



# Can AI be Agriculture's Great Equalizer?

A qualitative study by Syngenta Group & IPSOS

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Artificial Intelligence, or AI  
and digital tools are  
revolutionizing farming and  
sustainable practices.”

**Jeff Rowe**

CEO of Syngenta Group

# 01



# Objectives & Design

# Research objectives of the study

1

Explore barriers and adoption of AI

Identify **the barriers and drivers** for AI usage: societal, technological, educational, financial, environmental.

Identify expectations to create a **framework of desirability** across AI.

Identify nature, role and agendas of **accelerators of change**.

2

Provide ideas to accelerate AI

**Help define metrics** to monitor the future progress toward AI equity goals.

**Explore ideas** for making AI tools more accessible across different contexts.

# Methodology: the qualitative interviews

Individual qualitative interviews with farmers and experts: **15 interviews per market, 75 in total**, with the following sample structure.

## Size definition

|          | USA  | Brazil  | France  | India  | China  |
|----------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| 1 Small  | Up to 749 acres                                                                         | Up to 247 acres                                                                            | 124 – 247 acres                                                                            | Up to 5 acres                                                                               | 8 – 16 acres                                                                                |
| 2 Medium | 750 – 1,999 acres                                                                       | 247 – 2,471 acres                                                                          | 247 – 494 acres                                                                            | 5 – 10 acres                                                                                | 16–160 acres                                                                                |
| 3 Large  | More than 2,000 acres                                                                   | More than 2,471 acres                                                                      | More than 494 acres                                                                        | More than 10 acres                                                                          | More than 160 acres                                                                         |

| Split of the farmers per size of the farm |              |               |              |                   |
|-------------------------------------------|--------------|---------------|--------------|-------------------|
|                                           | Small farmer | Medium farmer | Large farmer | Total per country |
| Brazil                                    | 4            | 4             | 4            | 12                |
| China                                     | 4            | 4             | 4            | 12                |
| France                                    | 2            | 3             | 7            | 12                |
| India                                     | 4            | 4             | 4            | 12                |
| USA                                       | 2            | 6             | 4            | 12                |
| Fieldwork total                           | 16           | 21            | 23           | 60                |

| Split of the experts per background |            |     |          |            |                   |
|-------------------------------------|------------|-----|----------|------------|-------------------|
|                                     | Commercial | NGO | Academic | Government | Total per country |
| Brazil                              | 2          | 0   | 1        | 0          | 3                 |
| China                               | 0          | 0   | 1        | 2          | 3                 |
| France                              | 2          | 0   | 0        | 1          | 3                 |
| India                               | 2          | 1   | 0        | 1          | 4                 |
| USA                                 | 3          | 0   | 0        | 0          | 3                 |
| Fieldwork total                     | 9          | 1   | 2        | 4          | 16                |

