

Between datafication and digital entanglement: Swedish farmers' everyday use and understanding of weather through apps

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Abstract

Weather applications constitute mundane data infrastructures that people use on a daily basis. However, little attention is afforded to how these everyday technologies and their data potentially shape users' understanding of weather. One group to which weather conditions are particularly salient is farmers. The field of agriculture is increasingly data-driven, encompassing different commercial and non-commercial digital weather products. However, the potential performativity of said data on farmers' understandings of weather remains little explored. Taking inspiration from mundane data studies, and by interviewing Swedish farmers, we find that weather app data intensify farmers' attention to unfolding weather conditions, and affect farmers' relations to their environment and understanding of weather. Moreover, their experiences of using weather apps are characterised by ambivalence – the co-existence of conflicting feelings, practices and attitudes. This ambivalence emerges at the intersection of farmers' data use, habits, routines, discourses and embodiment. We propose to call this phenomenon 'digital betweenness'. 'Digital betweenness' directs and sensitises farmers to opposing and concurrent practices, forces, ideas and desires that are entangled in weather data encounters.

Keywords

Weather applications, datafication, digital entanglement, farming, weather

Introduction

In the autumn of 2024, the Swedish newspaper Dagens Nyheter reported that farmers increasingly use weather apps in their profession. To some farmers the use of this technology appeared indispensable, as one interviewee disclosed to the reporters: 'I check the weather apps 50–60 times a day' (Herold and Ohlsson, 2024). What the newspaper article may leave the reader to ponder is: what happens to a farmer's understanding of weather and connected agricultural practices when a device is used as many as 50–60 times per day?

In this article, we turn the lens to these apps, a family of digital products designed to provide real-time and forecasted weather for specific locations. Accessed through for instance smartphones, and concerning both mobile and web applications, real-time weather updates are now widely available (Zabini, 2016), allowing millions of people to check forecasts for air temperature, precipitation, wind, humidity and sometimes also on other environmental parameters such as air quality and pollen count (Vaughn et al., 2024). Most weather apps are general purpose and free of charge, but

specialised commercial apps are available too, often integrating additional sensor or model-based environmental data with practice-specific advice to gain further relevance to their customer base (Oui, 2022). What the various types of weather apps have in common is a propensity of embedding themselves in people's everyday lives.

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As data are increasingly embedded in our everyday lives through mundane technologies, infrastructures and practices, encounters with data are often naturalised and unnoticed (Goldstein and Nost, 2022; Smith, 2018). Pink et al. (2017) stress that it is through mundane experiences – everyday routines, contingencies, affect and accomplishments – that big data emerges and shapes understandings and practices. Mundane data studies are primarily focused on self-tracking applications, in areas such as medical, beauty, fitness and health (see e.g. Lupton, 2017; Pink et al., 2017; Sumartojo et al., 2016; Tkacz, 2022). Apart from self-tracking, other mundane applications studied concern food, social media, transport and gaming, to name a few (Abdelgaard, 2025; Morris and Murray, 2018). Indeed, the prevalence of apps in everyday life has given rise to the term *appification*, a feature of everyday life where digital data and routines are merged (Morris and Murray, 2018). While the term primarily revolves around the aforementioned research areas, we turn the focus to environmental apps as they are increasingly woven into the texture of everyday life.

Data-induced changes in relation to perceptions and practices increasingly occur in aspects surrounding environmental issues (Gabrys, 2019). For instance, environmental encounters through species recognition and air quality apps illustrate the entanglement between data, practices and embodied knowledge, and how these encounters also transform and negotiate environmental understandings and practices (Graminius and Haider, 2025; Lundquist et al., 2025). In the process, what we come to know as the environment may change (Beaulieu and Leonelli, 2021; Goldstein and Nost, 2022). Thus, investigating environmental apps, we argue, allows for a change in focus of mundane data studies from ‘human-self-tracking’ to people’s relations and understandings of the environment. Weather apps and resultant data, in particular, are described as occupying a central space in the commercialisation of meteorology (Randalls, 2010), a process where commercial interests and imperatives are said to shape practices and data and potentially, also users’ environmental understandings.

