INSIGHT

to AI in UK AgriTech

2021 and beyond

Make money work for you

BARCLAYS

Contents

Executive summary

Smart Tech is fundamental to securing UK Agriculture's future

Leveraging technology effectively is critical in unlocking opportunities – whether productivity, profitability or sustainability-related – that will be critical in securing a robust future for UK Agriculture.

While UK farmers are beginning to appreciate the many ways in which emerging technologies can deliver better outcomes – more efficient use of resources; more productive use of their time – there remain profound barriers that need cross-industry collaborative solutions.

Costs of adoption; return on investment; and fitness for purpose are all challenges that must be addressed – and can be addressed – to put UK Ag on track for the next decade.

The UK can be at the forefront of innovation and implementation

The UK boasts world-class technology and research capabilities, and is the global leader in the development of AI enabled solutions.

Organisations such as the Small Robot Company, the UK's leading ag robotics firm, which has developed the world's first weeding bot; Drone Ag, simplifying drone tech for the sector; and the Hands Free Hectare project are pushing innovation forward at pace.

Solutions that can readily be integrated into core processes can help to ensure farms such as Applegarth, which is successfully leveraging a range of Precision Ag technologies, will in future be the rule rather than the exception.

Pinpoint the use case then build the tech

Technologies offering immediately apparent solutions to known issues – and that 'fit' with existing infrastructure, hardware or processes – are 'easy wins'. AI-enabled sensor tech is delivering critical data to farmers from devices increasingly simple to implement, visualised in increasingly simple and impactful ways, and it is no surprise to see increasingly widespread adoption.

Other IoT or data solutions need to be matched more closely to farmers' needs, behaviours and – just as importantly – to be adaptable to different environments. And furthermore, to have clearly evident – and ideally demonstrable – return on investment. Small Robot Company is one developer that is beginning to drive out positive examples in this respect. Others should follow, ideally in collaboration with farmers to ensure innovation is targeted effectively.

Executive summary

Data will be at the core of tech solutions in 2021 and beyond

The explosion of data in the last ten years and more is already arming farmers with key insights with which to optimise process and outcomes. But the next wave of data innovation must go further.

With greater commonality in taxonomy and platforming must come fully integrated datasets capable of feeding ML-enabled algorithms capable of unpicking complex interdependencies and pinpointing solutions.

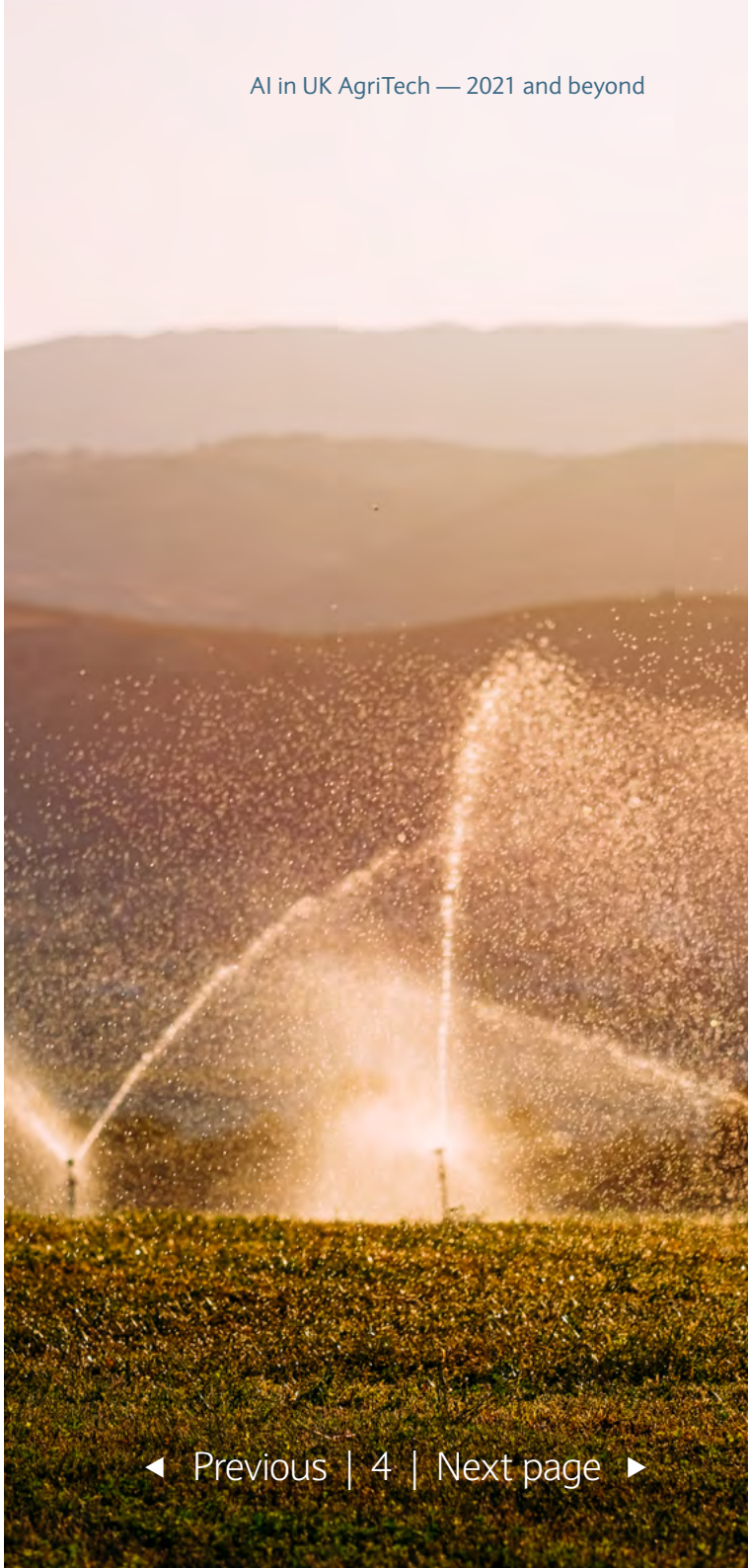
Bringing evidence, analysis, conclusions and recommendations for solutions to life simply and visually is the last piece of the puzzle, enabling farmers to make mission-critical decisions quickly and confidently. Providers such as Agrimetrics are beginning to bring this utopia to life, but would acknowledge that much needs to happen to allow the industry to transition to that point.

Key steps to accelerate adoption

Knowledge sharing between farmers, leading industry bodies and technologists is critical in ensuring that innovation is directed towards practical challenges; and that farmers are made aware of the possibilities that technology can unlock. Hands-Free Hectare is an exemplar in this respect.

Support mechanisms such as the Countryside Productivity Small Grants programme must be fully funded on a long-term basis to ensure that farmers are not penalised for early adoption of emerging tech.

Finally and perhaps most fundamentally, tech needs to deliver practicable, workable broad-spectrum solutions rather than disparate IoT components that are additive only within a very narrow scope and are often ill-suited to the rigours of UK farms and climate.



Introduction

Total global agricultural production has tripled in the last 60 years, outpacing even the huge increase – from 3B to more than 7B – in the number of mouths the industry must feed. Technology played its part in our enhanced ability to feed ourselves, but deforestation and intensive farming played more.

Now, as UN[1] estimates of the increases required to meet global demand in 2050 range up to 150% of current production, and the agricultural sector is challenged to build a more sustainable industry for the next century, it is axiomatic that technology must play a leading role in our efforts to build better. We must be resourceful, and resource-conscious, to prosper in the challenging times that face the sector in 2020 and beyond.

At the vanguard of developments in this context is the emergence of technologies enabled by Artificial Intelligence (AI), Machine Learning (ML), Deep Learning (DL), Robotics, the Internet of Things (IoT) and Cloud Computing. These technologies, already underpinning some of the most fundamental changes in agricultural working practices seen in a century and more, will shape UK farms' and farmers' futures. Leveraging these technologies effectively will separate the winners and losers, domestically and internationally.

This report, which leverages both in-person and quantitative data from samples of UK farmers, technologists and industry experts conducted by our research partner Illuminas in Summer and Autumn 2020, explores the challenges facing UK farmers at a pivotal time for the industry. It discusses the pace of change in the sector; examines some of the most exciting developments in agricultural technology in the UK today and tomorrow; and seeks to identify routes through which UK Farming can achieve sustainable competitive advantage through unlocking some of the benefits of these technologies.

[1] Creating a Sustainable Food Future Final Report, July 2019

Foreword

"Agriculture has for centuries evolved and moved forward, the rate of change in the second half of the last century begin to pick up pace and in the last decade, that change has gathered an unstoppable momentum.

The change global agriculture will witness in the coming decade I believe will be breath-taking. The drive towards greater farming efficiency to ensure UK agriculture maintains its position at the forefront of global production for traceability, welfare and quality, also driven by the UK farming target for achieving Net Zero by 2040 will see rapid and exciting times ahead. This report highlights some of the great innovation, the direction of travel and how Agri-tech is being employed in real farm situations to reach our goals as an industry in the coming years."

