that the Government really grasps the significance or urgency of this issue.

For example, Defra suggest that the UK's primary vehicle for bridging the long-recognised gap between early-stage discovery research and its translation into relevant crop backgrounds for use in commercial breeding programmes are the four Genetic Improvement Networks (GINs) covering wheat, oilseed rape, pulses and vegetables.

While valuable as a mechanism for networking and facilitating discussion between key players along the crop improvement pipeline, the GINs are woefully under-resourced. Defra currently funds the four GINs to the tune of £5.5 million over five years from 2018 to 2023. In other words, £275,000 per GIN per year.

To set that in context, the Government's flagship Transforming Food Production R&D programme is set to invest £90 million over four years in digital and precision farming projects such as robotic harvesters, vertical farms, AI and sensor technology.

Importance of genetic research and innovation *cont:*

A similar fixation with digital and precision agriculture as a major source of on-farm productivity gains also appears to be embedded in Defra's thinking, with one senior official recently describing the focus of new funding schemes to improve farm productivity: "So this is all about robotics and automation, so some of the things that we're going to be funding under that are things like robotic harvesting, weeding, robotic spraying, different types of feeding systems for livestock, things like fertiliser efficiency and LED lighting."[23]

These agri-tech innovations are incredibly important in driving efficiency improvements, but they will prove to be relatively worthless in the context of a failure to support and enable corresponding gains in genetic potential, when independent studies such as the HFFA report referred to above have shown that genetic innovation is the main driver of productivity gains in agriculture.

This report therefore endorses calls for a more coherent R&D strategy for crop genetic improvement which ensures promising new genetic discoveries, for example in model plant species, have a clear translational pathway into crops and products of value to UK farmers and consumers.

A new, long-term Crop Genetic Innovation Research Fund (CGIRF) is urgently needed to bridge this long-recognised gap in R&D investment.

Evidence also points to genetic improvement in farmed animals as a major driver of productivity and resource-use efficiency gains, alongside developments aimed at improving animal health and welfare, preventing future zoonoses or pandemics, reducing drug use and mitigating the climate change impact of livestock production.

Access to other technologies - including new digital applications, greener crop protection options, and automated growing systems such as vertical farming and robotics - will also be needed, not only to improve the productivity and security of our food supply, but also to protect biodiversity and enhance sustainability at the landscape scale.

Applying our rapidly advancing knowledge of the farm-level processes and practices underpinning sustainable efficient production, from optimal crop sequences (rotations) and data-led agronomy to best practice management of soil health and biology, will be equally critical.

However, independent studies such as the HFFA report referred to above have repeatedly shown that genetic innovation is the primary driver of productivity gains in agriculture. Given this knowledge, and assuming enhanced productivity remains a policy objective, then future policy development and the allocation of research funding must reflect that in relation to both crop and livestock production.

Sustainability metrics

Finally, there is an urgent need to measure and monitor progress towards stated policy objectives, and to embed farm-level data and sustainability metrics at the heart of a policy agenda focused on securing the optimum balance between food production, resource use and environmental impact.

Access to metrics capable of objectively and consistently monitoring that balance will be essential to set targets and measure progress for sustainable efficient production, to develop coherent R&D programmes, to understand and disseminate advice on best practice throughout the industry, and to provide meaningful information to consumers relating to the sustainability impact of their food choices.

Disappointingly, however, the UK lags behind other countries in its collection and use of farm-level data. While our food processing and retail sectors have made significant progress to benchmark and drive improvements in their operations against key sustainability criteria, the agricultural sector is characterised by vast silos of data - on-farm and in research institutes - which have not yet been properly integrated or exploited.

Farming businesses generate large amounts of data relating to input use, productivity and farm management systems. Increasing use of IT, satellite technology and automated data collection provides new opportunities for collection and analysis of farm-level data.

However, no centralised system currently exists for industry-wide sharing, collation or analysis of this information.

Case Study

Field to Market

International programmes have already demonstrated the extraordinary power of data and sustainability metrics as the basis to promote continuous improvements in sustainable agriculture measured against key indicators such as land, water and energy use, greenhouse gas emissions and soil quality.