This article takes Swedish farmers’ everyday use of weather apps as a point of departure. Farming has been described as both a profession and a lifestyle, shaping daily rhythms and relations to the local environment (Preininger, 2024). Knowledge of weather and the importance of weather forecasting are intrinsic to the farming profession, and farmers’ intimate relations to the local environment also encompass tacit knowledge about local weather conditions (Crane et al., 2010; Eastwood et al., 2019; Nyadzi et al., 2021). However, the current shift in agriculture towards a data-driven industry and the changing power dynamics between farmers and tech firms (Prause, 2025), coupled with the expanding market of targeted digital weather products as well as generic weather apps (Snow et al., 2024), prompt questions about farmers’ use of different apps, their agency in the everyday digital landscape, and, especially, how tacit

knowledge of weather and data intersect, are negotiated or diverge.

Given the limited scholarly attention to the use of environmental data in everyday life and its influence on environmental comprehension and practices, we aim to deepen the understanding of how farmers make sense of everyday datafied encounters by exploring the use and understandings of weather apps and their data in a farming context. We ask: How does farmers’ use of weather app data shape their understanding of weather? And, in which ways, if any, do weather app data affect farmers’ agricultural practices?

Making sense of the weather: Weather applications and farming

Recent studies illustrate that the availability and use of weather apps has exploded in the last decade (Vaughn et al., 2023). As many as 5993 weather apps were recently identified as downloadable for iPhones (Stewart and Bolton, 2023). Adherence to open data policies by public meteorological organisations is one reason for the increase of available applications, providing companies and citizens alike with free access to weather data (Oui, 2022). Consequently, various studies illustrate how the consumption of weather information has shifted from radio and TV to weather apps (Stewart and Bolton, 2023; Vaughn et al., 2024).

Satellite images, sensors, new weather model predictions and AI have gradually improved the precision of weather forecasts (Stewart and Bolton, 2023). Weather apps can deliver anything from hourly, daily or weekly forecasts to severe weather or air quality alerts (Phan et al., 2018). A Finnish report found that mobile phone users tended to check the weather in the morning, before lunch and in the evening, thereby keeping up with weather changes throughout the day (Harjanne and Ervasti, 2014). However, an Australian study found that farmers use weather apps more frequently than three times a day (Snow et al., 2024), suggesting that everyday context differentially shapes users’ interactions with weather data.

Indeed, one group to which weather conditions are particularly salient is farmers (Caine et al., 2015), and accurate long-term and short-term weather predictions are often sought after by farmers (Snow et al., 2024). A diverse array of sensors has been developed for this purpose, but hitherto, most studies have focused on the plethora of other types of farming-specific environmental monitoring devices available. Soil moisture sensors, crop disease sensors, livestock health apps, milking robots and drones for observing crop fields constitute just a small range of environmental data devices available (Bear and Holloway, 2015; Kambale et al., 2024). The data generated from such sensors are owned by the company providing the digital equipment (Atasoy, 2025), and commonly, these devices also generate recommended farming actions (Rose et al., 2016). Moreover, studies

of different types of agricultural digital sensors illustrate that tacit embodied professional knowledge may change as farmers become more physically detached from land and animals (Bear and Holloway, 2015; Preininger, 2024). At the same time, digital profession-specific devices are increasingly used by farmers. For instance, a UK survey illustrated that almost 50% of farmers used some form of environmental monitoring decision support technology in their profession (Rose et al., 2016). Likewise, an OECD (2022) report indicated an increased uptake of such devices among its member states.

However, the availability and use of all-purpose and targeted farming weather apps in agriculture have not received the same level of scholarly attention as other types of environmental monitoring devices available to farmers. Generic and freely available weather apps also provide farmers with data to incorporate in their professional activities (Caine et al., 2015; Snow et al., 2024). Commercial weather apps tailored especially for farmers are also increasingly common (Oui, 2022). These latter types of apps integrate publicly available weather data with profession-specific recommendations, creating an environment in which meteorological and commercial perspectives come to co-exist (*ibid.*), potentially also shaping farmers' understanding of the weather data they encounter. In sum, the increasingly datafied environment of agriculture provides fertile soil for exploring how data from weather apps – generic and farming-specific – are used, acted upon and shaping perceptions of weather.