Mark Suthern
National Head of Agriculture
Barclays UK

Roxanne Martin
Eagle Lab AgriTech Industry Lead
Barclays UK

> Agri-tech is becoming big business in farming. We're seeing more and more farms improving productivity and efficiency with tech."
>
> **Mark Suthern**
> National Head of Agriculture, Barclays UK

UK Agriculture

The importance of tech in securing competitive advantage

The eye of the storm

As UK Agriculture looks to build a more sustainable model going forward, it faces a range of headwinds – geopolitical, (macro) economic, regulatory – that will shape the fortunes of the industry for a generation and more. The industry's ability to respond to these seismic shifts will require innovative thinking, and innovation in business practices.

The issues impacting UK Agriculture

> How are we going to continue to be profitable? That is the driver for everything that we do … I think farms will operate in a very different way over the coming years. The challenges are going to be forced upon us. We are going to have to change."
>
> **Ian Rudge**
> Bedfordia Farms

Source: Illuminas Research (2020)

The eye of the storm

Meeting these challenges will require UK Farming to shift from 'vicious' to 'virtuous' cyclical behaviours.

In order to survive in a highly volatile market and deal with the variation in yields, weakening condition of resources and increased crop resistance, farmers have historically tended to adopt or persist with farming practices which have maximised yields in the short term, but which have led, however inadvertently, to grave depletion of natural resources in the long term.

However, the priority amongst UK farmers today is to use available inputs more effectively and efficiently. This is part of a broader shift towards a virtuous cycle of lower costs, more sustainable land use and – ultimately – greater productivity and profitability.

The Future of the EU-UK Relationship

88% of UK farmers believe uncertainty around the trade deal/CAP provision is impacting significantly on their businesses

Impact of COVID

47% of UK farmers believe their businesses have been negatively impacted by the ongoing pandemic

The UK Agricultural Bill

79% believe increasing environmental oversight and regulation is impacting significantly on their farm

Productivity challenges

64% of UK farmers are prioritising improving productivity, increasing output and/or farming smarter going forward

Sustainability

82% of UK farmers believe improving the sustainability of farming and restoring soil health is fundamental

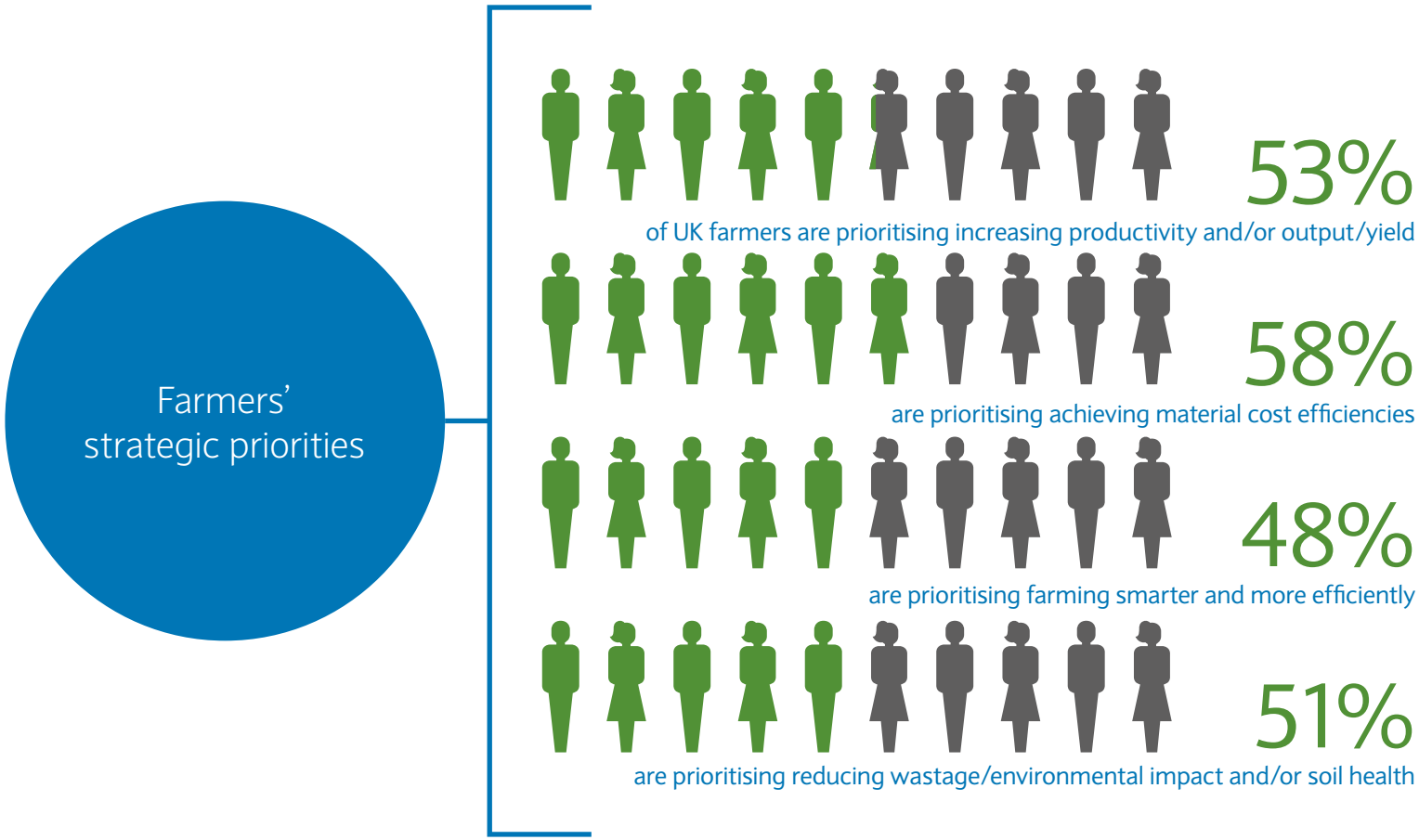
Climate change and 2040 Net Zero

90% of UK farmers believe climate change and the NFU's revised Paris target is impacting significantly on their farm

Innovation and new farming methods

45% of UK farmers have invested (30%), or are planning to invest (15%), in emerging tech to fuel process innovation

UK Farming must adapt quickly, putting technology at the heart of its response



"We believe here that the only way we are going to be able to produce enough food to feed the UK – as well as the wider world – is to use science and technology."

Tony Bambridge
B & C Farming

UK Farming must adapt quickly, putting technology at the heart of its response

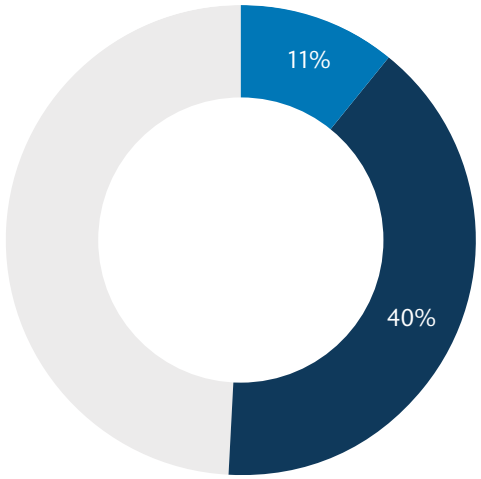
Improved productivity is fundamental to the UK industry's longer-term competitiveness, indeed to its financial sustainability, with UK Farming's productivity lagging that of EU competitors by sometimes considerable margins. Technology-related issues are often posited as some of the most fundamental in creating and maintaining the UK's competitive disadvantage.

- Educational/skills gaps;
- Limited intra-industry sharing of best practice;
- Lagging other countries in data generation and analysis and modelling capabilities;
- Disconnects between innovation strategy and funding and farmers needs;
- Slow deployment of connectivity (FTTP; 5G).

UK Farmers are beginning to appreciate the pivotal role of technology in farming smarter and more productively.

Investment in systems and solutions to enable greater productivity has to date has been relatively limited, with only 11% having prioritised in the past. But two in five farms plan to invest to unlock the greater efficiencies in their operations.

UK farmers recognise the fundamental importance of farming smarter to longer-term sustainability, both environmentally and commercially. With only 36% of UK land croppable and estimates suggesting that high-intensity farming techniques have depleted our arable land of c. 50% of its organic content, action is imperative.



Have invested in AgriTech to achieve increases in productivity

Will invest in AgriTech to achieve increases in productivity

"Our focus is on wasting less and not growing too much. Reducing waste is the main thing. It's expensive and by being more efficient (with your inputs) you are able to cut a lot of it out."

Patrick Allpress
Allpress Farms

54%

of UK farmers that are prioritising improved productivity believe tech investment is fundamental to addressing this challenge

Tech-enabled smarter farming has the potential to unlock the advantages UK Farming desperately needs

More efficient resource allocation is critical to manage costs, improve productivity, reduce environmental impact and – ultimately – farm smarter. The Circular Agriculture model at the heart of the revolution transforming farming in the Netherlands recognises that productivity centred on improved **resource efficiency** will result in **increased productivity** with concomitant **environmental benefits**.

