Farmers' Mental Health in the Fourth Agricultural Revolution

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Abstract: So-called “agriculture 4.0” (or “fourth agricultural revolution”) technologies, such as artificial intelligence, drones, and robotics and automation, may have a key role to play in the future of farming. There is a burgeoning literature in the social sciences that explores the distributional justice associated with so-called agriculture 4.0, namely how benefits and costs may be unevenly distributed (de Boon et al., 2023). Several themes have emerged from this work, including the potential impacts of agriculture 4.0 on corporate control and power, data ownership, farmer autonomy, job satisfaction, the farm workforce, and uneven rates of adoption. However, there has been relatively little work directly linking technology and mental health of farmers. Understanding better the factors affecting farmer mental health is important because global research consistently shows high rates of stress, anxiety, depression, and suicidal ideation in some parts of the farming community. This chapter reviews current work that either directly explores digital technology and farmer mental health, or that may indirectly provide insights on the topic because the study considers the impact of technology on a known factor that influences mental health. Although further research is needed to unpack this topic, the clear message from the chapter concerns the “double-edged sword” nature of emergent technologies and the fact that knowledge is situated. For some farmers, new technologies can enhance mental health by improving the attractiveness of farming, job satisfaction, and lifestyles, and improve succession rates. For others, particularly those unable to invest or adopt, or those who hold different views on the attractiveness of farming and connection to land and animals, agriculture 4.0 may not lead to more positive mental health. Further research is needed in this under-explored area.

Keywords: agriculture 4.0; landscapes of support; precision agriculture; mental health; wellbeing.

Mental health of farmers: current global knowledge

In many parts of the world, there is a growing evidence base surrounding the causes of, and solutions to, poor farmer mental health. Whilst not a problem for all farmers, there are serious cases of poor mental health amongst farming communities worldwide. For example, a survey of 15,000+ farmers in England and Wales found that over 1/3 of farmers displayed signs of probable or possible depression (Wheeler and Lobley, 2022). Though the majority of published studies appear to be from the developed world (Daghagh Yazd *et al.*, 2019), similarly poor levels of farmer and worker mental health have been noted in studies in many places, including, but not limited to - Australia (Hossain *et al.*, 2008 – many other studies), Canada (Hagen *et al.*, 2020); China (Liu *et al.*, 2018), Finland (Kallioniemi *et al.*, 2016), India (Das, 2011), Ireland (Russell *et al.*, 2023), Mexico (Carvajal *et al.*, 2014), New Zealand (Firth *et al.*, 2007; Knook *et al.*, 2024), Nigeria (Olowogbon *et al.*, 2019), Norway (Logstein *et al.*, 2016), Thailand (Hanklang *et al.*, 2016), and the USA (Rudolphi and Berg, 2023). Problems appear to be sometimes more prevalent in farming than in comparable sector, although this has not been universally found (Daghagh Yazd *et al.*, 2019). Demographics seem to play a role in mental health risk factors and help-seeking, including age (Rose *et al.*, 2023; Rudolphi and Berg, 2023) and gender (Hammersley *et al.*, 2023; Budge and Shortall, 2023).

Many research studies have explored the causes of poor mental health amongst some farmers, with several different categorisations. One way of categorising pressures is to divide them into (see Rose *et al.*, 2022):

1. **Social factors**: may affect any human, but some may be exacerbated in agricultural settings, such as struggles with isolation and loneliness, stigma, family conflict, illness, bereavement, sexuality, rural crime etc.
2. **Business factors:** specific to farming, such as animal and crop disease, poor finances, lack of time off the farm, succession challenges, tenancy issues, inspections etc.
3. **Policy and public challenges**: criticism from the public, policy change, bureaucracy.

Some studies have tried to compare stressors across countries, including Nyczaj Kyle *et al.* (2025) who compared the UK and Canada.