Datafication and digital entanglement: A conceptual approach to datafied weather in agriculture

To explore farmers' mediated experiences, practices and resultant understanding of weather by using weather apps and the data they provide, we lean on a conceptual framework incorporating two concepts: datafication and digital entanglement.

Datafication primarily concerns the observable perceptual and practical transformations induced by data (Mayer-Schönberger and Cukier, 2013; Wickberg et al., 2024). It seeks to highlight how the quantification of a phenomenon renders something hitherto non-quantified in the realm of everyday life into binary, computable, decontextualised, dematerialised and tabulated form. This enables the phenomenon to be analysed and managed, introducing new practices and perceptions of the phenomenon in question (Mayer-Schönberger and Cukier, 2013; Wickberg et al., 2024). While datafication is seen as a mono-dimensional process with a primary focus on observable phenomena, a related way of viewing data in the world is presented by the concept of digital entanglement (Searle et al., 2024; Taffel, 2019). The notion of digital entanglement allows for the exploration of digitally mediated, human–nonhuman

entanglements as situated in diverse contexts. Digitisation is here seen as a plural process (Ziegler-Remme, 2024) and is more reciprocal and contextual than the aforementioned term datafication. It allows for the exploration of perceptions and interpretations of users of data, whereas datafication – a feature of the more quantifiable aspects of data processes – primarily focuses on the observable and deductive (Pink et al., 2017: 3). The concept of digital entanglement stresses the interaction between data, everyday contexts, previous knowledge and geographical locations. This opens up for a wider array of perspectives that data are actively co-shaping. Indeed, the versatility of data and their adaption to multiple contexts allow for a multitude of meaning-making activities, as data are reshaped and made useful by their practitioners (Pinel and Svendsen, 2023).

In this paper, we use digital entanglement as a guiding concept to explore our data. Simultaneously, we explore the conditions of digital entanglements that make processes of datafication more prominent, not the least since the ongoing transformation of agriculture into a data-driven industry has raised questions about farmers' agency, connection to their land and changing professional perceptions (Ofstehage, 2018; Prause, 2025). Indeed, the mundanity of everyday data encounters often obscures the 'agentive properties' of both the technologies in question and their surrounding discourses, and how they might sustain power relationships and affect understanding (Smith, 2018: 1). Facets of datafication processes – including the indispensable use of data, detachment, decontextualisation and managerial perspectives towards the datafied object (Knorr and Pentzold, 2025; Mejias and Couldry, 2019; Pinel and Svendsen, 2023) – are implicated in these transformations.

The process of datafication is commonly accompanied by political and social discourses proclaiming data to be indispensable to professional and everyday life (Knorr and Pentzold, 2025). The indispensability of data is also an argument driving the datafication of agriculture (Atasoy, 2025; Prause, 2025). Environmental data are also increasingly recognised as essential for various social and political practices (Gabrys et al., 2016), raising the question of how meteorological data – viewed through mundane applications – are appraised by and impact farmers. Moreover, datafication has been linked to processes of separation and detachment: a disconnection between the quantified phenomena and the individual (Lupton, 2018). Such detachment furthers managerial viewpoints shaped by data, where the measured entity is analysed and controlled, rather than sensed and experienced (Mayer-Schönberger and Cukier, 2013; Mejias and Couldry, 2019). As described earlier, in agriculture, data-induced changes have been reported to impact farmers' professional experiences, including a sense of detachment from animals, land and decision-making (Bear and Holloway, 2015; Preininger, 2024). Consequently, this may apply to the use of weather app data when entangled in specific contexts.