Effective use of technology will be critical to unlocking these benefits, and there is recognition – albeit among only one-half of UK Farmers – that tech can play a central role in achieving efficiencies in resource utilisation.

59%

of UK farmers that are prioritising farming smarter believe tech investment can be material in achieving those goals

43%

of UK farmers that are prioritising farming smarter have invested in technologies to help them do so

46%

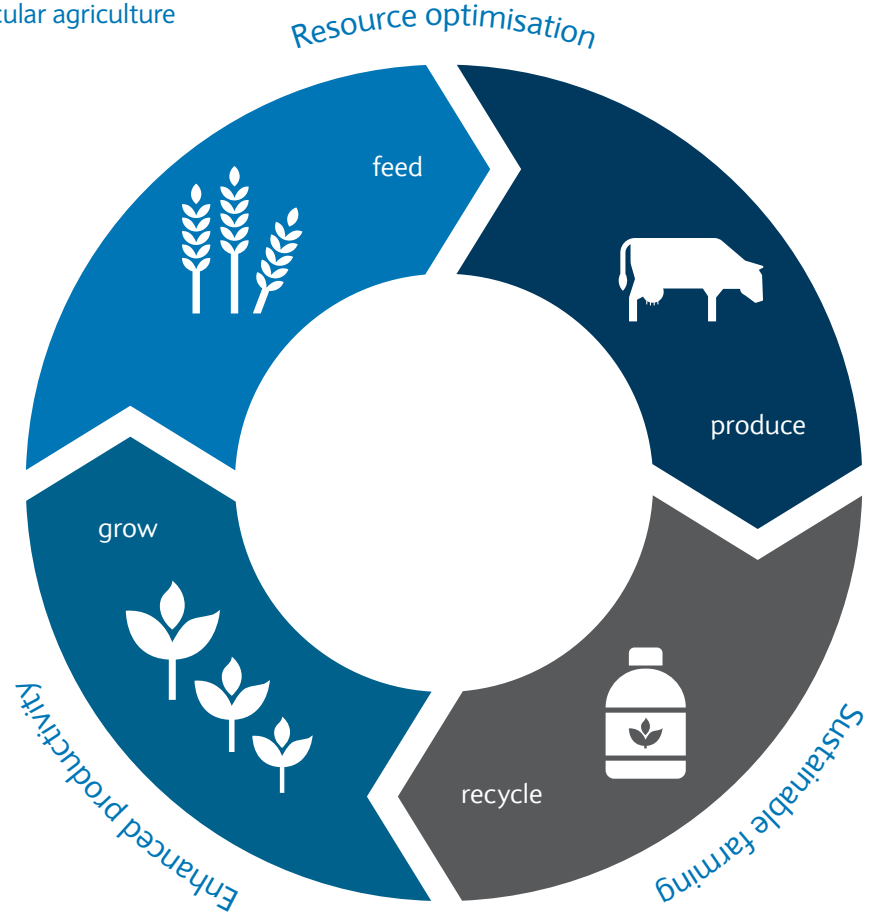
of UK farmers that are prioritising farming smarter plan to invest in technologies to help them do so in the near future

52%

of UK farmers prioritising more efficient resource allocation believe tech investment is central to doing so

Tech-enabled smarter farming has the potential to unlock the advantages UK farming desperately needs

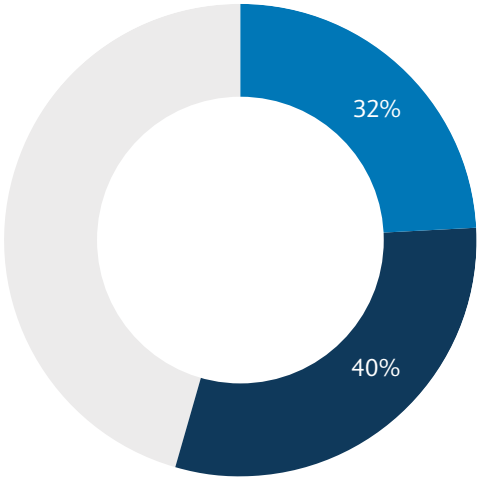
Circular agriculture



> "We need to make our farm sustainable for the next generation, and the ones after that."
>
> **Ian Rudge**
> Bedfordia Farmsg

Evidence of the relationship between technology and better and more sustainable outcomes is irrefutable; and many UK Farmers – although not all – appear to recognize the importance of continuing to invest, and to innovate. Technologists looking to drive greater engagement within the farming community must, it seems clear, put sustainable impact on productivity at the heart of their messages.

One-third of farmers have claimed already to have made investments in technologies to enable more efficient use of resources, with a further 40% planning to do so in 2021–23.



Have invested in AgriTech to enable smarter resource utilisation

Will invest in AgriTech to enable smarter resource utilisation

There is an emerging core of tech-enabled UK farmers that are building for the future

Leading the charge

Data from recent survey work shines a light on a core group of UK farmers that are looking to emerging AgriTech to build more sustainable businesses and set the foundations for commercial success; with another 14% that are focusing instead on embedding existing tech investment before prioritising further investments. However, 55% have no plans to look to technology. Is this group in danger of being left behind?

Planned investment in emerging agricultural technologies

31%
of UK farmers plan to invest in new, emerging technologies to ensure business success

14%
do not plan to invest in AgriTech but have done so in the past to realise priorities

55%
have never invested in advanced AgriTech and have no immediate plans to do so

There is an emerging core of tech-enabled UK farmers that are building for the future

Planned investment in emerging agricultural technologies

are more aggressive, more entrepreneurial farm businesses.

Often led by younger farmers, more comfortable with technology and more likely to see tech as offering a genuine competitive advantage if leveraged effectively.

are farms typically comfortable with the various applications of AI and emerging tech.

These businesses are currently looking to embed existing inventory/investments, and to realise ROI on those, before committing to new investments.

AgriTech is part of **Applegarth Farm**'s DNA. A adherent of vertical farming, 2021 will see the go-live of its 6,000 sq. ft aeroponic greenhouse programme, to add to the array of existing sensor and robotic technologies the farm deploys.

Tech has enabled every phase of Applegarth's growth to date, and its commitment to ongoing investment is central to its competitive strategy going forward.

Central to the strategy of **Bedfordia Farms** is optimised productivity and resource management; and its tech strategy has been focused to that end. For 2021, it has prioritised its partnership with Agrimetrics to rationalise its array of different field, soil and yield mapping platforms to provide more coherent and consistent analysis rather than planning fresh investments.

Two businesses following different paths, but each in their own way leaders, illustrate some of the opportunities that tech-oriented Agribusinesses are looking to unlock as they align their businesses to compete in the next decade and beyond. The potential of AI to be pivotal in doing so is only just beginning to be apparent.

"We need to make money, but we need to do it in the right way and in line with legislation and public sentiment. Whatever technology can assist with that, we're buying into it."

Ian Rudge
Bedfordia Farms

Source: Illuminas Research (2020)

UK AgriTech

How can we enable agriculture 4.0 in the UK?

AI will transform UK agriculture forever

Farmers are only just beginning to recognise the transformative potential of AI in its various applications, ranging across different innovations in every component part of agricultural systems. Whether in real time **detection** of developing issues; in rapid and accurate **diagnosis** of those issues; in **determining** the most appropriate actions to take; or in the application and **delivery** of solutions at source, AI is already changing the way farmers work. And yet we have only begun to unlock its potential. Farms in future may as closely resemble open-air laboratories as they will the farms of today.

UK AgriTech commands a set of baseline capabilities that is the equal of any in the Netherlands, the US or other highly developed agricultural nations; and the Department of Trade has been active in promoting the nation's Ag and AI, Robotics and Autonomous Systems research as world-class. However, there remain many challenges in bringing these technologies to life within a sector which has been described as the least digitised in the world today. Is this characterisation justified? And if so, what must be done to ensure UK farmers are not left behind in the AI arms race?

Advanced AI-enabled systems are beginning to make their way out of the labs and into the fields

There is an increasingly broad range of technologies becoming available which offer the potential fundamentally to transform the farms of today into the farms of the future.

There are however a range of challenges in harnessing the power of AI in the agricultural sector, some of which are, research confirms, impeding broader adoption and preventing the sector from accessing some of the competitive advantages it so desperately needs.

Detection

Using techniques such as image processing, soil nutrient monitoring and crop and animal health scanning to detect problems often invisible to the naked eye.

Next-gen **sensor tech** from firms such as **Arable** are multi-functional and can seamlessly integrate with ML-enabled decision-making systems.

Drone Automation, in development at **DroneAg**, will offer **full automation** of collection, analysis, and remote transfer of data to farmers in real time.

Leading industrial Drone developer **American Robotics** is bringing **automated Drone and IoT Sensor** platforms to market, offering full integration of aerial imaging data and in-field sensor biometrics.

Diagnosis

Advanced data analytics, using a range of inputs from on and off-farm data resources, providing real-time diagnoses of complex problems.

Analytics solutions from **GlasData** and **Diometer** offering seamless integration of data from different providers and platforms.

Telemetric tools able to enable the location and baseline problem diagnoses for equipment and livestock.