# 02



# Key Findings



# 01



The Digital Divide is real, but based on more than just farm size



# 02



AI farming feels distant and alien to many farmers



# 03



Overcome barriers by providing tangible value, and thinking local

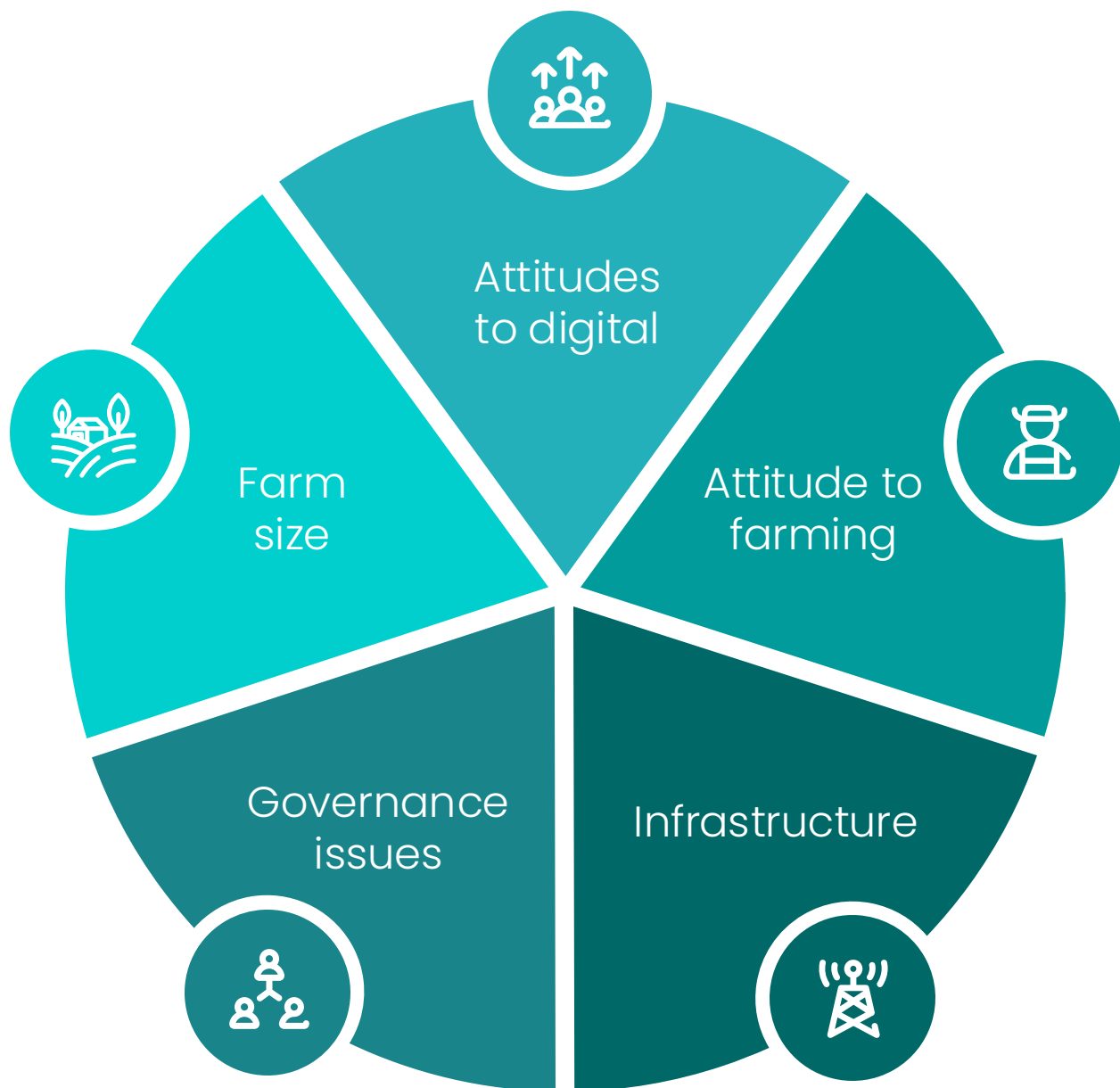


# 01



The Digital Divide is real,  
but based on more than  
just farm size

The digital divide is driven by a range of factors...



# As expected, farm size is important – large farms are more likely to adopt digital/AI



**Large farms** are more likely to adopt AI and digital farming tools because:

- They have more resources/greater investment capacity.
- Greater need for efficiency.
- And can better justify the investment, both in infrastructure and in software and platforms.

In **India** for example, large farms see digital farming:

- **As a way to replace labor**, ensure top-quality output.
- And professionalize farming into a business – both on-field (automation, precision) and off-field (market linkages, exports).

“ Obviously, large farms have the capacity to purchase equipment that allows them to diversify their farming methods and be more flexible, which is the key to success.”

– Expert, France



**Small farms**, on the other hand:

- **May not see enough return on investment.**
- May lack the scale to benefit as much from these technologies.
- Have less capacity to be able to invest the **money and time** to adopt AI.

“ It will indeed make some farms much more efficient than others that don't embrace AI. Perhaps some of the available resources aren't accessible to small producers due to cost. But it will make a difference.”

– Expert, Brazil



# However, attitude to the digital world also has a major impact



**Those who are more comfortable and familiar with the digital world will naturally be more accepting of digital/AI solutions.** Farming is a tough world and trying new things, particularly where it is out of their comfort zone/what they are familiar with, presents a risk, and requires greater reassurance.

## Age is often mentioned as playing a role in this



For example, in the **US, younger farmers** are often more open to adopting digital tools and AI. In contrast, **older farmers** are often less willing to try new technologies, preferring traditional methods and sometimes lacking the skillset or interest to learn new digital systems.

## Education



In the **US, farmers with a college background** are more open to adopting digital tools and AI. **In China in particular, it was mentioned that the general education level of farmers is low,** they may lack a profound understanding of what is digital and what digital could bring, beyond production and machinery-level.

## Social factors



In **India, some farmers have low trust in digital solutions due to lack of human involvement.** They have doubts about the effectiveness of technology when it is not widely adopted around them. This is especially among small and marginal farmers who work hard but earn little – mental fatigue limits their willingness to explore new approaches.

## Mindset



In **Brazil, those with a more innovative mindset** seek solutions to optimize production, reduce costs, and increase competitiveness. They tend to view technology as a **differentiator**, not as a cost or a **risk** (often younger farmers or the ones supported by younger people such as their kids).

# Other factors can also play role:

## Attitudes to farming



In many markets, **still prevalent faith in the tried and trusted methods**, and farmers are somewhat reserved and resistant to change.

- In **France**, where a small number were resistant to trying new methods vs existing techniques.
- In India, smaller farmers tend to have a **traditional and cautious mindset**, and follow what neighboring farms are doing. They have a strong reliance on age-old practices, especially in crop selection and farming methods.
- In **China**, more traditional farmers are likely to have **inherited the family business** – they are less adventurous and simply adapting with time and **aiming to stay up-to-date**.

## Infrastructure



Location can minimize availability, depending on the **infrastructure** available. AI requires good field **connectivity**, and in **Brazil**, producers in areas with stable internet access have a lower barrier to entry.

On the contrary, in **India**, more remote areas can have problems accessing both the internet and even electricity can be an issue.

“Infrastructure for digital farming is not ready – most things are done manually – problem of electricity, internet in interiors, tech background; it's not just about downloading an app but about learning and installing provisions for all these things.”

– Small Farmer, India

# Finally, there can also be public governance issues



It is evident in China, agricultural policies play a significant role in sector development.