Datafication is often accompanied by the process of standardisation (Mayer-Schönberger and Cukier, 2013: 93; Mejias and Couldry, 2019). In practical terms, this often means the reduction of variety and heterogeneity since a standard set of variables and measures underpins the collection of data. This inevitably sidelines aspects that may be of importance on a local scale, decontextualising data from the local (Mejias and Couldry, 2019; Pinel and Svendsen, 2023). Related to our study, data-driven agricultural processes have been argued to standardise agriculture and to eliminate local variations (Atasoy, 2025). Moreover, in terms of weather, critique of earlier weather forecasting technologies has focused on local imprecision (Snow et al., 2024; Stewart and Bolton, 2023). As such, weather data could indeed be described as decontextualising weather to general conditions, turning a blind eye to local variations. But by hourly updates, automatic geolocation and data from local weather stations, weather apps are meant to bridge existing gaps between general weather patterns and local conditions (Snow et al., 2024). Thus, instead of decontextualising weather to general, regional patterns as earlier forecasting technologies did, app data are supposedly meant to do the opposite – namely to contextualise and introduce local variation. The tension between generalised processes of datafication and accompanying elements of decontextualisation, and of the contextualising *raison d'être* of weather application data, conceptually places weather apps in between different *modus operandi* of data. Consequently, this also raises questions about how farmers' situated interactions with data may unfold.

Digital entanglement as a concept that emphasises situated interaction moves away from the view that data either disengage, detach or reconnect people with nature. Effects of data on knowledge and human relations to nature depend on the specific contexts in which they are used (Searle et al., 2024). What constitutes 'entanglement' is specific to the situation studied. Taking inspiration from data scholars, we see routines, affect, embodiment, habits, material objects and spatiality (Abdelgaard, 2025; Lupton, 2017; Pink et al., 2017; Sumartojo et al., 2016) as focal entry points to understand farmers' mundane weather data interactions. Feelings, particularly, are emphasised in relation to mundane data, as they help people to make sense of the data (Sumartojo et al., 2016), tying embodiment and feelings to data practices (Lupton, 2017). While these approaches rest on individually sensed emotions, there are also social dimensions to emotions, such as discourses stipulating what one should feel in particular settings. Social discourses surrounding data often involve expectations of reliability, accuracy and precision generated by large datasets (Beer, 2019; Knorr and Pentzold, 2025). Likewise, discourses surrounding datafied agriculture are generally marked by positivity, promises of efficiency and accuracy, and progress (see, Atasoy, 2025; Kambale et al., 2024), which can influence expectations of data

(Beer, 2019). By utilising digital entanglement and discourses surrounding datafication, we can explore how farmers navigate social and individual dimensions of emotions and their visions of what data can achieve and reveal.

Based on the examples in the conceptual literature and their alleged relevance to farming and weather applications, we thus explore attributes of datafied weather by paying attention to the following aspects of processes of datafication: data-induced detachment and decontextualisation, data-induced managerial perspectives and practices, and the sense of the indispensability of data for everyday life. Moreover, we see digital entanglement as the intermingling of datafied weather, geographical locations, work practices, discourses, other weather devices, affect and embodied knowledge concerning weather and farming practices. Utilising these two concepts – datafication and digital entanglement – in conjunction thus helps us to shed light on what everyday data encounters look like in a Swedish farming context, and what kind of perceptions of weather they come to shape.

Methods

Delving into how processes of datafication and digital entanglement occur in agricultural contexts requires close examinations by way of qualitative research methods. Thus, we use a methodological interpretivist standpoint to interpret interlocutors' sayings (cf. Brinkmann and Kvale, 2015). This approach has been coupled with a walk-through method to study how interlocutors emulate how they use weather apps (Light et al., 2018). More concretely, this has been achieved by asking interlocutors to show the applications that they used to monitor weather, allowing a point of entrance to the mediatory characteristics of these apps through their user interface arrangements, functions as well as everyday, situated use through digital entanglement. The unfolding of farmers' meaning-making of digitised weather could thus be dually achieved.