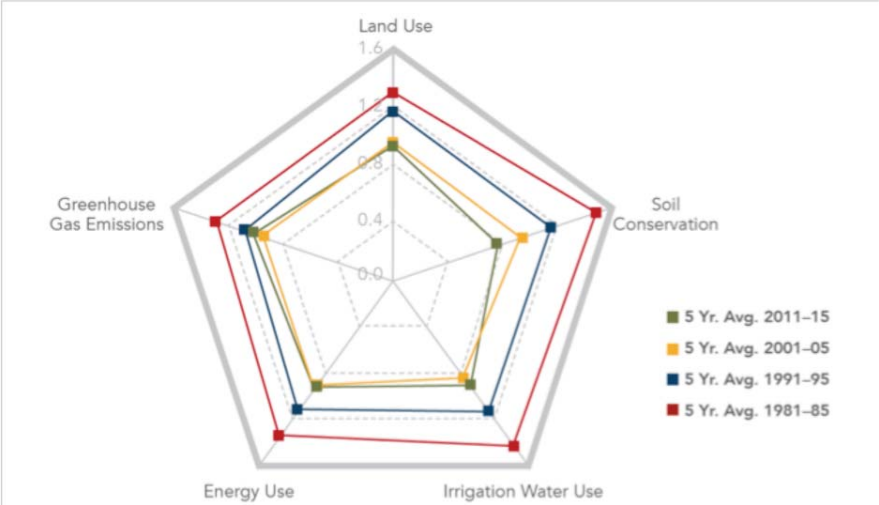
The US-based Field to Market (FtM)[24] programme, for example, is a collaborative, multi-partner initiative involving a wide range of stakeholders, from farmers and agribusinesses through to food processors and retailers, conservation groups, academic scientists and the US Government.

For more than a decade, FtM has been analysing field-level information to measure performance on a farm, regional and national basis in terms of resource use and environmental impact per unit of production.

The spider graph below, for example, shows progressive improvements over time in the sustainability 'fieldprint' of US corn production across five main sustainability indicators – land use, soil quality, irrigation water use, energy use and greenhouse gas emissions.

Case Study *Field to Market cont:*

Indicators of resource use impacts to produce corn for grain 1981-2015



	2000 *	Unit
Land Use	0.008	Planted acres per bushel
Soil Conservation	4.8	Tons per acre
Irrigation Water Use	0.242	Acre-in per bushel
Energy Use	49,059	BTU per bushel
Greenhouse Gas Emissions	13.211	Pounds CO_2e per bushel

** Five year average 1996–2000*

Access to farm-level information such as this allows for continuous monitoring of sustainability performance, applicable to a range of agricultural sectors and production chains.

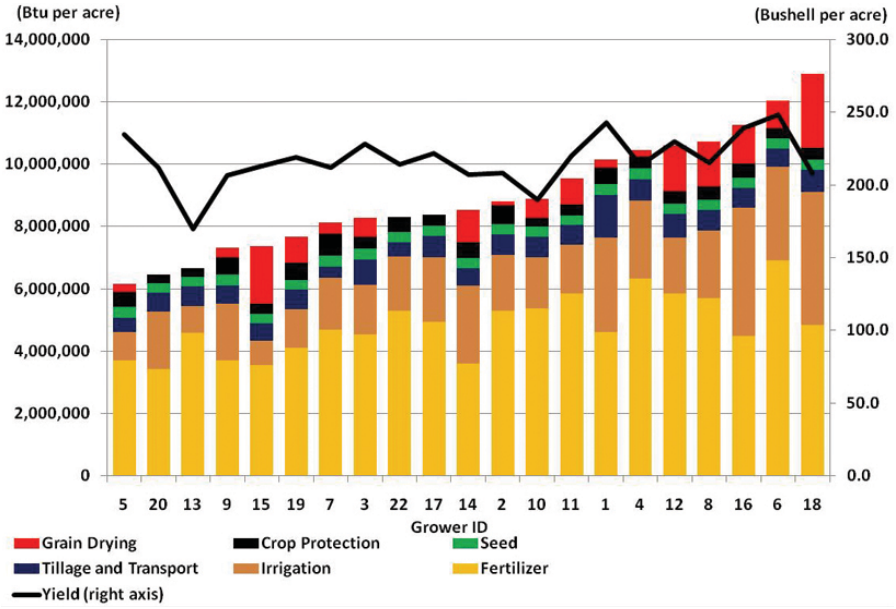
For example, a 2009 Field to Market pilot project in Nebraska involving Bunge, Kellogg's and 22 growers representing 40,000 acres of corn production (35-40% of raw material supply to the local mill) analysed on-farm corn production data to complete the carbon and water footprints for Kellogg's Frosted Flakes.