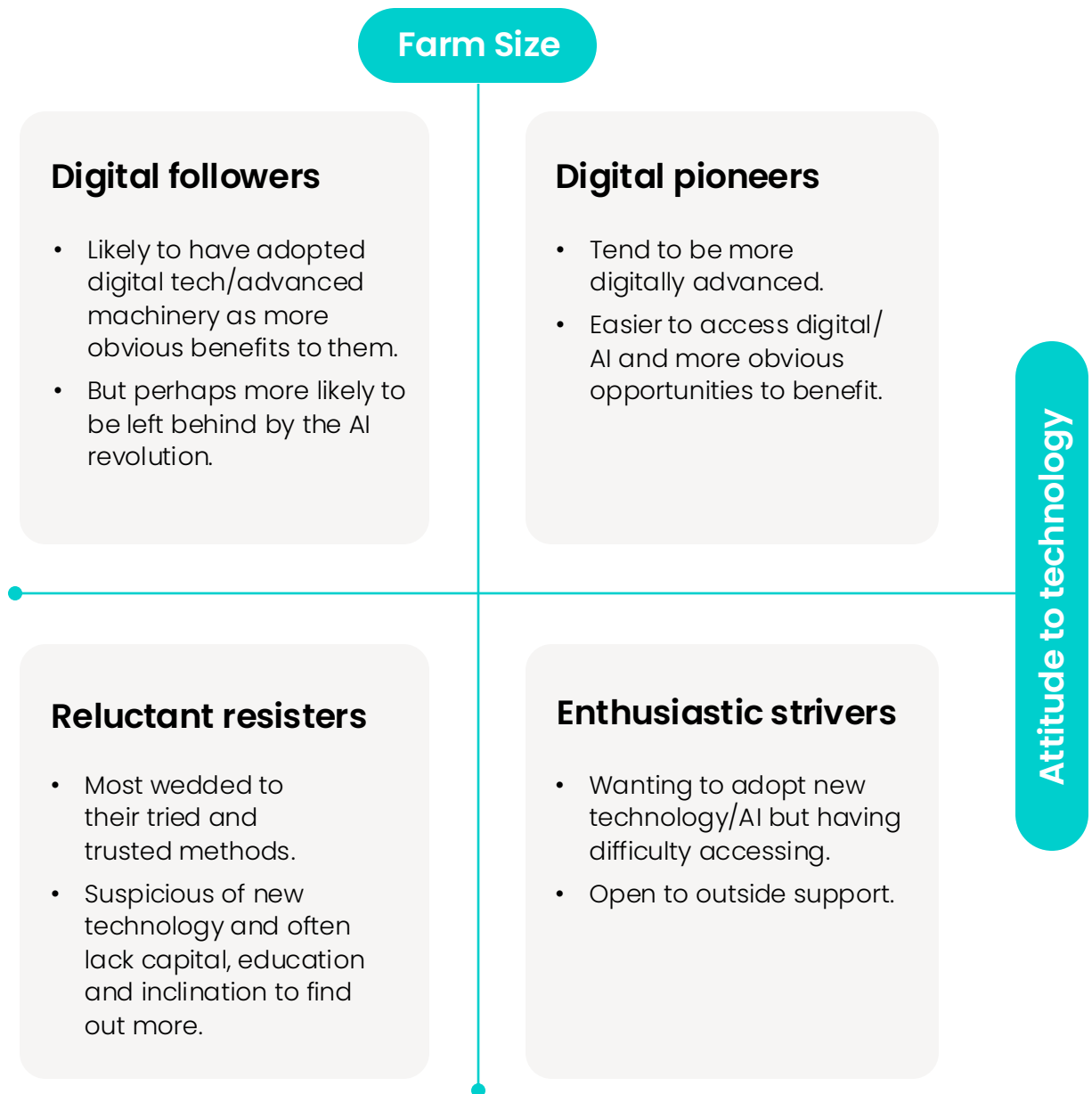
“ The gap will widen, as large farms have greater access to more advanced and reliable technologies. From the perspective of technology dissemination, it is certain that it starts with large-scale farmers and then spreads to small-scale farmers, so large-scale farmers have a stronger willingness to accept.”