Some farmers can find it difficult to seek or gain support for their mental health for reasons that include poor accessibility of empathetic help in rural areas (Hull *et al.*, 2022; Malone *et al.*, 2025), worries over confidentiality (Riethmuller *et al.*, 2025), and stigma associated with the subject (O'Connor *et al.*, 2024). There is still much to learn about how different stressors affect different farmers and how support can be best targeted (Nye *et al.*, 2025).

A scoping review by Hernández García (2024) suggested that there was no literature (at that point) that had looked into how precision technologies affect farmer stress, although this is an arguable point. It is true to say, however, that studies have rarely directly looked at the role of emergent agricultural technologies in improving or worsening farmer mental health, though some studies have begun to draw a link (e.g. Carolan, 2023, 2024; Hansen *et al.*, 2020).

Agriculture 4.0 technologies and mental health: an emerging area of interest

It has always been the case in the evolution of technological change in farming that new ideas and methods lead to improvements in some areas, but also regression in others. The same will likely be true in the area of mental health, including effects on the specific factors affecting it outlined above. Hereafter, I review some of the early social science research which has explored the possible social impacts of emergent agricultural technology, with a focus on mental health. These existing studies have either directly explored this issue by making an explicit link between technology and mental health, or indirectly by evaluating how technology addresses one of the known factors influencing mental health (e.g. succession, crime, finances etc.). Since the technologies, and hence related research, are emergent, it is hard to make definitive statements on the directionality of impact between technology and mental health in farming. It is important, though, to conduct on-farm post-adoption research to build the empirical case for if and how technologies are changing life on the farm, particularly in order to critically interrogate dominant narratives of a 'positive, game-changing' revolution. Still to date, much research on farmer technology adoption stops at the point of self-confessed uptake (de Oca Munguia *et al.*, 2021). This prevents us from knowing what happened next on the farm – did the farmer continue to use the tool and did it have overall positive or negative impacts? Did the farmer stop using the tool and why? How did life on the farm change and how do farmers, workers, families, and advisors feel about it? These are all key questions for the next post-adoption phase of social science work on the so-called fourth agricultural revolution.

In the following sections, the discussion involves different digital agricultural technologies, some of which may not be typically associated with so-called agriculture 4.0. Though a clear definition of agriculture 4.0 remains elusive (Klerkx and Rose, 2020), various emergent technologies such as artificial intelligence, robotics, drones, the internet of things, gene editing, and alternative technologies like hydroponics and cultured meat, are generally seen as in scope. Other digital technologies, such as mobile phone apps, some older wearable technologies for livestock, autosteer, or the internet in general, are generally considered to be 'older' technologies and are rarely described

as revolutionary. However, it is important to note that technology adoption in farming can be slow and non-linear (Rose et al., 2022). In many rural areas of the world, user readiness for digital technologies like smartphone apps or the internet can be low (McCampbell et al., 2022). Furthermore, although some agriculture 4.0 technologies like generativeAI might appear to be very different to those that have come before it, it is still likely that many of the benefits and costs of previous digital technologies outlined in the social science literature will be applicable. Therefore, this chapter widens the scope of what an 'agriculture 4.0' technology might be and focuses specifically on digital technologies, which may or may not be emergent in specific parts of the world.

The effects of automation on lifestyles: freed time or increased technostress?

Some agriculture 4.0 technologies, particularly robotics and automation, promise to reduce drudgery by taking over dull, dangerous, and time-consuming jobs on farm. In turn, this has the potential to free up time for farmers to do other things, including spending more time with their family and spending more time off the farm, for example on vacation. Research in agriculture illustrates a clear link between time spent off the farm (on non-agricultural pursuits) and farmer mental health (Wheeler and Lobley, 2022). Those farmers who do not (or cannot) take holidays or days off are more likely to suffer from mental health problems. Therefore, in principle, technologies that are designed to lighten the load and reduce time-consuming jobs could be beneficial.