The summarised findings of the pilot study (see graphs below) show wide variations in resource-use efficiency across the 22 growers involved. Although all growers considered their farm management practices to be 'sustainable', and all were producing to a similar level of yield output, detailed analysis of their field-level data indicated that the most efficient growers were using half as much energy, and a third of the water consumed by the least efficient growers.

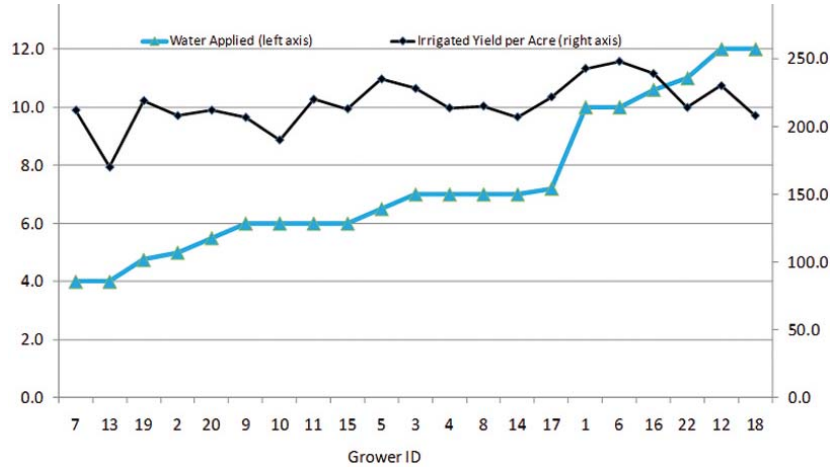
Case Study *Field to Market cont:*

Kellogg's / Bunge / Field to Market pilot study

Irrigated Corn Crete Nebraska 2009, per unit energy versus yield



Irrigated Corn Crete Nebraska 2009



Data-derived insights such as this provide the basis to monitor, understand and disseminate advice on best practice to drive continuous improvements in sustainable efficient production throughout the industry.

Sustainability metrics *cont:*

Defra has already funded a significant body of work on sustainability indicators and metrics as part of the Sustainable Intensification Research Programme, including the prototype development of a farmer-friendly data and benchmarking dashboard allowing producers to assess and compare their performance against those indicators and against a weighted average of their peers. This is very similar in principle to the US Field to Market model (see case study).

Like other outputs from the SIP, however, this work appears to have been quietly shelved, while Defra has indicated its support for the Sustainable Food Trust's Global Farm Metric.

This is a puzzling policy decision without apparent explanation or scientific basis. Not only is the Sustainable Food Trust an activist, pro-organic NGO which openly campaigns against technologies the Government is seeking to enable, such as gene editing, and has taken a prominent role in promoting widely discredited anti-GMO 'research'[25], but the Global Farm Metric model itself is designed to reward less productive, more extensive farming systems by favouring a whole farm, or area-based, approach to measuring resource use and environmental impact.

Logically, it would make sense for the Sustainable Food Trust's area-based Global Farm Metric to be submitted to a process of independent scientific scrutiny and validation by recognised academic experts in the field.

Speaking in September 2021 at a meeting of the APPG on Science & Technology in Agriculture, leading scientists evaluating the sustainability impact of different farming systems, including Professor Andrew Balmford (whose *Nature* study was previously cited), and Professor Paul Wilson of the University of Nottingham, who led the metrics work as part of the Defra Sustainable Intensification Research Programme, indicated that, to be meaningful and robust, sustainability metrics must focus on measuring resource use and environmental impact per functional unit of output, not per area farmed.[26]

Given the importance of metrics underpinning the scientific and evidential basis for other policy decisions, the Government should commit to the development of robust metrics for sustainable agriculture, grounded in science, and drawing on the considerable body of work already funded by Defra as part of the Sustainable Intensification Research Programme.