Determination

Harnessing the power of AI to determine the most appropriate solutions to complex problems and – in the future – allowing farmers to outsource decisions to tak action.

Research at **CHAP** using ML to build a thinking machine capable of recommending optimal biological treatments strategies.

John Innes Centre developing a low-cost solution for automated seed imaging and ML-based phenotypic analysis of crop germination.

ML-driven neural networks from **GlasData** able to understand the interrelationships between soil, climatic, biological and other inputs to provide recommendations for yield optimization.

Delivery

Automated solutions such as advanced robotics, able to undertake complex and precise tasks that until now have required manual intervention.

The UK's leading ag robotics firm, **Small Robot Company**, has developed a robot capable of plant-by-plant care and the world's first weeding bot.

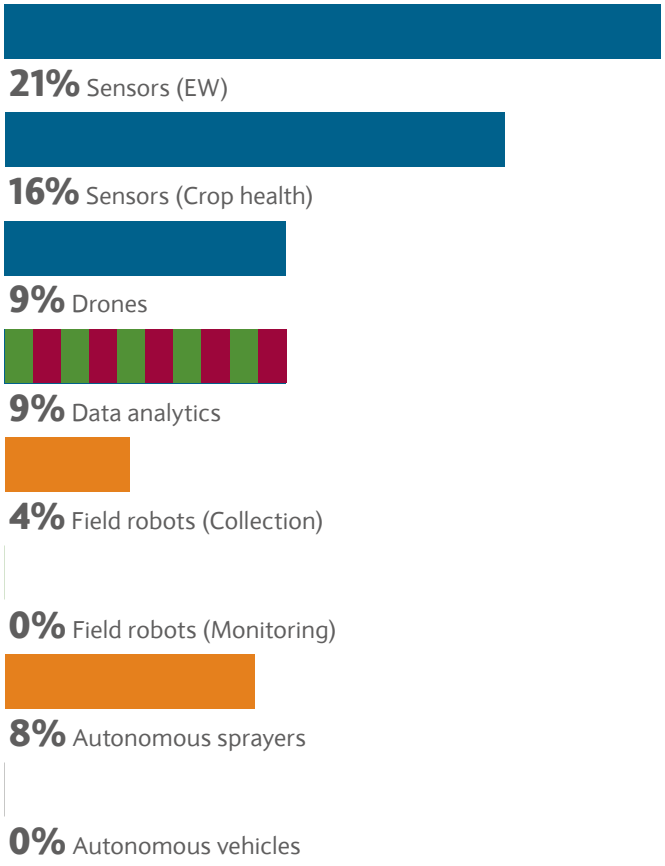
Ongoing development of **Autonomous Agri Vehicles** by **HandsFree Hectare Project** in the UK and **Bear Flag Robotics** and others in the US.

The **Ceres AgriTech** venture to improve outdoor robotic capabilities in terms of: speed of performance; accuracy and reliability of image processing; haptics to enable soft-harvesting capabilities; ability to perform in a range of conditions on-farm.

AI-based tech has yet to achieve widespread adoption

AI-enabled AgriTech remains some way from seeing wide-scale implementation on UK farms, as evidenced below.

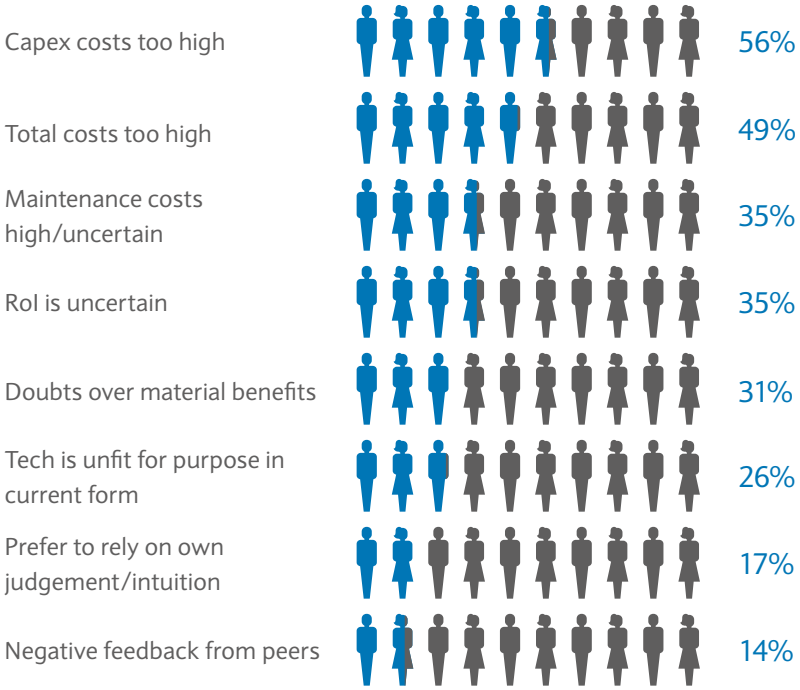
Current adoption of AI-enabled AgriTech



Source: Illuminas Research (2020)

Barriers remain profound, with cost (perceived or actual, depending on experience) the most significant factors. Data from Defra's Farm Business Income Survey indicates that, across sector, profitability declined between 8.5%-17%* to FYE2019, with YoY changes over the last 15 years ranging from +40% to -36%. Farm profitability is more than usually subject to volatility, and reducing the sector's exposure to swings in input costs and, where possible, to output yields, is a priority for industry lobbyists and trade bodies.

Barriers to adoption of AI-enabled AgriTech



Source: Illuminas Research (2020)

Without measures to protect farmers from very considerable swings in costs, only a minority of highly profitable – or highly geared – farms are likely to continue to support investment in emerging tech.

Against this backdrop, many farmers consider themselves as simply incapable of making the very significant investments required to unlock the benefits of AI; many others – including 36% of adopters in our survey – are uncertain as to whether that investment can, or will be, recouped. **The onus is on technologists and providers to bring the benefits to life and to ensure that propositions are available that meet the needs and the budgets of UK farmers.**

The benefits of AI-enabled tech are considerable, but the barriers are – for many farmers – no less profound

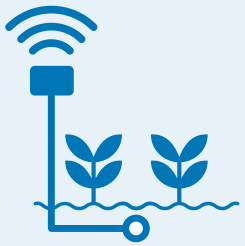
There are a range of issues around which all parties need to converge to ensure that the benefits of Ai-enabled AgriTech can be fully realised.

	Detection	Diagnosis	Determination	Delivery
Benefits	• Precision Agriculture (enabling resource and cost efficiencies and gains in yield / output) • 'Always on' crop, plant, soil and/or animal health monitoring capability • Greater, and more efficient, farm coverage	• Greater oversight of farming activity and status of fields, crops, etc. • Digitisation of inputs, outputs, and/or financials • Evidence-based, rather than intuition-based, decision-making	• Widest possible set of inputs • Ability to understand and identify complex causal relationships • Replaces intuition with evidence-based solutions • Integrating problem identification to solutions implementation	• Automation of time and labour-intensive farming tasks • 'Always on' source of labour • Increased productivity, efficiency and output • Frees up time to concentrate on business management/strategy
Enablers	• Greater availability of 'all in one' solutions comprising predictive capabilities (Sensors) • Launch of fully automated systems and legislation enabling their adoption (Drones) • Detection capabilities superior to the naked eye	• Availability of platforms able to automate data collection irrespective of device type/app/provider • Simple, smart and easy platform UX • Analytical tools which can identify the impact of farming activity on output/yield, resource usage and profitability	**In development** • Potential 'accelerators' include – Consolidation of disparate data sources – Agreement of industry benchmarks – Cross-team working groups (end-users; technologists; institutions) to direct innovation to most directly applicable areas	**In development** • Potential 'accelerators' include: – Greater investment in R&D to enable the development of tools able to deploy outside of lab conditions – Cross-team working groups to develop fit for purpose soft harvesting executions – Greater availability of 'Farming as a Service' propositions
Barriers	• Lack of 'all in one' solutions able to predict issues • Incompatibility with existing on-site data platforms • Time/labour required to manage (Drones) • Human ability to detect issues by 'walking the fields' and solutions require human intervention	• Limited platform interconnectivity/cross-compatibility • Limited integration with existing on-farm tech • Poor platform UX • Face validity of data • Outputs describe the 'state of play' rather than inform 'direction of travel' • Requires farmers to be 'in the office' rather than out on farm	• Insufficient data inputs (range of variables/quality of data/time series datasets) • No commonly agreed data taxonomy / benchmarks • Outputs based on 'partial picture' data lack face validity	• Insufficient data • No commonly agreed data taxonomy/benchmarks • Outputs based on 'partial picture' data lack face validity

Use of sensors and drone tech for problem detection is growing, but challenges remain

The benefits of sensor and drone technologies are increasingly widely recognised but adoption remains relatively narrow at present, and there are tech and commercial challenges to overcome to broaden adoption of technologies which are key enablers of Precision Agriculture.

Although the benefits can be significant, with faster detection of emerging issues and greater precision in solutions offering often significant delta improvements in resource utilisation, many farmers remain unconvinced that the tech is fit for purpose, or that it can in fact provide time, labour or cost savings.