Robotic milking systems are one example of an automated technology that can act as a proxy for the likely impacts of other emergent technologies on-farm. These devices automate the process of milking. Instead of the farmer and workers having to herd cattle several times a day into the milking parlour and spend hours (depending on herd size) manually connecting machines to teats, cleaning, and monitoring individual animals, cows come to a robot on their own at a time of their choosing. The robot recognises each individual, checks if they are ready to be milked, automatically connects the milking device to teats, cleans, and lets the cow out afterwards. This process also collects data on individual animals, which can be used to monitor production, health, and welfare parameters.

There is some evidence in the literature that automated milking systems (AMS) have improved the lifestyles and mental health of some farmers, but not for all. In Norway, for example, Hansen *et al.* have conducted a number of studies exploring the link between adoption of AMS and farmer job satisfaction and wellbeing. In a 2020 study, they found that it had improved the lifestyles and mental health of some farmers by freeing up time and reducing the need to manually milk at unsociable hours. A positive outcome from AMS was particularly noted if farmers received training and good extension advice and had a successor to the business.

However, not all farmers received a boost to their wellbeing as a result of AMS adoption. For some, it did not reduce work, but rather changed it. Instead of spending time milking cows, farmers and workers spent time interpreting data collected by the AMS and reacting to alerts. The potential for data-driven farm technologies to increase technostress or cognitive burnout or overload, particularly for people who do not always have advanced computer literacy skills, has been noted in several other studies (e.g. Barrett and Rose, 2022; Carolan, 2023; King *et al.*, 2023). In addition, a review of how AMS change the nature of farm work has noted that the dominant discourse of automated technologies reducing work is oversimplistic (Martin *et al.* 2022). Rather, as Hansen *et al.* noted, it simply changes the type of work on farm. Whilst this may be attractive to some people, it can create stress for others. Interestingly, the Hansen *et al.* study (2020) indicated that the effects of new farm technology on mental health can have a temporal element. Whilst there may be an initial increase in stress as a result of having to learn a new technology, adjust work routines, and respond to 'teething issues', after this transition period, there can be longer-term benefits if the technology performs as expected.

Other studies have explored how precision or automated technologies could change life on the farm and influence farmer and worker identity, exploring the potential impacts of this on job satisfaction and mental health. As stated above, new technologies could take over tasks that are dangerous to the physical health of humans. For example, the Thorvald modular robot is now commercially available to autonomously treat powdery mildew in strawberry crops instead of humans having to put on protective clothing at night (when the mildew needs to be treated) and use dangerous pesticides (see Rose and Bhattacharya, 2022).

The research shows a direct link between good physical health and good mental health (Ohrnberger *et al.*, 2017); therefore, if emergent technologies can reduce or eliminate dull and dangerous farm work, mental health could improve. Some studies have explored how autosteer technologies on tractors may help to reduce stress and fatigue, allowing farmers to undertake other tasks at the same time. For example, a study in Finland by Haapala et al. (2025) used heart rate monitors to compare the wellbeing of operators using or not using autosteer technologies. The study found that using autosteer technologies on tractors can reduce farmer stress. A similar finding was made in a study of automated spraying in the USA, with a claim that automated steering reduced stress for the operator by 48% (Burgers and Vanderwerff, 2022). Furthermore, if farmers are stressed by the inability to recruit labour, which is a problem facing many sectors globally (see Rose and Bhattacharya, 2022), labour-saving technologies represent an opportunity to address this stressor. Additionally, autonomous robots could reduce input costs and lead to higher profitability, including for small farms (Lowenberg-DeBoer, 2024). Since poor financial outcomes are a key stressor on farmer mental health, if agriculture 4.0 technologies are able to improve profitability, then a key stress factor will be mitigated against. However, for emergent technologies associated with agriculture 4.0, some of which are still in development or early scaling, it is too early to judge what impact they will have on profitability for different types of farm. We are yet to see how 'game-changing' so-called agriculture 4.0 technologies really are, and for whom (Klerkx and Rose, 2020).

