Farming Sustainably using Technology

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Sustainable Development Goals

- UN has developed 17 goals to achieve global sustainable development.
- Smart Farming is related to several goals, directly and indirectly.
Adoption rate is as low as 25% across European farms (European Parliament, 2016)

(Adnan et al., 2019; Brewster et al., 2017; Lowenberg-DeBoer and Erickson, 2019; Walter et al., 2017)
Farmers participated from across the globe.
Participant Country Breakdown

Ireland 19.83%
Romania 16.12%
Norway 16.12%
Italy 9.09%
South Africa 6.40%

< 5% Respondents
Serbia – 4.96%
Greece – 3.93%
Slovenia – 3.51%
Czech republic – 1.45%
Georgia – 3.51%
Spain – 2.48%
Germany – 1.86%
Age

Source: DEMETER Farmer Voice Survey
Drivers for Tech Adoption

#1
Provide better information to manage the farm

#2
Simplify Work

#3
Increase profitability

The Farmer’s Voice - Understanding the drivers and barriers to Smart Farming Technology adoption
Farmers believe that SFTs could help further improve their environmental impact and somewhat agree that they would help meet climate change impacts.
Sustainability

Smart-farming technology would help me further improve my environmental impact

Source: DEMETER Farmer Voice Survey
Sustainability

Smart farming technology would help me cope with climate change impacts

Source: DEMETER Farmer Voice Survey
“A big issue in the future will be the climate change, so I think it will be one of the main causes to buy a new technology - to improve our crops, save money, and impact less the environment.”

_Crop Farmer, Romania M35_

“I think they will invent some sensors that we will use to help us have a low environmental impact”

_Cereal Farmer, Italy, F26_

“All the environmental things, that is going to have a big impact on how I work”

_Winemaker, Georgia, M28_

“I suppose the big thing coming down the line for farmers will be the environment. And smart farming technologies they are supposed to help that – I’m looking at GPS controlled fertiliser spreaders”

_Dairy Farmer, Ireland M40_
Barriers to Adoption

- Cost
- Data Privacy Concerns
- Access to finance

Source: DEMETER Farmer Voice Survey
Internal and external influences on the farmer’s intention to adopt smart farming technology
Factors impacting adoption

INFORMATIONAL

BEHAVIOURAL & SOCIAL

BUSINESS & ECONOMIC

TECHNOLOGICAL

EXTERNAL INFLUENCES
INFORMATIONAL FACTORS
Lack of awareness

- Gap & disconnect in the knowledge transfer to farmers. ¹
- Overload of information – which tech is best? ³
- Unclear on the benefits. ³
  - Needs to be relatable
- Overuse of technical language. ⁴
- Use peer farmers to share knowledge

¹ Busse et al., 2014, ³2Klerkx and Rose, 2020; 3 Klerkx, Jakki and Labarthe, 2018; ⁴ Harris and Achora, 2018
Perception & Attitude

- Adoption is related to the farmer’s anticipation of impact \(^1\)
  - Economic benefit/ Profitability
  - Farm performance
- Perceived Usefulness & Perceived Ease of Use creates attitude.
- Positive attitude towards technology will increase likelihood to adopt. \(^2\)
- Farmers’ expectations/perceptions on what SFT will deliver differs to that of tech providers or scientists. \(^4\)

\(^1\) Naspetti et al., 2017; \(^2\) Meijer et al., 2014; \(^3\) Godoe and Johansen. 2012; \(^4\) Kernecker et al., 2019
BUSINESS & ECONOMIC FACTORS
Farm size & investment cost

- Cost of SFT can be prohibitive. ¹
  - Initial investment & time to upskill
- Large farms are more willing and able to adopt due to mostly higher income levels
  - Absorb financial risk
- Farming context affects the speed of adoption
  - Adoption is more prevalent in arable and viticulture but to a lesser extent in animal-based farming.²

¹ Lawson et al., 2011; ² Borchers and Bewley, 2015; Eastwood et al., 2017a
Cost of SFT can be prohibitive. 1

• Initial investment & time to upskill

Large farms are more willing and able to adopt due to mostly higher income levels 2

• Absorb financial risk

Borrowing capacity & future sustainability of the farm have significant influence. 3

Many SF solutions have been designed with the larger farmer in mind.

1 Lawson et al., 2011; 2 Castle, Lubben and Luck, 2016 3 Barnes et al., 2019 & Paustian and Theuvsen, 2016
Characteristics of the technology

- Ease of use/Complexity
- Compatibility
- Trialability
- Relative Advantage
- Observability
Connectivity and data privacy concerns

- Poor 3G/4G coverage & broadband issues:
  - Increases the digital divide.

- Trust in the technology supplier is key

- Data storage & privacy issue:
  - Who owns the data?
  - How is it stored?
  - What happens if data is hacked?
What do farmers think?

“Some of the technologies are being oversold and you're kind of told you can't manage without this and everybody is using it and it's going to do this for you, like that is just not the case.”
Dairy Farmer, F32

“I would trust the technology, but I probably would be a little more sceptical with the person selling the technology”.
Sheep Farmer, M42

“For me, buying something, whatever it is, the biggest thing is backup from the supplier, no matter what you are buying”
Dairy Farmer, M36

“There needs to be reassurance that if you sign up to these things that that information is going to be used in the right way and if they had that reassurance, then they might trust them a bit more.”
Beef Farmer, M42
External influences

- PROCESSOR
- DISTRIBUTOR
- RETAILER
- CUSTOMER
- REGULATOR/POLICY
- FARMER
Conclusion

Relatable case studies for several farming contexts - facts & figures.

Training, education & workshops – blended learning approach.

Peer learning.

Access to capital

Govt investment in tech infrastructure & incentivise.

Contracts & Agreements.
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