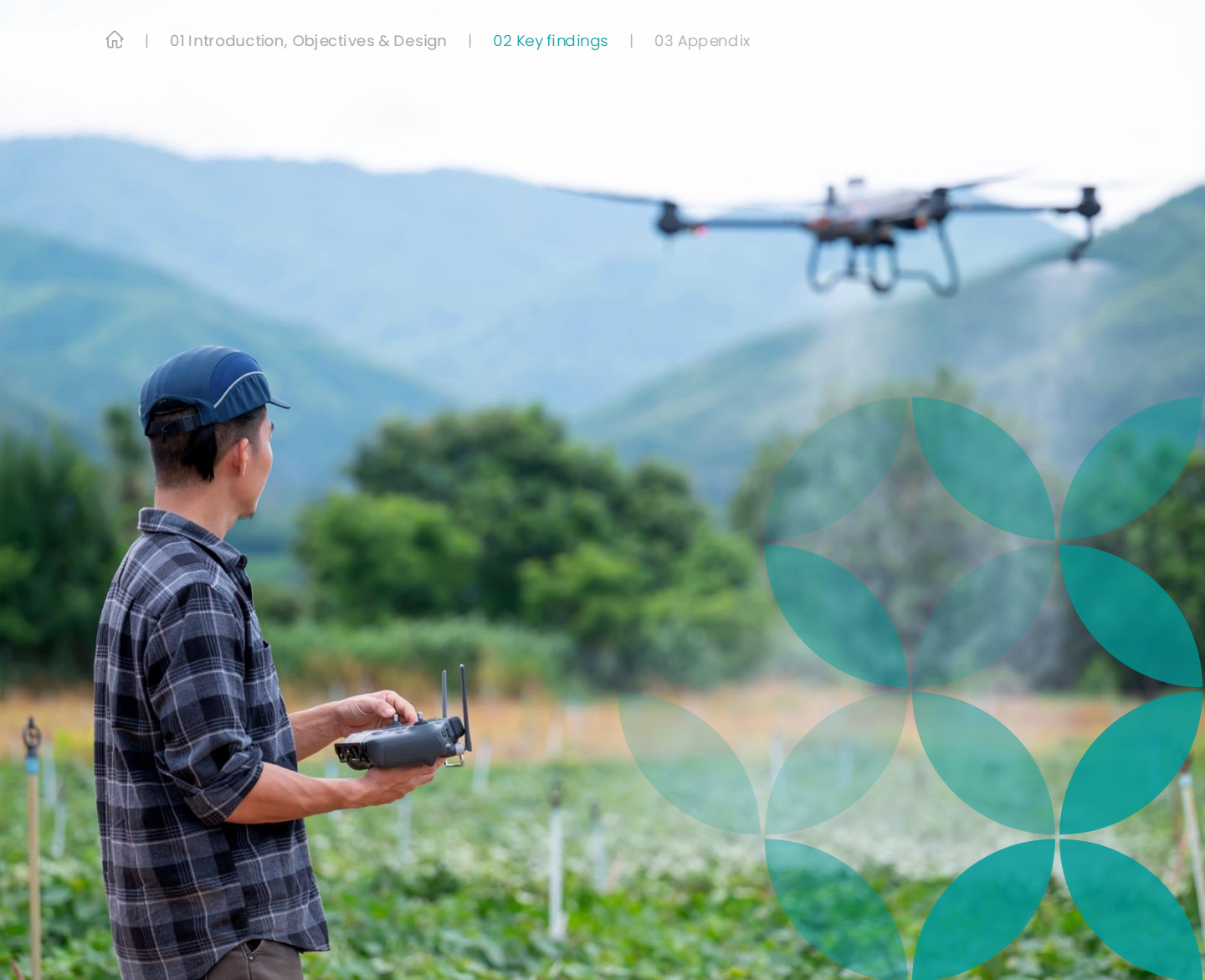
– Expert, China

In many countries, especially **India** and **Brazil**, there is an issue with **a lack of understanding of AI amongst government workers** who provide farmers with support. They are trusted but not knowledgeable.

In France, regulatory constraints (use of plant protection products, withdrawal of products without any real alternative) are diverting farmers' energy and adding an additional burden.

# Broadly speaking, farmers fall into 4 categories





## 02



Digital is aspirational and advancing, but AI farming feels distant and alien to many farmers

'Digital Farming' is a somewhat vague term but is relatable, with most farmers associating it with technology, screens, and GPS.

In most markets, it's a technology used for **better agricultural management and production optimization, through machinery, devices, and software** – being able to process and gather data to help them make more informed decisions as key in digital farming.

- It's almost synonymous with Precision Agriculture, which uses GPS and drones to make things happen.
- Growers do mention some challenges here of integration across platforms, data privacy and how to understand the true value of digital tools.
- **Digital agriculture is often a familiar tool, integrated into practices, especially in more prosperous markets;** but in France, farmers mention its introduction being driven by **administrative and regulatory requirements**.

**India seems to have a basic understanding of Digital farming at this stage:**

- **Digital Farming = Machines That Reduce Labor.**
- Most farmers **equated digital farming with machines and physical tools.**

Whereas "AI" in agriculture still seems a way off for most farmers – it is a very abstract concept.

**Perceptions range from:**

- Completely alien/unknown/quite fearful, through to
- Curiosity, intriguing, but wanting to wait and see/learn about it.

Even in China, there is little awareness and understanding about what AI farming is – it is something being explored in the Pioneer farms/academia.

**There are also a number of fears/potential concerns:**

- **Losing control**
- How much can they **trust** it?
- What happens to their **data**/who controls it/sees it/owns it?

**“** For me, **AI is still in the Q&A phase** (like DeepSeek). When it comes to real-world applications like production management or precision farming, AI is still missing—I **haven't come across any examples of AI use.**”

– Expert, China

**“** I'm a naturally skeptical person but always open to new technologies. I'll let some people test it first, the ones who are more curious, then I'll go.”

– Farmer, Brazil

# The adoption of digital farming is a natural evolution with clear potential benefits for farmers

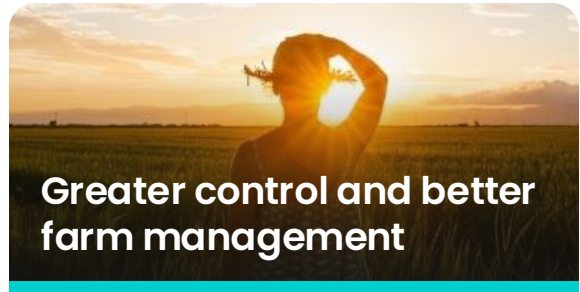


## Increase farm productivity, efficiency and cost reduction

Digital farming to better analyze and monitor soil conditions, climate, plant health, and other relevant factors to make more assertive decisions, reducing waste and production costs.

“ It helps us make decisions, it helps us work more efficiently, it's useful to us today, and I think we'll continue to use it, and it does help us in our decision-making.”