Agriculture 4.0: improving attractiveness of farming?

Generational renewal in farming continues to face mounting challenges around the world, including within the European Union where just 11.9% of farm managers are under 40[1]. Attracting young people into the farming industry is, therefore, crucial and many reports on the subject see emergent technologies as part of the solution to attract younger, skilled workers into the sector. In the mental health literature, there is a clear link between job satisfaction and mental health. For some, adopting the latest technologies may be attractive and younger farmers in particular may seek work on farms that have the most cutting-edge equipment. However, for others, the way in which labour-saving technologies change life on the farm may not be desirable. Taking an everyday approach to understanding how technology changes life on the farm is important (Rose *et al.*, 2023). As stated above, new technologies do change farm workflows. Precision livestock technologies, including wearable sensors or artificial intelligence-enabled cameras, can monitor individual animals 24/7, potentially reducing the time needed for humans to check each animal (sometimes in large herds) for health and welfare issues. The effect of this could be that farmers spend less time with their animals, as has been noted in assessments of how AMS change farm workflows (Bear and Holloway, 2019). Automated crop technologies, such as robots or drones, could again reduce the amount of time spent

[1] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Farmers_and_the_agricultural_labour_force_-_statistics#:~:text=Slightly%20more%20than%20two%20thirds,the%20age%20of%2040%20years.

on the land for a farmer, whilst the increasing move to digital recording and administration can lead a farmer to spend more time indoors on the computer (Rose *et al.*, 2018).

A forward-looking video by John Deere produced in 2012[2] features a farmer called 'Terry'. It imagines a world in which automated technologies have arrived on the farm. Terry wakes up in a morning and makes coffee, checking a computer projection on his wall for the latest weather forecast. He sits down at his office table, placing the mug onto it, which reveals computer-generated images of his farm, as if he were playing a computer game. From this console, he can control his farm, or allow a team of advisers to control his farm. Only at the end of the day, as dark clouds gather and melancholic background music plays, does Terry decide to go and look at his crops, using a phone app to make diagnostics on his phone.

Here, it is important to acknowledge Carolan's (2024, recalling Haraway) point that knowledge is situated; in other words, views towards, and impacts of, agriculture 4.0 technologies on mental health will differ depending on context – the circumstances surrounding the farm, farmers, workers, and families. For some farmers, the John Deere video may be an attractive vision of the future farm. Drawing on farmer interviews in Iowa and Minnesota, Carolan (2023) presents quotes from a farmer called 'Beth'. As Carolan (2023, 46) writes 'digital agriculture came into the picture for Beth because of its role as a vehicle to make dairy farming satisfying to her.' Beth said to him (quote directly taken from Carolan, 2023):

"I faced a lot of pressure to take over the farm. But I also knew I wouldn't have been happy doing what my parents did. Dairy farming's a 365 days-a-year, twice-a-day, job, for Christ's sake. I'm proud of what we've built, a 21st-century operation that's probably more high-tech, data-oriented as what any of my friends from my high school days are doing. […] They're off working in cities like Chicago, but this is the real deal; the type of Cloud-based, IT-savvy job people from my generation want'".

Another farmer, Lynn, said *"Forget working harder. I'm all about working smarter, which, yes, in my book means working less"* (from Carolan, 2023). For Beth and Lynn, therefore, new technology had been a way of improving job satisfaction, reducing the drudgery of farm work, and improving mental health. For some other younger farmers, agriculture 4.0 technologies could also be seen as improving the attractiveness of the industry and securing their interest in making a succession to the family farm. Since worries over lack of succession is a major source of anxiety and mental health problems (Rose *et al.*, 2022), anything that attracts farmers' children to take over the farm would likely improve mental health within farming families.