Awareness	75%	77%
Currently use, or would consider	65%	57%
Currently use	27%	9%

Use of sensors and drone tech for problem detection is growing, but challenges remain

Benefits

Always on

- Detection tech generates data which enables users to remotely monitor the health of crops/plants, soils and/or animals in real-time and 24/7/365

Precision

- Detect issues (pests, disease, poor growth, etc.) and to deploy solutions (fertilisers, herbicides, etc.) precisely
- Reductions in resource usage and waste, cost efficiencies, and gains in yield/output

Process efficiencies

- Greater, and more efficient, coverage of any given farm's land area than 'walking the fields'

Smarter farming

- Generates time series plots which enable farmers to understand impact of farming activity on growth rates and identify activities with greatest positive impact on yield (e.g. varietals; rotations; treatments; etc.)

Barriers

Deployment costs

- Complexity/diversity of farm businesses require multitude of sensors (limited multi-function availability)
- Sophisticated drones (multi-spectral/ thermal imaging; thermal and/or hyper-spectral sensors; image processing capabilities) can cost tens of thousands of pounds

Return on investment

- Little evidence exists of the link between investment and material gains in output/yield; and that which does is not compelling

Lack of predictive capability

- The value-add of insights derived is limited to confirmation of issues – which farmers can detect by 'walking the fields' – rather than revelation of future ones

Technical issues

- Require human operation and training
- Limited battery life and risk of motor failure
- Legislative implications of drones unclear
- Time/labour intensive to operate

"Thanks to the Yara N-Sensor we are seeing areas of the field which are struggling and need input, so with a better sprayer we're making better use of the product having made the decision to use it based on the data."

JJ Ibbett
Bedfordia Farms

"We got a Drone and to a degree it helped but you still have to interpret the pictures. Our agronomist looked at the problematic ones and said 'I'll go and have a look'. He may as well have done that in the first place!"

Tony Bambridge
B & C Farming

There are a range of different solutions that can enable greater deployment of detection tech

There are a range of issues to address which, if addressed, can be potentially transformative in driving broader and deeper adoption.

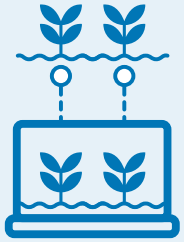
Challenges	Solutions	Benefits	Impact on uptake
Core functionality	• Multifunction detection devices, such as integrated crop/plant and soil health sensors and drones • 'All in one' devices able to monitor crop/plant growth, soil moisture, pests and disease, etc. • Sensitivity of detection beyond the human eye/farmer's own experience • Telemetric functionality for auto measurement and transmission of data between device platforms.	• More consistent UX across different functions • Simplified procurement process • Time/labour efficiency (obviates the need for farmers to 'walk the fields') • Ability to operate in rural areas with low broadband speeds • Automated production of comprehensive data sets which are easy-to-use and manage	• Potentially considerable if pricing model and tariffs are sufficiently compelling
Device inter-operability	• Devices which use standardised data architecture and taxonomy • Develop an 'open source' culture to enable technologists to add value and disrupt the monopolisation of larger firms' propriety software	• Automated data entry into a centralised platform • Integrated data analysis • Time/labour efficiency (avoids manual entry/management of multi platforms)	• Potentially value-additive provided platform UX engages
Platform integration	• Platform able to predict issues based on the health profile of any given crop/plant, soil and/or animal • Ability to diagnose underlying causes of issues • Ability to recommend potential actions to address issues	• Optimisation of resource utilisation • Reduction in waste • Increased yield/output • Improved profitability	• Potentially game-changing if insights can be validated
Cost	• Multifunction detection devices (as above) to reduce cost per function	• Increased cost-efficiency • Reduced inventory	• Potentially considerable if pricing model and associated tariffs are sufficiently affordable
Skills/ educational gaps	• Drones capable of autonomous/driverless operation (including automation) • Provision of clear and up-to-date legal/regulatory guidelines on their use (Drones)	• Obviates the need for farmers to acquire skills in Drone operation • Time/labour efficiencies (obviates the need for farmers to 'walk the fields') • Clarifies legal/regulatory implications of their implementation	• Potentially value-additive

Cross-industry collaboration will be essential in addressing these challenges. Barclays aims to promote cross-industry collaboration with the launch of the Eagle Lab Farm in University of Lincoln, helping to build an established ecosystem of AgriTech businesses dedicated to working with like- minded partners, and thereby creating a more sustainable farming industry for generations to come.

There are a number of challenges to address before farmers adopt a ‘data-first’ approach

There is at present no fully AI-enabled analytics platform live in the UK, and what minimal adoption of data solutions is evident at present is limited to relatively simpler, piecemeal solutions.

There are a number of potentially compelling benefits to more effective AI-based data tools, but feedback from experts and technologists would suggest the industry is some way from being capable of delivering fully operational solutions.



Awareness	57%
Currently use, or would consider	53%
Currently use	9%

There are a number of challenges to address before farmers adopt a 'data-first' approach

Benefits

Digitisation of core farming

- Enable farms to have a digital record of inputs, outputs and financials
- Enables farm managers to better monitor and manage core operations
- Integration with procurement and auditing processes

Enhanced monitoring and tracking capabilities

- Data analytic and visualization tools enable the farm to understand the status of their fields, crops/plants, soils, and/or animals
- Enables historical/point in time comparisons

Evidence-based decision making

- Ability to make decisions based on 'hard' data rather than solely farmers' own experience/intuition (e.g. when/where and what treatments; when/where to plough, sow and harvest; fields, areas and/or animals to keep in/take out of production; etc.)

Barriers

Lack of commercially available solutions

- No ML-driven insight and decision-recommendation platform is yet (widely) available

Limited value-add

- Very limited evidence of the impact of data on decision-making at present, with manifold frustrations over volume of data collected vs. value of data generated

Poor user experiences

- No availability of unified platform architectures able to work with multiple data inputs from different devices, data sources, etc.
- Amount of data to analyse ("data overload")
- Validity of data, data errors, gaps, etc.

Cultural

- Farmers are neither agronomists nor data scientists
- Difficult to meld data and intuition or experience
- Significant upskilling across the industry is required

"John Deere's platform (JD Link) has enabled us to make more informed decisions about how to cultivate a field based on the data on it, rather than just based on a 5-minute kick-around."

JJ Ibbett
Bedfordia Farms

"What we need is to see the data brought together, and any gaps filled, to enable us to identify the decisions that are increasing – or decreasing – the yield potential."

JJ Ibbett
Bedfordia Farms

There are a number of potential solutions to drive greater engagement with data solutions

The industry needs to move much more quickly to agree standards for data integration before material progress may be made.

Challenges	Solutions	Benefits	Impact on uptake
Core functionality	• Smart tools to enable farm managers to generate simple, visually engaging, charts and which enable the cross analysis of inputs, outputs and/or financials • Ability to automate the categorisation of data sets and to select/filter analyses • Algorithms to be based on agreed benchmarks parameters • Ability to target variables known to be deterministic • Integration with 'big data' (national, regional and farm-based datasets)	• Provision of directional outputs, with visibility of the rationale for direction(s) proposed • Measurable impact of changes to farming practices on productivity and – ultimately – profitability • Avoid 'data overload' • To establish norms in crop/livestock health and development, etc. • Build more robust algorithms and produce more consistent outputs through cross-industry partnerships	• Potentially game-changing if data driven decisions lead to material gains in productivity and profitability • A simple and light touch approach to diagnostic and predictive analysis that complements farmers' existing experience and intuition
Device inter-operability	• Devices based upon a single standardised data architecture and taxonomy	• Datasets with sufficient depth and breadth of data points to be additive • Automation of data entry into a centralised platform • Time/labour efficiency • Reduced errors	• Potentially value-additive provided platform UX engages
Platform integration	• Centralised platform able to integrate inputs from different providers • Smart platforms able to automate all data input and gap-fill based on norms	• Ability for data outputs to be fed back to devices to enable autonomation of activity • Data at the core of analysis and implementation, ensuring trackability across processes	• Potentially transformative in terms of accuracy, transparency and efficiency of process
Cost	• Centralised platform (single cost) • Direct incentivisation of data sharing (Agrimetrics model)	• Single licensing cost	• Potentially transformative assuming user experience is positive
Skills/ educational gaps	• Cost-effective remote education training programmes • Case studies/testimonials	• Upskilling UK Agriculture in tech best practice, increasing awareness and familiarity with solutions	• Fundamental to break down barriers

The adoption of a unified data taxonomy, architecture and language are fundamental to unlocking the potential in data to revolutionise UK Farming. Barclays believe that only by working together towards a unified language can the industry maximise the potential from data applications in future.

Automation may be potentially game-changing but technology is insufficiently developed

Automation is capable of unlocking potentially significant advantages as UK Agriculture looks to compete internationally while facing labour shortages at home.

It is likely to be 2023 and beyond before the beneficial impact of greater automation is felt, absent regulatory reform and significantly expedited development cycles. There are currently many barriers to address.