– Farmer, France

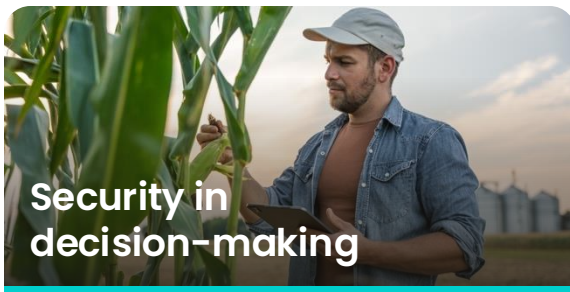


## Greater control and better farm management

Digital farming allows for more precise control over all stages of production, as well as process optimization and task automation, freeing up time for other activities.

“ The first year I used GPS to apply agricultural pesticides, I saved 8% on pesticides. This led us to look for other technologies combined with our experience.”

– Farmer, Brazil

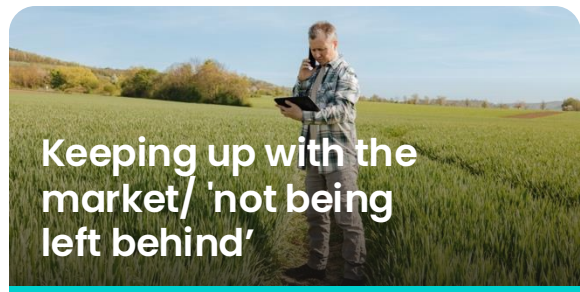


## Security in decision-making

Digital farming for data-driven decision-making combined with farmers' expertise, resulting in better decisions.

“ We can synchronize our planter to our satellite, and it can tell us, okay, over here we want to plant a certain hybrid. Over here we want to plant a different hybrid, because it's going to perform better.”

– Farmer, US



## Keeping up with the market/ 'not being left behind'

Digital farming as a natural path of evolution that promotes a sense of belonging among farmers.

“ And if we don't invest, don't improve, don't engage in some technology segment, we won't be able to keep up.”

– Farmer, Brazil

# Digital farming is widespread, but sometimes only at a basic level

More sophisticated digital farming seems most prevalent in the US and France, and less so in China (outside of their experimental farms) and especially India.

| Technology                                                                           | Key benefits and issues                                                                                                                                                            |                                                                                                                                                            |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Auto-Steer, GPS Guidance – machines with precision agriculture technology            | <ul style="list-style-type: none"><li>Saves money on seed, fertilizer, and chemicals – especially on large acreages, reduces operator fatigue and make long days easier.</li></ul> | <ul style="list-style-type: none"><li>Costs for both machinery and usage subscriptions. Learning curve. Data transfer and integration difficult.</li></ul> |
| Drones & Imagery                                                                     | <ul style="list-style-type: none"><li>Enables targeted scouting, early detection of issues, and more precise application.</li></ul>                                                | <ul style="list-style-type: none"><li>Cost of hardware and software. Limited by connectivity or weather.</li></ul>                                         |
| Irrigation technology                                                                | <ul style="list-style-type: none"><li>Increased productivity. Substantial water savings and climate risk management.</li></ul>                                                     | <ul style="list-style-type: none"><li>Complexity of the technology-not intuitive.</li></ul>                                                                |
| Weather Apps & Decision Support Tools                                                | <ul style="list-style-type: none"><li>Greater productivity – real-time, local weather information allows farmer to plan field work.</li></ul>                                      | <ul style="list-style-type: none"><li>Reliability of forecasts.</li></ul>                                                                                  |
| Monitoring crop health                                                               | <ul style="list-style-type: none"><li>Cost reduction through product savings, pest and disease traceability.</li></ul>                                                             | <ul style="list-style-type: none"><li>No major issues mentioned.</li></ul>                                                                                 |
| Yield Monitoring, Mapping & VRT (Variable Rate Technology), Fertilization management | <ul style="list-style-type: none"><li>Higher yields and lower costs.</li></ul>                                                                                                     | <ul style="list-style-type: none"><li>Data overload. Learning curve for software. Lacking actionable insights. Integration between brands.</li></ul>       |
| Mapping – soil characteristics                                                       | <ul style="list-style-type: none"><li>Productivity gains and savings generated by adjusting the volumes applied.</li></ul>                                                         | <ul style="list-style-type: none"><li>Time/cost/difficulty of training.</li></ul>                                                                          |
| Cloud Based Farm Management Platforms                                                | <ul style="list-style-type: none"><li>Supports record-keeping, compliance, and decision-making.</li></ul>                                                                          | <ul style="list-style-type: none"><li>Costs. Data privacy Limited actionable insights. User-friendliness.</li></ul>                                        |
| See & Spray and Other Camera Based Technologies (US)                                 | <ul style="list-style-type: none"><li>Reduces input costs. Increases efficiency. Environmental impact.</li></ul>                                                                   | <ul style="list-style-type: none"><li>High cost. Proprietary systems.</li></ul>                                                                            |

Less sophisticated

High level of sophistication

# Despite negative preconceptions, farmers still believe that AI could be helpful in the future

## Overall benefits of AI



- Bring more knowledge and deeper insights.
- Improve crop management decisions, help select better seeds (a current pain point).
- Analyze variables (soil, weather forecast, area history) and recommend the most resilient crop variety/seeds for that specific scenario.
- **Increase knowledge and autonomy**, reducing dependence on the paid services of an agronomist.
- **Manage farms remotely** and help upgrade them to fully autonomous operations.

## Operational improvement



- Help make better decisions.
- Potential **cost reduction**.
- More advanced **profitability and sustainability** for the farm.
- **Predictive power** to reduce losses, especially those related to climate and raw material/supplies performance.
- Make the family business more **scalable** and **less physically demanding**.
- **Solve the succession problem** by aligning the agricultural profession with the skills and lifestyle expectations of the younger, digitally native generation.