But, Beth was a younger, IT-savvy farmer who was keen to, and able to, embrace new technologies. Based on another set of interviews of farmers across Arizona, California, Colorado, New Mexico, and Wyoming, Carolan (2024) also explored the potential of digital technologies to increase inclusivity and diversity of people in agriculture. He focused particularly on speaking to farmers with disabilities. He quotes farmers who said that digital technologies had enabled them to keep working in agriculture despite their disability. One farmer, for example, who was paralysed said that "tractors, drones, e-collars, robotic milkers are technologies that enable me to remain in farming" (quote taken from Carolan, 2024). This farmer recalled how his parents' generation had toiled on the farm well past the point of having severe physical ailments. Other farmers had other disabilities, but had found technology a vital route towards continuation in the industry; for example, an autistic farmer recalled finding calm in the routine-based, ordered world of vertical farming, whilst another with multiple sclerosis could not have worked in the industry without technological aides. Reminiscent of the Hansen

[2] https://www.youtube.com/watch?v=t08nOEkrX-I&pp=0gcJCdgAo7VqN5tD

et al. (2020) study on robotic milking, other farmers in Carolan's (2024) study argued that technology had freed up time for them to spend on non-farming activities; enabling them to follow more-than-farmer identities – such as "mothers," "fathers," "husbands," "mothers," "partners," etc." Again, the beneficial impacts of technology on physical health, to succession activities for some disabled individuals, and the potential to free up time, is likely to have a positive knock-on impact on mental health.

For others, the John Deere vision of the future may not be so attractive. Some farmers may want to spend more time with their animals, on their land connected to nature, and to be free from new forms of technostress (Barrett and Rose, 2022; Schillings *et al.*, 2021). As Carolan (2023) argues, there are many farmers priced-out of adoption of new technologies, a trend noted by many social science papers that find uneven distribution of agriculture 4.0 benefits (see e.g. Bronson, 2019). Some farmers may feel that they are being left behind with the rise of agriculture 4.0. There are farmers concerned about data ownership and privacy (Ruder and Wittman, 2025), digital divides (Mehrabi *et al.*, 2021; Rotz *et al.*, 2019), the rise of "algorithmic rationality" (Gardezi and Stock, 2021; Miles, 2019), the reduction of farmer autonomy (Brooks, 2021), and the rise of corporate power and land assetisation (Duncan *et al.*, 2022; Fairbairn *et al.*, 2025). There are farmers who are investing in new technology, but who may feel that they do not get the most benefit out of in compared to larger companies on whom they are becoming increasingly reliant for repairs and upgrades (Clapp and Ruder, 2020). There has been an intense debate amongst scholars about the link between biotechnology and farmer suicides in India, with critics claiming that seed monopolization has been a causative factor in the high rates of suicide (Thomas and De Tavernier, 2017). Whilst Thomas and De Tavernier (2017) found the association between seed monopolization and farmer suicides to be questionable, there may be a link between those farmers who were economically disadvantaged as a result of the changes associated with biotechnology adoption (or non-adoption) and poor mental health outcomes. Therefore, for those farmers who cannot adopt due to digital divides, or do not want to adopt (but may be forced into doing so through assurance schemes or retailer relationship), the march towards agriculture 4.0 may be a source of stress and anxiety.

Digital technologies as part of the 'landscape of support'