Awareness	76%	58%
Currently use, or would consider	44%	39%
Currently use	5%	0%

Automation may be potentially game-changing but technology is insufficiently developed

Benefits

Automation

- Labour savings offer the potential to be transformational

Productivity gains

- Process automation driving increased output/yield (in principle or in practice), for example robotic milking machines enabling cows to be milked more frequently, increasing output and providing demonstrable ROI

Greater flexibility

- Relieving farmers from time/labour intensive tasks, and thereby providing greater flexibility in task management
- Allows farmers to move from 'working in' their businesses to 'working on' their businesses

Always-on labour

- With the industry facing potentially very significant labour shortages post Brexit, robots provide a 24/7/365 alternative to domestic or overseas workers

Barriers

Deployment costs

- Capital expenditure is often considerable for larger solutions (e.g. Robotic Milkers) and beyond many farmers' available tech budgets
- Cost of Field Robots is often net-neutral vs. human labour, with productivity gains often marginal

Operability

- Robotics very often optimised for vertical farming environments but incapable of operating in rough terrain or adverse climatic conditions
- Very often incapable of performing tasks with the accuracy or delicacy of human sight and touch

Cultural

- Shift away from the farm as a centre of local employment and community
- Significant training/upskilling requirements

Legal

- Autonomous vehicles are currently illegal in the UK and the ongoing consultation, assuming min. six months' delays for COVID, is unlikely to publish recommendations before 2022

"Before the robots each cow averaged 9k litres per year. Now, with the robots, we're getting 10.7k litres per cow, per year. We've increased our yield almost 20% with the same number of cows, feed, and acreage."

Will Griffiths
Blaencorse Farm

"Today's robots can only deal with controlled environments such as glasshouses where the payback is over ten years. They're going to cost you, what, £20k pa? I don't know. Against a person it's not worth it at the moment."

Patrick Allpress
Allpress Farms

IoT can power fundamental changes to working practices if optimised

There are considerable gaps in operational capabilities of technologies currently available. For those businesses starting afresh with vertical farming environments, the benefits are more immediately attainable. But for the majority of mature businesses, the technology is at present not fit for purpose.

Challenges	Solutions	Benefits	Impact on uptake
Core functionality	• Robots able to reliably conduct crop/plant and soil care and/or harvesting tasks • Robots able to operate/adapt to different terrains and weather conditions • Integrated vehicle fleets for automated tasks (e.g. harvesting) • Telemetric functionality for automatic measurement and transmission of data • Ability for devices to interact/train one another (device-to-device learning)	• Solving for the sector's productivity issues • Offsetting labour shortages exacerbated by Brexit and COVID • Ability to operate in rural areas with low broadband speeds • Automated production of comprehensive data sets which are easy-to-use and manage • Optimisation of machine capabilities	• Potentially revolutionary but is more likely to be evolutionary
Device inter-operability	• Single operating 'language' to allow intra-device communication in real time	• Seamless integration with data analytics and other devices • Time/labour efficiency (avoids management of multiple platforms)	• Potentially value-additive assuming can be delivered SIMPLY
Platform integration	• Integration of data outputs and agents, enabling automated diagnosis and delivery of solution with minimal or no manual intervention	• Increased yield/output • Improved profitability	• Potentially game-changing
Cost	• Provision of robotics in agriculture as a service • Ability to 'bolt on' robotics onto existing machinery/equipment	• Reduced capex/opex requirements	• Potentially value-additive
Skills/ educational gaps	• Basic robot maintenance • Provision of clear and up-to-date legal/regulatory guidelines on their use	• Reduced maintenance costs • Clarity regarding legal responsibility	• Potentially value-additive

It is critical that to take meaningful steps forward in productivity and competitiveness, UK farming has access to the right tech and tools. Barclays wants to be able to support the farming industry through the de-mystification of tech by ensuring that technology is solving everyday problems the industry faces, starting with the problems and working backwards towards the solutions.

UK AgriTech

Trailblazers

One of the UK's leading Agri-tech drone solutions providers

Background

DroneAg is a firm of farmers, agronomists and drone techs building drone-enabled solutions from its base on a 6000-acre farm in Northumberland. The firm was formed in 2015 when its founder Jack Wrangham, from a farming background, wanted to apply his skills and experience from his time managing an aerial media company utilising drone tech, to the challenge of unlocking the benefits of drone technology for UK farmers.

What Challenges Is Drone Ag Addressing?

The company began life by manufacturing custom-made Drone Systems but soon thereafter pivoted to design and implementation – including training provision – for agricultural drones, after realising how often farmers that had made initial investments in drone tech subsequently allowed them to go largely unused, often because of training needs or under-appreciation of the benefits.

The insight gained from interactions from farmers, and the frustrations they expressed with expensive tech from they were unable to extract (sufficient) value, inspired 'Skippy Scout', an AI-enabled mobile app able to deploy almost any existing Drone on-farm into an easy to use, automated agricultural detection tool.

What Value Is Drone Ag Adding?

The core principles of the app, which mirror those of Drone Ag more generally, might almost serve as a 'ready reckoner' of the principles to which technologists should subscribe:

- Simple to implement
- Simple to use
- Fully automated
- Affordable
- Help get the most from existing tech
- Integrated with other data sources
- Proven to identify problems

The app recently won gold at the LAMMA 2020 Innovation Awards (which recognise and give exposure to some of the best advances in agricultural manufacturing).

DroneAg is the UK's only pure play provider of Drones for the Agricultural sector and one of the few technology providers whose core personnel are all steeped in agriculture from birth, giving them baseline knowledge that they augment by staying close to their target client groups, via Trade events, at one of their training courses, or on-farm itself.

The firm's mantra of 'Do More In Less Time' empowers its core client groups – smaller, younger, resource challenged businesses – with tools that would otherwise be beyond their budgets and their experience to access. The propositions are fully integrated with existing processes and provide farmers the insights to make the right decisions quickly.

> "We've learned a lot over the last five years. We assumed when we began that a farmer wouldn't be bothered by a price point of £25k for a Drone System because he spends £80k on a Tractor. But we learnt that's not how it works. A farmer doesn't know what to do with a drone, but he knows exactly what to do with a tractor."
>
> **Jack Wrangham**
> Founder, Drone Ag

The UK's Agri-Food data marketplace

Who are they?

Agrimetrics is one of four centres for agricultural innovation seeded by Innovate UK, drawing on the expertise of founding partners NIAB, SRUC, Rothamsted Research and The University of Reading. A graduate of Microsoft's prestigious 'AI for Earth' accelerator, its goal is to help build more productive and sustainable food systems by improving access to food, farming, and environmental data – and by making it easier and more affordable for agrifood organisations to derive insights and ultimately commercial value from that data.

Collaboration is the cornerstone of the Agrimetric philosophy, and of its open architecture aggregation proposition, The Agri-Food Data Marketplace, which allows agrifood organisations and reseachers to access relevant ancillary data points to enrich analyses; to share data securely; and to monetise that data.

What Challenges Is Agrimetrics Addressing?

Poor access to data, or lack of expertise or budget to unlock its value, are major barriers to innovation in the agricultural sector, Agrimetrics's Marketplace and underlying linked-data technologies are enabling solutions providers to address these challenges and thereby to drive efficiencies and improve performance and sustainability across the whole food chain.

Some of the key areas Agrimetrics are targeting include:

- Crop Analytics – algo-enabled predictive analytics providing estimates of yield, risk and supply chain forecasting; and tools for crop health management, such as optimising water usage and preventing crop lodging.
- Harvest Forecasting: AI-driven predictive modelling that can predict the optimal window for harvesting of time sensitive perishable crops.
- Sustainability analytics, such as natural capital accounting, bringing data views together not simply to enable regulatory compliance but to help data-hungry organisations manage resources more cost-effectively and identify potential competitive advantages.

In short, Agrimetrics is enabling organsiations to move towards what it firmly believes is the future of farming – a sector powered by data, an information business.

What Value Is Agrimetrics Adding?

The Agrimetrics platform, Data Marketplace, is something entirely new in UK agriculture, and promises to break down some of the most fundamental barriers to deeper integration of data into agrifood processes:

- Open architecture allowing users access to breadth and depth of data in one place, easily searchable, through one simple interface.
- AI and linked-data technologies pre-linking and harmonising data from multiple sources, saving man weeks or months in data transformation.

Agrimetrics strives to ensure that their data simplifies, rather than complicates, the decisions agribusinesses make, providing only the most relevant data in the simplest possible way to demystify the often very complex world of AI-enabled analytics.

Looking forward, Agrimetrics is focused on removing barriers – whether privacy or compensation-related – to ensure data owners and users all benefit from this new data ecosystem and to enable the data-driven knowledge sharing that Agrimetrics believe is key to securing a profitable future for UK farming.

> "Don't tell a farmer 'you need to adopt AI'. Ask them what challenges their business faces, and is there a tool that can help? AI is just one tool in the box."
>
> **Professor Richard Tiffin**
> Chief Scientific Officer

The Small Robot Company: The UK's leading agricultural robotics firm

Background

Small Robot Company (SRC) aims to revolutionise UK farming to make food production sustainable. Inspired by work of Simon Blackmore in the National Centre for Precision Farming at Harper Adams and his vision a new way of farming, founders Ben and Sam were inspired to begin work on Farming as a Service, embodied in and powered by AI and cutting-edge robotics technologies.