## Emotional benefits



- More **freedom**.
- Feeling ahead of others or aligning with current demands.
- Being an **example of transformation for peers**.
- More **independence**, without losing control of the farm.
- **Pride** stemming from more sustainable/advanced practices.



Yet, at this stage, more of an ideal than a foreseeable future.

# The main drivers for use of digital/AI farming focus on profitability, but it could have wider benefits too



## Optimising inputs – to increase profitability

- **Greater precision** in inputs based on crop needs and units already applied in the form of manure/ fertilizer/water, etc.
- **Reducing operating costs** in products and mechanization, particularly with regard to fertilizer prices and, more broadly, protection products.



## Practical benefits for the farmer

- Greater **comfort** at work, less fatigue for the farmer.
- **Time** savings.



## Compliance and regulation

- In response **to/compliance with regulations** governing nitrogen application rates (especially France).
- Also meeting **supplier requirements** for traceability/provenance–potentially opens up new markets (especially in India and China).
- And to a lesser extent... **reducing environmental impact**.



## Emotional rewards?

- Mentioned particularly in **China**, but there might also be an **emotional benefit/reward** for implementing AI/ digital farming, especially for the **'Pioneer' farmers' and Advisors**, who take a more business-focused approach to farming.
- **Empowerment & creativity: a commander at the head of a "machinery troop"**, controlling a whole system by simple remote control; a **powerful influencer and leader**, serving as an example and paving the way for his peers; a **creator finding innovative solutions** to grow.



*Decisions that are economical... I think the cost of the application is quickly recouped in the savings we can make on a daily basis, at the end of the sprayer, in the price of fertilizers."*

– Farmer, France



## AI could be more easily implemented if...



It combines **simplicity, clear and tangible benefits at an affordable price**, both for initial purchase and on-going running costs.

A simple solution, which adapts to their machines and daily operations, and can be operated remotely via a cell phone.



Management of the entire farm, including finance, administration, human resources, and machinery.



Better monitoring and damage prevention.



Automation and reduction of labor.



For a minimal upfront cost, but with monthly maintenance installments.



Increased productivity and profitability.



*Currently it gives vague information – it should feel like a personalized experience based on what crops I grow it should interact with me, like a virtual farming consultant.”*

– Farmer, India



# 03



## Overcoming barriers by proving tangible value, and thinking local

# There are a range of structural, financial and conceptual BARRIERS to AI



## Lack of Knowledge

A widespread **lack of digital understanding**, with many simply not knowing what AI is in their field of activity/agriculture, what it does, or where to begin learning about it. Many end up turning away, considering it useless on their farms. **Difficulty in adapting to the technology**, are significant barriers, especially for older people. Fear of the unknown. **The complexity of current solutions can be a major limiting factor.**



## High (and ongoing) costs

**Everything** involving technology in this field **is expensive and isn't a one-time investment**; technology comes with **recurring subscription costs**, for example, which weigh on the budget.



## Workforce

Barriers already faced with simpler technologies are the same ones projected for AI: **the lack of qualified personnel dedicated to learning and operating new platforms**. Digital/AI farming **requires skilled people** to operate it and extract its full potential, but there is currently a shortage of it (and when it exists, they are not engaged).



## Data Privacy/ Security

There's an overload of information, but **nothing that provides the necessary security to invest**. There are also concerns that the data they are providing might be used against them in some way – by suppliers (fixing prices)/ the govt (raising taxes, etc.)

For some, while concerns about data privacy are real, they're viewed with a certain fatalism: *"there's nothing safe anymore," the data is already available anyway.*



## Infrastructure

The **lack of infrastructure and connectivity** in some rural areas still needs to be overcome (esp. India, China, Brazil).

Also **functional issues**: providing systems that work in the local **language/dialect**.



## Trust

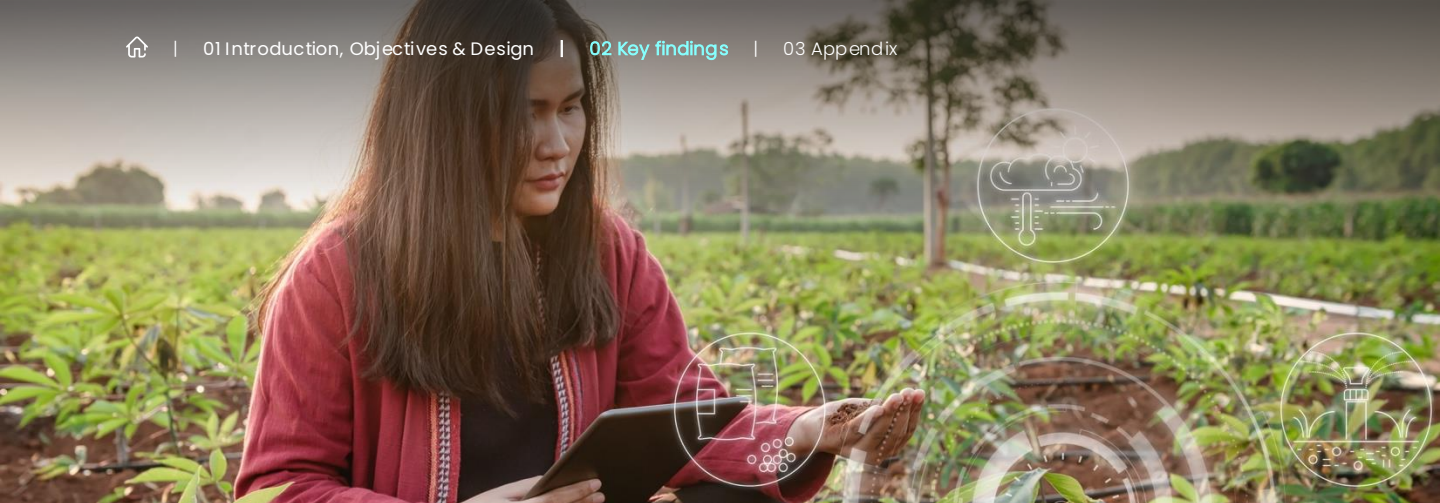
Many farmers – perhaps especially smaller farmers/those less educated – experience problems with/find it difficult to trust – suppliers/ advisors... being sold supplies/equipment, etc. that are focused on profits for the supplier more than being best for their needs.