Defra Secretary George Eustice has relayed a vision for UK agriculture as a world-leading sector that has at its heart a fusion of traditional farming practices alongside greater access to modern technologies. This is a true agroecological approach, and one that can deliver on the urgent need to grow our food productivity, address the climate challenge, enhance the environment and protect biodiversity.

But those objectives will only be achieved if we are ambitious and if we are guided by the world-class science for which the UK is renowned.

Summary of recommendations:

- **Put scientific rigour and evidence at the heart of UK regulations, policy development and R&D investment in food and agriculture;**

- **Restore the strategic policy focus on sustainable intensification in UK agriculture** - using scientific knowledge and innovation to help optimise the balance between food production, resource use and environmental impact, and re-focusing on the outputs of the four year, Defra-funded Sustainable Intensification Research Programme (SIP);

- **Confirm the UK as a signatory to the global Coalition on Sustainable Productivity Growth for Food Security and Resource Conservation (SPG),** signalling a recognition that science and innovation can help farmers adopt environmentally friendly and climate-smart farming practices without sacrificing productivity;

- **Recognise the importance of genetic innovation as the single main driver of productivity gains in agriculture, and establish a long-term, strategic Crop Genetic Innovation Research Fund** in response to UKRI's 2021 review of UK plant science, which warned that major opportunities to translate early-stage genetic discoveries from lab to field are being lost;

- **Move further and faster to make UK regulation of new genetic technologies in agriculture more proportionate and enabling;**

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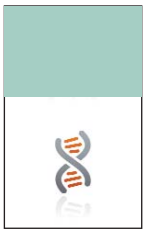
Science *for* Sustainable Agriculture

Key Themes

Six key themes frame the work programme of Science for Sustainable Agriculture in seeking to ensure the positive contribution of science in agriculture and food production is recognised in public life and policy making.

Science-based regulation

Ensuring the regulation of agricultural innovation is proportionate, non-discriminatory, and based on the best available scientific evidence. Highlighting opportunities for the UK to become a global leader in agri-science through a more enabling approach to regulation – and identifying areas where a failure to follow the science is driving research and investment elsewhere.



Importance of genetic innovation

Raising awareness and understanding of the critical role of genetic improvement as the foundation of high yielding, resource-efficient and climate resilient agriculture. Independent research has shown that genetic
ure - policy development and allocation of
research funding must reflect that.

Sustainable intensification and metrics

Highlighting the urgent need to restore the policy focus on 'sustainable intensification' in agriculture, and to develop science-based sustainability metrics capable of objectively and consistently monitoring the balance between resource use and environmental impact per unit of production. Robust farm-level metrics will provide the basis to define 'sustainable intensification' in practice, to set targets, measure progress and frame the policy and R&D agenda, especially in the context of debates such as land-sparing vs. land-sharing.

'Naturalness' in food and farming

Encouraging informed debate around the use of potentially misleading terms such as 'natural' in relation to food and agriculture. Farming itself is not, and never has been 'natural', in fact farmers spend much of their time trying to sustain production in the face of 'natural' intrusion, e.g. in the form of weeds, diseases and other pests. Scientific innovation increasingly offers better ways to protect harvests while minimising impacts on unfarmed habitats and environments.

Ethics of sustainable agriculture

Working to ensure all ethical aspects of new technology and innovation in agriculture are considered, ie not just the implications of permitting new technologies, but also the ethical considerations of blocking or restricting the potential of innovation to produce more food with less impact on the environment.

Agri-tech innovation

Working to recognise and showcase the potential of other technologies and innovations - alongside genetic improvement - to enhance the efficiency and reduce the environmental footprint of productive agriculture (digital, AI, precision engineering, automation, robotics, biologicals, renewable energy etc).

Science *for* **Sustainable Agriculture**

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