Aware of the often sceptical attitudes with respect to new technology, and the pain those on the 'bleeding edge' often experience, nevertheless consultation with farmers highlighted opportunities for early stage tech adoption if it could be derisked financially and operationally. That opportunity is made real in SRC's 'Farming-as-a-Service' (FaaS) model.

What Challenges Is SRC Addressing?

Fundamentally to challenge existing – longer-tern unsustainable – norms of farming, putting AI at the heart of an integrated scanning, processing and execution loop that monitors crops, solves problems and implements solutions. Small thinking machines replacing large dumb technology. Putting the emphasis on accuracy rather than vspeed.

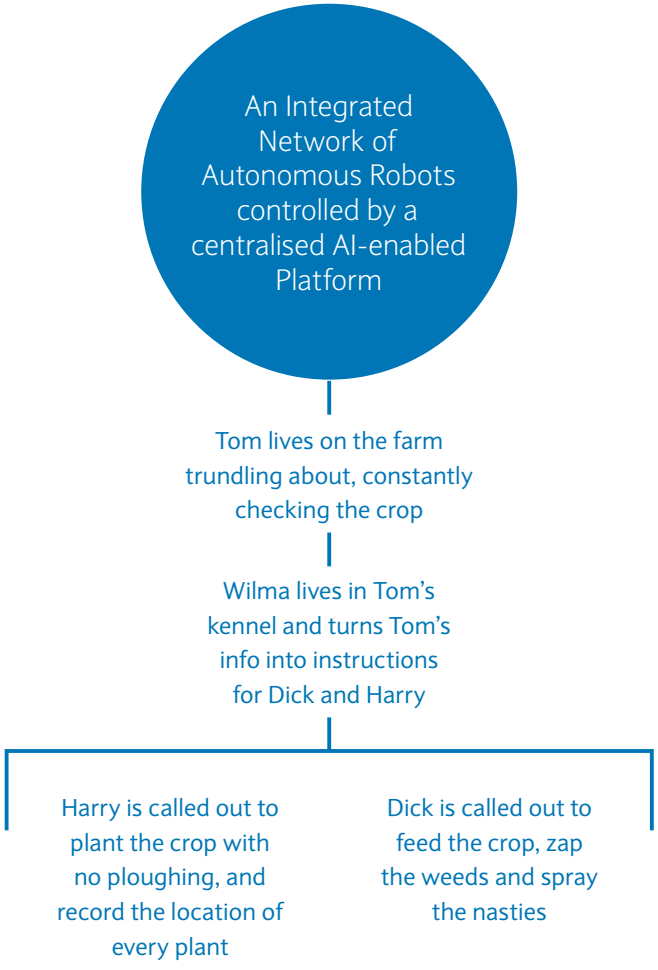
All managed through a simple user interface that visualises the challenges for farmers and allows them to be in control of the solutions without requiring significant upskilling in analytics or bioscience.

What Challenges Is SRC Addressing?

FaaS is helping farmers in:

- Reducing the environmental cost of farming through more efficient use of inputs, whilst – at the same time - maximising outputs.
- Reducing costs, including inventory and maintenance overheads, offering technology with few of its inherent commercial risks.

FaaS is putting Precision Agriculture at farmers' fingertips, allowing them to pay for outputs rather than inputs, and although in its infancy in deployment, services such as automated weed identification, early (non-chemical) intervention and weeding are proving extremely popular with those farmerssolutions. These conversations remain an ongoing workstream within the business, rather than a 'one-off' at the point of product design.



Looking to take the next steps in data integration

Background

Bedfordia farms more than 2,400 Ha (almost 6,000 acres) of predominantly arable farmland in North Bedfordshire and South Northamptonshire. The business has since inception put tech at the heart of its sustainable approach to agribusiness; and has enthusiastically embraced nascent scanning and sensor technologies since those first became available to UK farmers.

Data has to date been value-additive primarily as inputs into specific tactical decisions governing day-to-day operations (e.g. to understand field areas farmed, treatments applied, etc.) but have yet to be valuable in helping to determine more fundamental or strategic challenges.

What challenges is Bedfordia trying to address?

Bedfordia is looking to draw insights from data to inform strategic challenges, whether operational or strategic (e.g. which varietals to prioritise; which fields to which to allocate resources) or, further, the strategic direction of the farm (e.g. which crop varieties to plant, optimal fields/field areas to use, etc.). However, Farm Managers do not possess the necessary skills to provide that level of analytical input, but more fundamentally there is scepticism as to whether the array of different IoT technologies already deployed can be integrated in ways that can surface the insights required.

Bedfordia's most pressing need is full integration and automation of inputs from each of the different technologies deployed, overlayed with metadata, to provide commercial outcomes.

What does AI need to deliver?

Against this backdrop, the farm has recently brought Agrimetrics on-board, specifically to explore the farm's historic yield data – and in doing so, rectify inaccuracies – and to combine current data streams with data from Agrimetric's platform to provide a holistic and predictive solution.

The vision is to build a robust ML-enabled analytics capability, built on multiple seasons of data, that can provide insights into how to achieve positive outcomes in terms of yield and productivity. The approach Bedfordia and Agrimetrics will take will seek to optimise for (a) internal considerations – crop varieties, seeding patterns, field rotation – etc.) and (b) external factors such as climatic data – to achieve profitability and sustainability objectives. In effect, putting data at the core of the management of key decisions that affect the direction the business will take over the next cycle.

Future tech investment is likely to focus on how to build out capabilities to deliver pre-emptive and remedial solutions to challenges that the new data platform identifies. Sensor-enabled Sprayers are only one of the solutions being considered to add value in this sense. And to ensure technology continues to be at the heart of Bedfordia's development over the next 50 years, just as it has been for the previous.

> "Adoption of tech isn't our issue. It's seeing financial gain from it. The message from our MD is that we keep chucking money at tech but has it had a financial return? That is very difficult for us to answer."
>
> **JJ Ibbett**
> Assistant Arable Manager

> "Currently I make decisions based on my own experience of the farm. I use bits of data from different sources and then ground truth them but I'm still making decisions in an old-fashioned way. The data hasn't been reliable and it hasn't come from one source."
>
> **Ian Rudge**
> Arable Manager

The Future of Farming?

Background

Hands-Free Farms is an ongoing project which had its genesis in the Hands Free Hectare, a three-year project looking to bring robotics and autonomous vehicles powered by data out of the lab and onto the field. It began in 2016 as a JV funded by Harper Adams University, partnering with Agri-Epicentre, Precision Decisions and Farm-Scan, its mission to grow, monitor and harvest produce without physical intervention from farmers – ultimately, to introduce into farming the mechanisation that has powered quantum leaps in productivity in other sectors.

What challenges is HFF trying to address?

The Hands-Free project is a proof-of-concept for Agriculture 4.0 – for precision based on data, brought to life in automation. The major benefit of autonomous farming is, HFF has posited, operational efficiency and optimised resource utilisation. Enabling the farmer to focus less on the field and more on the balance sheet. Freeing time and energy to channel those to more favourable commercial outcomes (such as: identifying and servicing the best customers; working and innovating with the best partners). And while HFF would argue that truly precise agriculture – and the depth of data required to enable it – is years away, nevertheless that simply connecting data points and IoT machinery and monitoring what's happening in real time can itself revolutionise farming as most farmers know it.

How is HFF bringing this to life?

The Hands-Free project recently (Sep 2020) completed its first successful crop drilling operation, creating a wealth of data that can be used to create yield maps to optimise subsequent harvests. Most importantly, the hands-free farm operates on real, irregular terrain, providing proof-of-concept for autonomous farming for many farmers that have to date been – often currently – sceptical of the ability of IoT machines to operate in the field. In HFF's view, both technologies and proofs of concept exist in other industries – farming, being later to the party, can adopt the best of those without necessarily having to suffer the pain of the 'bleeding edge.