## Lack of role models

Seeing the new technology working amongst similar farms, ideally in their local area, is arguably the most effective means of raising awareness and boosting take-up.

Farmers are very conscious of not being left behind/ missing out.



Overcoming these barriers: requires raising awareness and knowledge about technologies and facilitating access to them, through numerous local agents willing to help farmers

**Raising awareness, facilitating access, for instance by accessing free services through apps.**

### Deploying trials and demonstrations

Private companies should take steps to better promote and implement AI—**producers need to see it to believe it.**

- **Seeing:** For example, by offering products with embedded technology for a trial period. Farmers **the technology working in their local area is a potentially powerful motivator**, overcoming key concerns.
- People better equipped to present the technology and provide **after-sales support** (it's no use just presenting, selling, and not following up).

### Leveraging social media

Is a key channel to help promote AI and raise awareness, perfectly suited for **demonstrating use cases** and providing simple examples of how AI can help farmers.

### Liaising with trusted government and bodies, such as cooperatives, to solve the Trust vs Knowledge paradox:

- **Manufacturers and private suppliers provide some support, and are savvy**, but trust varies.
- Government experts are trusted to be impartial, but often lacking knowledge in AI.

# Fundamentally, AI needs to prove itself: Practical gains first, digital dreams later

## That AI is effective and genuinely works



**Trust and Tangibility are non-negotiable.** Farmers trust what they can see working instantly (e.g., fuel-theft IoT, Plantix app in India) or advice coming from someone superior or expert.

The abstract nature of AI means there's a risk of the tool being **guided by flawed premises and scientifically inconsistent narratives** versus being based on solid, proven agronomic science.

**Does it just sound good, or does it work in the real world?**

## That it is effective vs human resources



A resistant mentality among many producers. Older farmers, especially, are so confident in their ability to manage the land that they **have difficulty imagining a machine capable of replicating the complex, multivariate diagnostic processes required in agriculture.**

“ AI, for me, there is no return on investment, so no. If it's to replace something I'm capable of doing without it, I don't see the point.”

– Farmer, China

## Countering: “It's not designed for me”



There's a belief that **AI isn't designed for all farm types/sizes.** The most advanced technologies, like fully autonomous machines, as being exclusively for 'large-scale farmers' with vast, uniform fields, not for a 'small farmers' with smaller, more varied plots of land.

**This is often reinforced by a lack of focus from salespeople/experts.**

# 03



# Appendix

## Digital Technology Use

# Digital farming is widespread, but sometimes only at a basic level.

## Any AI often comes as a by-product through existing machines, platforms and software

|                                                                                  | How/why they use it                                                                                                                                                                                                                                                                          | Benefits                                                                                                                                                                                                                                                                | Issues                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Auto-Steer, GPS Guidance - machines with precision agriculture technology</b> | <ul style="list-style-type: none"> <li>Used for planting, spraying, and harvesting to reduce overlap, improve accuracy, and automate steering e.g., John Deere, Case IH, Ag Leader, and Trimble systems.</li> <li>Recommendation from trusted growers or dealers, and proven ROI.</li> </ul> | <ul style="list-style-type: none"> <li>Reduces overlap and input waste, saving money on seed, fertilizer, and chemicals.</li> <li>Offers efficiency and productivity, especially on large acreages, also reduces operator fatigue and make long days easier.</li> </ul> | <ul style="list-style-type: none"> <li>Costs for both machinery and usage subscriptions. Learning curve.</li> <li>Challenges with full utilization on smaller acreages. Some systems are proprietary, making data transfer and integration difficult.</li> </ul> |
| <b>Drones &amp; Imagery</b>                                                      | <ul style="list-style-type: none"> <li>Drones used for crop scouting, imagery, and even application of seed or chemicals e.g., PerfctFly (Brazil).</li> <li>Satellite and aerial imagery used for field health monitoring and identifying problem areas.</li> </ul>                          | <ul style="list-style-type: none"> <li>Enables targeted scouting, early detection of issues, and more precise application.</li> <li>Motivated by cost-share programs or discounts from ag retailers. Interest in new technology and seeing neighbors use it.</li> </ul> | <ul style="list-style-type: none"> <li>Cost of hardware and software.</li> <li>Learning curve.</li> <li>Limited by connectivity or weather.</li> </ul>                                                                                                           |
| <b>Irrigation technology/ AI drive platform</b>                                  | <ul style="list-style-type: none"> <li>Irrigation technology – more typically digitally controlled, but some examples of AI-driven irrigation platform. H2O (Valley) (Brazil).</li> <li>Word of mouth from a neighboring farmer.</li> </ul>                                                  | <ul style="list-style-type: none"> <li>Increased productivity and risk mitigation (by applying the right amount of water).</li> <li>Substantial water savings and climate risk management.</li> </ul>                                                                   | <ul style="list-style-type: none"> <li>Complexity of the technology – not intuitive and required a significant investment of time to understand; high monthly costs.</li> </ul>                                                                                  |
| <b>Weather Apps &amp; Decision Support Tools</b>                                 | <ul style="list-style-type: none"> <li>Used for planning field operations and risk management.</li> <li>Some apps recommended by other growers or ag retailers. Can be linked in with irrigation systems on same platform (not smart tech).</li> </ul>                                       | <ul style="list-style-type: none"> <li>Greater productivity – real-time, local weather information allows farmer to plan field work.</li> <li>Ease of use and low (or no) cost.</li> </ul>                                                                              | <ul style="list-style-type: none"> <li>Reliability of forecasts.</li> <li>Sometimes subscription costs.</li> </ul>                                                                                                                                               |