The literature on farmer mental health is exploring how 'landscapes of support' (Shortland et al., 2023) could be improved. Depending on context, support landscapes typically include a mix of formal providers, such as professional healthcare, mental health charities, and faith groups, and informal help provided by family, friends, peers, rural communities, and advisors who regularly see farmers. Increasingly, digital technologies are becoming part of the landscape of support for farmer mental health. To overcome challenges of isolation and poor accessibility of mental healthcare in rural areas (see Shortland *et al.*, 2023), online counselling support for farmers may hold promise. Through various schemes, such as "Make the Moove" in Ireland (Macra Na Feirme, see Hammersley *et al.*, 2025), or studies investigating the potential of, and demand for, online support in Scotland (Lamont *et al.*, 2023) and Australia (Gunn *et al.*, 2021), it has been found that support provided through digital technology can support farmers with their mental health. For example, the potential benefits of online forums for farmer wellbeing have been explored by Carlisle et al. (2024), whilst Gunn et al. have explored both what farmers want from online wellbeing interventions (Gunn et al., 2021) and have conducted initial evaluations of online resources that have been provided (Gunn et al., 2023). Online education delivery around mental health to agricultural students has also been considered by Knook et al. (2025). These studies have generally concluded that online interventions to support farmer mental health can be effective; the Gunn et al. (2023, 378) study found that the 'ifarmwell' initiative was "likely to help farmers reduce their levels of distress and improve their mental wellbeing, by improving their

psychological flexibility, ability to focus on the present and accept things beyond their control, as well as by reducing the extent to which they believe unhelpful thoughts". However, the risks of online forums are also currently being explored (Howse et al., in review). There may be perils in directing farmers to the wrong type of online forum or social media, as we know that such spaces can be sources of conflict and public criticism of farming, which is a key mental health stressor (Rose *et al.*, 2022).

Other nascent initiatives are starting to explore the potential for virtual reality to deliver psychological therapies to farmers (e.g. Rural Minds project in the UK[3]) or how digital technologies can be used to monitor the impacts of support interventions for farmers (Stynes et al., 2025). Some existing digital tools can also help to address isolation and social connectivity, which play a key role in mental health. GPS trackers and other digital systems can monitor the location and performance of farmers and workers on the farm. This can contribute to positive health and safety, particularly if there is an accident on the farm and emergency services/first responders can pinpoint the location of the patient more easily across vast and isolated agricultural landscapes[4]. Again, if physical health is better looked after on-farm, there should be a link with improved mental health.

Digital farm technologies: the promises and perils of surveillance

However, research has also indicated the mental stress and anxiety that greater digital surveillance of the farm workforce can have. Whilst research has widely pointed out the potential displacement of labour from automated technologies (e.g. Rotz *et al.*, 2019), there have been less studies on how digital technologies could affect the current workforce on-farm. Drones may be used to monitor the performance of workers doing tasks in fields or the picking rate of fruit pickers can be evaluated 24/7 (Prause, 2024). Using a case study of the fruit industry in South Africa, Prause (2024) finds that digital systems track worker progress, how quickly they are picking, and how well they are performing tasks. These data can be used to set targets, often unrealistic targets, and can be used as a way of disciplining workers, firing workers, or rewarding the most successful workers. There is a real mental health risk of unchecked forms of surveillance capitalism in which workers constantly feel watched and under pressure to perform (Ruder, 2024). I have too witnessed technology being used in this way to monitor workers on a fruit farm in the UK, apparently to support the workforce, but clearly also to reward and disincentivise failure.

Shiny, new technologies: a magnet for, or a deterrent to, rural crime?

Rural crime is a major cause of poor farmer mental health (Smith, 2020). With increasingly more sophisticated and expensive technologies, the proceeds of criminal activity also have the potential to rise. Theft of expensive technologies is on the rise. For example, statistics cited in the UK Parliament in 2025, stated that GPS theft had surged by 137%. Thefts of quad bikes and all-terrain vehicles rose to over £3 million. Drones, autonomous robots, and other technologies associated with agriculture 4.0 are expensive. There is the potential for significant mental health challenges if a farmer suffers loss of a new, expensive technology to rural crime. Despite this potential, there are also ways in which new and existing digital and other farm technologies can also deter crime (e.g. digital trackers, tracking paint, an engineered farm environment to deter theft, and low-tech methods [though uptake of technology-based measures may be low) (Smith, 2025).

Farm extension and communication in an AI-world: opportunity or risk?