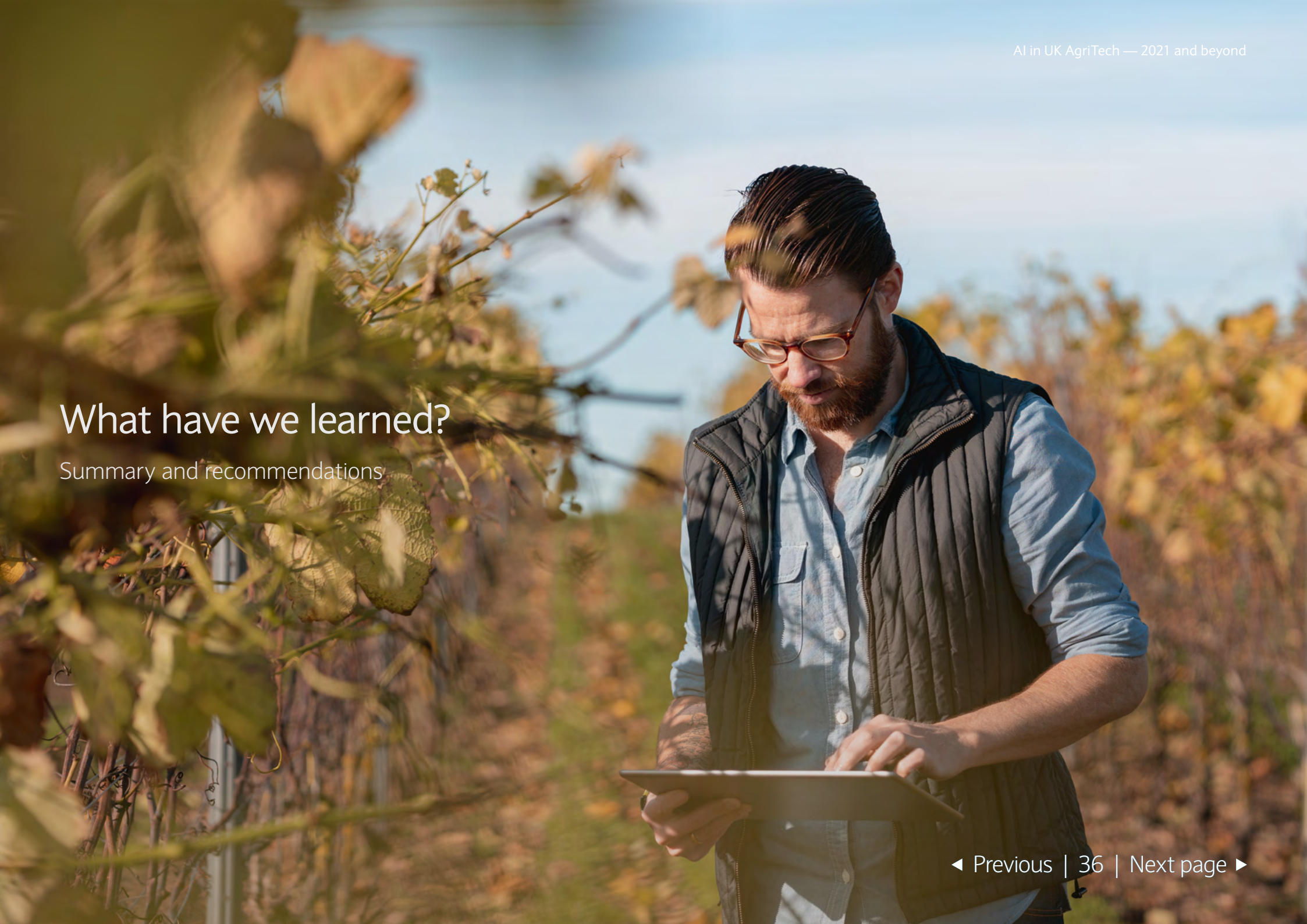
The future

Like any other farm, the Hands-Free project has to contend with many of the problems with which any UK farmer wrestles. Its first attempt to drill a crop was abandoned during a period of poor weather because the tech struggled to work in boggy underfoot conditions.
HFF is committed to continue to work with technologists to address challenges of this ilk and to develop robotics systems that are resilient in the face of the complexities farmers face, and can materially add value, freeing the farmer himself to focus on where he or she can most materially effect great outcomes.

> What we want to be able to say to farmers is that the systems we've developed can get the job done while you're asleep! So you can focus on the business of running the farm"
>
> **Parmjit Chima,**
> Head of Engineering, Harper Adams

> "Ultimately just about every other manufacturing industry there is, and I don't distinguish between farming and manufacturing, is about the introduction of technology to automate repetitive tasks."
>
> **Parmjit Chima,**
> Head of Engineering, Harper Adams

> "The Hands Free projects have shown that autonomous farming is possible today, massively changing the previous perception of the Ag industry."
>
> **Kit Franklin,**
> Senior Lecturer & PI Hands Free Farm, Harper Adams



What have we learned?

Summary and recommendations

Adoption of AI-enabled Agri-tech is in its infancy, but farmers are starting to get on board

Farmers are fundamentally no different to any other business owners – innovation must add obvious and tangible value to process or outputs in order to warrant investment. With farmers operating within relatively tight margins, and able to allocate no more than 5% of total operating and capex budgets* to emerging technology, every pound wasted is a pound from their pockets. In this context, technologies offering immediately apparent 'fit' with existing infrastructure, hardware or processes and that offer measurable benefit, are most likely to engage, sensors and robotic milkers being just two examples. And, just as obviously, those technologies that appear to require 'leaps of faith', or present obvious deployment challenges, do not.

Sensors are conceptually and operationally relatively simple, and offer quantifiable RoI

Field robots are perceived to offer as many operational challenges as they do solutions

* Source: Illuminas Research (2020) Median Figure

UK Farming must adapt quickly, putting technology at the heart of its response

Unlocking the potentially significant benefits of data presents a different set of challenges, notwithstanding the overarching issue of ROI.

Holistic integration of multiple data sources (from local sensor tech and regional/national sources) remains very uncommon; and fewer than one in ten UK farmers have implemented any form of Analytics solutions.

The practical barriers to deeper adoption of Data Analytics are different in nature to those for IoT arrays, but no less fundamental:

The volume of data can be overwhelming for farmers whose core skillsets do not generally encompass data analysis and interpretation.

Different data architectures and taxonomies present integration challenges and inhibit easy and intuitive data visualisation.

Small data (local) is often believed to be more relevant than big data (norms), and there are significant steps to be taken to convince farmers of the relevance of data solutions leveraging data that is not their own.

So what can be done in the near term?

Have adopted data analytics solutions

Source: Illuminas Research (2020)

Recommendations include:

- To establish quickly an agreed framework and taxonomy for core data outputs
- To encourage a collaborative culture with respect to data sharing, and a programme and set of systems to enable
- For technologists to work with users to optimise visualisation interfaces, in order to surface simply and clearly the most important messages
- Longer term, to work to a methodology that allows farmers to look straight through from evidence to recommended solution.

Collaboration will be fundamental in getting to solutions more quickly

Bringing the different stakeholders within UK Agriculture together to tackle the challenge of unlocking the benefits of technology offers the best hope for overcoming some of the barriers noted quickly and – importantly – without exposing farmers to significant commercial risk over and above those they already face.

> "The farming industry is fundamentally risk averse because the margins are very small. When you get a bumper crop get the cash in the bank because that will be saving you from next bad year!"
>
> **Industry Commentator**
> (Anon)

Collaboration will be fundamental in getting to solutions more quickly

Farmers listen to other farmers rather than necessarily to technologists or academics for advice as to systems and solutions. Whether that listening is 'over the fence' or over social media, word of mouth is fundamentally important in sharing experiences and guidance.

Industry bodies and other farmers are the two most broadly trusted sources for advice on emerging technologies. These are the groups believed to be closest to the challenges that farmers face in accessing the benefits of tech while, to the extent possible, derisking that process commercially.

It is imperative that technologists and research groups insert themselves into this circle of trust. At present, farmers are significantly less likely to look to either of the latter groups for guidance and support, for a number of reasons, not least of which is perceived partiality on the part of tech entrepreneurs and the 'ivory tower' mentalities of the latter.

> "There isn't an awful lot of interest (amongst the technologists) in sort of engaging with farmers and end users and understanding how they're going to get the kit out there. There is some, but it's still sort of boys designing fancy toys in a laboratory somewhere."
>
> **Industry Commentator**
> (Anon)

Formalised structures to enable all parties to discuss and share ideas and experiences openly do exist, but are perceived by many farmers to be closed circles, or impenetrable because of the gulfs in backgrounds, experiences and even language that exist.

It is imperative that those perceptions are addressed, and those gulfs closed.

46% of UK farmers would look to INDUSTRY BODIES for information and guidance on emerging technology opportunities

41% of UK farmers would look to PEERS for information and guidance on emerging technology opportunities

9% of UK farmers would look to ACADEMICS for information and guidance on emerging technology opportunities

Our Barclays Eagle Labs were set up specifically to attempt to enable those kinds of conversations. Working with University of Lincoln, Barclays Eagle Labs have launched their first AgriTech focussed Eagle Lab in the heart of Lincolnshire, aimed at supporting AgriTech innovators with help their business to thrive, and develop technology that will aim to create a more sustainable farming future for generations to come.

Want to know more?

Speak to one of our team:

Mark Suthern
Managing Director
National Head of Agriculture
Mobile: +44 (0)7775 543752*
Email: mark.suthern@barclays.com

Oliver McEntyre
National Agricultural Strategy Director
Mobile: +44 (0)7775 544363*
Email: oliver.mcentyre@barclays.com

Roxanne Martin
Eagle Lab AgriTech Industry Lead
Mobile: +44 (0)7471 145298*
Email: roxanne.martin@barclays.com

Visit
barclays.co.uk/agriculture or
labs.uk.barclays/AgriTech

* Call charges may apply. Please check with your service provider for details.

IBIM10211 9917747 January 2021