# More sophisticated digital farming seems less prevalent in India, and China (outside of Pioneer farms)

|                                                                                                 | How/why they use it                                                                                                                                                                                                                                                                                                                                                                                                                                              | Benefits                                                                                                                                                                                                                                  | Issues                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Monitoring crop health</b>                                                                   | <ul style="list-style-type: none"> <li>Tools for monitoring crop health, identifying pests and diseases.</li> <li>Data is collected by field technicians using tablets and, after being processed at headquarters, enables treatment decisions. CropWise/Syngenta Protector (Brazil).</li> </ul>                                                                                                                                                                 | <ul style="list-style-type: none"> <li>Cost reduction through localized applications (product savings), pest and disease traceability.</li> </ul>                                                                                         | <ul style="list-style-type: none"> <li>No major issues mentioned.</li> </ul>                                                                                                                                                                                   |
| <b>Yield Monitoring, Mapping &amp; VRT (Variable Rate Technology), Fertilization management</b> | <ul style="list-style-type: none"> <li>Yield monitors and mapping software (e.g., Ag Leader, Climate FieldView, Precision Planting 2020) collect and analyze yield data. (France) Farmstar, AtFarm.</li> <li>VRT is used for seeding, fertilizer, and chemical application, adjusting rates based on field variability.</li> <li>Part of a package with new equipment, or because their agronomist/distributor/Chamber of Agriculture recommended it.</li> </ul> | <ul style="list-style-type: none"> <li>To identify variability in fields and target inputs where they're most needed.</li> <li>Because of the promise of higher yields and lower costs.</li> </ul>                                        | <ul style="list-style-type: none"> <li>Data overload—farmers often collect more data than they know how to use.</li> <li>Learning curve for software.</li> <li>Lacking actionable insights.</li> <li>Integration between brands can be a challenge.</li> </ul> |
| <b>Mapping – soil characteristics</b>                                                           | <ul style="list-style-type: none"> <li>Mapping providing an intra-plot diagnosis of all physical soil characteristics (water reserve content, mineral elements, etc.), linked to a yield map. Mainly used on a PC e.g., Interra-Scan, BeApi.</li> <li>Seen at agricultural trade shows specializing in machinery (e.g., SIMA) or recommended by distributors/other experts.</li> </ul>                                                                           | <ul style="list-style-type: none"> <li>Restore deficits and homogenize plots/optimize plot potential.</li> <li>The result is productivity gains and savings generated by adjusting the volumes applied (fertilizer and seeds).</li> </ul> | <ul style="list-style-type: none"> <li>Some implementation difficulties at first but quickly resolved by the presence of a technician.</li> </ul>                                                                                                              |

# The most advanced technology seemed to be more prevalent in the US and France



|                                                                 | How/why they use it                                                                                                                                                                                                                                                                                          | Benefits                                                                                                                                                                                                                                                                                            | Issues                                                                                                                                                                                                     |
|-----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cloud Based Farm Management Platforms</b>                    | <ul style="list-style-type: none"><li>• Platforms like Ag Leader AgFiniti, Cropwise, Climate FieldView, John Deere Operations Center, and Granular are used for data storage, analysis, and sharing.</li><li>• Data is uploaded from equipment or via email, and accessed on PC, tablet, or phone.</li></ul> | <ul style="list-style-type: none"><li>• Some chose platform for ease of use, others based on recommendation.</li><li>• Centralizes data – integration with equipment and other data.</li><li>• Enables remote access.</li><li>• Supports record-keeping, compliance, and decision-making.</li></ul> | <ul style="list-style-type: none"><li>• Subscription costs.</li><li>• Data privacy concerns.</li><li>• Limited actionable insights.</li><li>• Some platforms are more user-friendly than others.</li></ul> |
| <b>See &amp; Spray and Other Camera Based Technologies (US)</b> | <ul style="list-style-type: none"><li>• Tools like John Deere's See &amp; Spray use cameras and AI to identify and spray only weeds.</li></ul>                                                                                                                                                               | <ul style="list-style-type: none"><li>• Dealer recommendations and compatibility with existing sprayers were also factors.</li><li>• Reduces input costs.</li><li>• Environmental impact.</li><li>• Increases efficiency.</li></ul>                                                                 | <ul style="list-style-type: none"><li>• High cost</li><li>• Proprietary systems.</li></ul>                                                                                                                 |



# Thank You

The study is co-produced by Syngenta Group and IPSOS

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