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Public perception of smart farming

A lot of research has been conducted into ways in which smart farming technologies can be employed to create more efficient farming practices. However, less is known about what the non-agricultural population and specifically consumers think about the use of smart farming technologies. When we think about general opinion regarding gene technology (e.g., genetically modified wheat), it is clear that public acceptance can be a huge barrier to the adoption of new technologies. Therefore, care should be taken to involve the public early on, when considering the use of new technology. Furthermore, due to the ongoing trend towards increased digitalisation, it now seems timely to find out what the public thinks about smart farming technologies and whether they would be willing to accept them.

An online survey to better understand public perceptions

To investigate what Swiss consumers think about smart farming technologies, we conducted an online survey in 2021. A total of 287 individuals from German speaking parts of Switzerland participated in a two-part questionnaire. In the first part, participants were asked to name the first thing that came to their mind when thinking about "traditional farming" and "smart farming", respectively. Subsequently, they rated their answer on a scale from 0 (very negative) to 100 (very positive). In a second part of the survey, the same method was used to investigate participants' perception of four specific smart farming technologies. Regarding plant production, we asked them about spray drones that apply plant protection products and hoeing robots, used for mechanical weeding. For animal production, we used milking robots, where cows are milked willingly and autonomously and virtual fences, where cattle wear collars that signal to them when they enter the virtual fence. These technologies were explained using a short description and a picture to make sure that participants understood the nature of the practices they were considering. Again, they named the first thing that came to their minds and rated it afterwards.

Perception of traditional farming

The first thing people noted when thinking about *traditional farming* were specific tools such as plough, harrow or rake. They further mentioned things such as hard work or workload, indicating that they were well aware that this work is hard and physical by nature, specifically mentioning that traditional farming requires a lot of manual labour. Furthermore, specific crops, machines or fields and acres in general, were frequent images that came to participants' minds and in some cases participants referred to their own memories of working in agriculture. The most critical points mentioned related to plant protection products and artificial fertiliser. Similarly, manure was associated with rather negative sentiments, possibly following public debate over healthy rivers and lakes. However, despite these concerns the overall perception of traditional farming was quite positive.

> " *Concerns, especially about animal welfare seem to be a strong driver regarding public acceptance.* "

Perception of smart farming

In contrast, opinions about smart farming, without being given a definition of what smart farming was, appeared to be very different. Smart farming was strongly associated with milking, including mentions of milking robots and automatic milking, probably due to the fact that this technology has been on the market for quite some time and the public is well aware of its existence. It is especially interesting to note that the pictures that participants named in connection with traditional farming focused more on plant production, whereas for smart farming, milking was the dominant topic.

Furthermore, frequent mentions included specific technologies such as drones, GPS or autonomous machines. In total 11 out of 287 were not able to name anything, which is a strong indication that they did not understand what smart farming involves. Still, the ratings were positive and even more positive than for traditional farming, suggesting that the public approves of smart farming technologies being used in agriculture.

Smart farming for crop production

For spray drones, primarily positive associations were recorded, including terms such as 'reasonable', 'efficient', 'modern' and 'innovative'. Consumers showed a clear interest in this technology and saw the benefits of precise application of plant protection products, which can contribute to higher resource efficiency. At the same time, however, they worried about noise and whether the technology might be dangerous. Some mentioned that they are generally opposed to plant protection products and instead of reducing them, they should not be used at all.

For hoeing robots, again, consumers expressed interest in the technology, stating that it contributed to sustainable farming and that it was innovative. They did worry, however, about the high costs associated with this technology – this is a concern that applies to most smart farming technologies – a shift from traditional farming to smart farming always comes with high technology costs.

Participants further worried about potential damage to soil, as for instance regarding soil compaction. Experts, however, are aware that hoeing robots have less weight than traditional tractors and are therefore beneficial for the soil as compared to traditional farming methods. Overall, both technologies were evaluated quite positively.

Smart farming for animal production

Clearly, more critical were statements for the two smart farming technologies in the domain of animal production. Consumers were especially critical of virtual fences. Animal welfare benefits of the technology and possible danger for hikers or children were among the main concerns. When a cow approaches the virtual fence, its collar first emits a sound. The sound increases in volume the closer the cow gets and when the cow tries to exit the fence area, the collar emits an electrical signal to stop the cow from leaving.

Though the strength of the electrical signal is smaller than the amount that common fences emit, consumers perceive this as harmful to the animals. Similarly, due to the invisibility of the fence, they stated it could be dangerous to hikers or to children. Despite the fact that some consumers thought the technology was interesting or innovative, the overall assessment was rather negative.

Milking robots seem to be quite well known by consumers. Aspects that were considered positive were how the technology is useful, interesting and that it brings relief to the farmer, as it saves time. Similarly, the fact that cows can decide autonomously when they want to be milked was positively received, as this provides self-determination to the animals involved. Still, animal welfare was an issue here too. For instance, participants criticised the fact that a cow is used for milk production only and therefore treated like a machine, further criticising the lack of human-animal relationship. Still, consumer perception for milking robots overall was slightly positive.

Public knowledge can drive public acceptance

In this study, we found that consumers generally have a positive image of agriculture and especially of smart farming technologies. However, they seem to be more critical towards technologies relating to animals compared to technologies related to plants.

Concerns, especially about animal welfare seem to be a strong driver regarding public acceptance. From our study, it becomes clear that there is still a need for strong communication between industry and the public, as a significant proportion of respondents knew little about smart farming technologies or mentioned issues that clearly differ from experts' perceptions. Targeted communication can help defuse possible concerns, further strengthen consumer confidence and improve understanding of agriculture. ■

About the author

Dr Jeanine Ammann studied food science at ETH Zurich in Switzerland and worked in the food industry. After completing a PhD in consumer behaviour and a few years of research and teaching in the university environment, she joined Agroscope where she currently investigates consumer behaviour along the food value chain.

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