[3] https://www.farminguk.com/news/immersive-vr-training-to-help-understand-mental-health-in-farming_67421.html

[4] https://digital-strategy.ec.europa.eu/en/library/video-how-digital-tools-can-support-wellbeing-and-safety-farmers

Generative AI, specifically through the use of Large Language Models (LLMs), is being increasingly used in farm extension activities. Programmes such as ChatGPT can analyse large volumes of data and condense instructions to farmers or advisors into simple, accessible outputs. There are several farmer chatbots available or in development (e.g. Farmer.Chat by Digital Green), which offer the opportunity to provide extension advice quickly to isolated farmers, who may not always be able to access human advisers, including ones who are able to communicate in their native language (Tzachor *et al.*, 2023). Since this is an emergent area of scholarship, with social scientists beginning to explore opportunities and risks of LLMs in farm extension, there has, as yet, been no explicit consideration of how it could impact farmers' mental health. This short section, therefore, is somewhat speculative, attempting to map the early scholarship on LLMs against its impact on known stressors of farmer mental health.

There are both opportunities and risks of Large Language Models (de Clercq *et al.*, 2024; Marinoudi *et al.*, 2024; Ibrahim *et al.*, 2024; Silva *et al.*, 2023; Tzachor *et al.*, 2023). As stated, they offer the potential to give quick advice to farmers, utilising large datasets and other sources of information, potentially overcoming the data-action gap on-farm (Palczynski *et al.*, in review). They could help to give extension advice to those who cannot access advice. However, there are worries over data ownership, digital divides, and misinformation, which could lead to bad advice being given to a farmer. It may also be worth exploring the unintended consequences of digital extension, including through the use of LLMs. Research on farmer mental health indicates that those humans who go up the farm track to see farmers, such as agronomists, accountants, land agents, and more, can play an 'accidental counselling' role (Shortland *et al.*, 2023). Since farmers can be isolated from sources of professional support, those individuals who do encounter farmers personally on farm visits could play a key role in spotting signs of distress and signposting towards support. Whilst connections can be made digitally, if extension were to become increasingly virtual, there may be consequences from the loss of personal visits.

It is too early to judge how the increasing use of LLMs in agricultural extension will affect farmers' mental health, but the stakes associated with giving advice are high. If farm management decisions and finances improve or suffer as a result of good or bad advice, it follows that mental health may improve of worse. It also remains to be seen how the rise of generativeAI affects the farmer-adviser relationship, which can be a valued and trusted relationship from both perspectives.

Concluding remarks

Digital technologies, including emergent ones associated with agriculture 4.0, are not a panacea for sustainability. The question of how existing digital, or emergent technologies, affect life on the farm is dependent not only on what they can do, but also on how policy instruments (such as grants, regulations, training, infrastructure etc.) influence the nature of scaling and use, and the ways in which this interacts with farmers' beliefs and worldviews. The impact of technology on mental health will be situated; in other words, depending on farmer circumstances, belief systems, and ability to adapt, it may improve or worsen lifestyles and conditions on the farm, which will have an impact on mental health. The individuality of impacts is worth reiterating; what one farmer considers an improved lifestyle is a view that may not be shared by others. It has always been the case in the evolution of technological change in farming that new ideas and methods lead to improvements in some areas, but also regression in others. This chapter in some ways was difficult to write because of the lack of explicit scholarship on the impacts of emergency agricultural technologies on mental health. A clear message, therefore, is to promote the need to carry out such studies, rooted in farmers' everyday perspectives, from a variety of different demographic and sector viewpoints, and exploring farmers' post-adoption experiences. Such scholarship needs to explicitly examine the link between digital technologies and mental health, including examining the effect of specific technology types across farm and farmer types and geographical contexts, sharing learnings between teams of researchers around the world.

These studies will need to embrace mixed methodologies, including utilising digital technologies themselves in the evaluation of farmer mental health (see e.g. Stynes et al., 2025), and, where possible, offer everyday, post-adoption, longitudinal perspectives into how technology changes life on the farm (for the good or bad).

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