Our unit of analysis is farmers' meaning-making of weather through their use of weather apps in their everyday occupation. We focused on the southern part of Sweden where most agriculture takes place, to gain geographical spread and ensure variation in weather conditions along with how these may intersect with farming. Interlocutor selection criteria included that interviewees were geographically dispersed across several of the southern Swedish regions, that they engaged in farming professionally and that their work varied in terms of farm size, crops grown and animals kept. Agriculture covers 7% of the Swedish land area which is managed by c. 56,000 agricultural companies with an average farm size of 47 hectares of arable land (Swedish Board of Agriculture, 2024). In a European context, Swedish agriculture is described as having a high but not leading level of digitalisation and productivity (Bocean, 2024).

Interlocutors were contacted through email with an introductory letter detailing the aim of the study. Upon interest,

they were further contacted by phone to arrange date, time and form for the interviews to be conducted. Fifteen interviews were conducted by drawing on established contacts with farmers through previous studies, through contacts with crop advisors, by searching web pages of local farmer organisations and by asking interviewed farmers to suggest additional potential interlocutors. Five interviews were carried out in the western region of West Gothland (Västergötland), five in the southern region of Scania (Skåne) and five in the eastern region of Uppland. These three regions harbour 17%, 16% and 6% of the agricultural land in Sweden, respectively, and we thus covered some of the main areas for agricultural production (Swedish Board of Agriculture, 2024). Further characteristics of interlocutors and their farms are provided in Appendix 1.

Empirical data comprised transcripts from recorded semi-structured interviews conducted between 17 January and 7 March, 2025. Interviews were transcribed through the use of the Swedish speech-to-text model KB-Whisper (Vesterbacka et al., 2025) and manual verification. The duration of the interviews ranged from approximately 30 min to 90 min, with consideration to interlocutors' availabilities and time schedules, resulting in roughly 11 h and 30 min of recorded audio. All interviews were conducted on-site at the farms, with the exception of one that was conducted by video conference application. All interviews followed an interview guide which comprised interview questions ranging from background questions; the interlocutors' use of weather apps; and how weather data was understood and what this meant for their farming. Open-ended, structuring and probing questions were asked and followed up on (cf. Brinkmann and Kvale, 2015). During the interviews, the interlocutors typically showed us how they monitor the weather through smartphone applications or streamable long-term weather forecast videos, either upon request or as a response to our interview questions (cf. Light et al., 2018). Regarding research ethics, all interlocutors, who have been pseudonymised, gave their written consent to be interviewed and to have their personal information collected (cf. Swedish Research Council, 2024). This study passed an ethics review clearance from the Swedish Ethical Review Authority, reference number 2024-06023-01. Quotations from the interviews were translated from Swedish to English by the authors.

Our analysis of the transcripts of the semi-structured interviews comprised an interpretivist stance with the ambition to go 'beyond what is directly said to work out structures and relations of meanings not immediately apparent' (Brinkmann and Kvale, 2015: 235). Our procedure incorporated paying attention to the situated practices or app use through the conceptual lens of datafication and digital entanglements. As such, the analysis comprised an interpretation of farmers' meaning-making of weather data and how everyday use of such data shaped understandings of weather. This analytical method of going back and forth

between theory and empirical material was used to make sense of 'the unpredictable conversational world of human beings' (Brinkmann and Kvale, 2015: 235). As described in the conceptual outline, the following aspects of datafied weather emerged from our empirical material: decontextualised and managerial perspectives of weather and the indispensable use of weather data. These facets, integral to processes of datafication, provided a window into the everyday meaning-making activities of our interlocutors and related practices, and served as starting points for the exploration of contextual digital entanglements.

Analysis

In this section, we delve into farmers' engagement with weather apps by exploring different facets of datafication and digital entanglement that affect their agricultural practices and understanding of weather. The analysis is divided into three subsections: the first introduces the indispensability of data and ambivalence surrounding the use of data in everyday professional practices, the second outlines the re-contextualisation of weather, and the last illustrates detachment, ambivalence and managerial perspectives of weather and farming. Together, the subsections seek to answer how understandings of weather and agricultural practices are shaped by weather data.

The indispensable use of weather data in the everyday?

A salient feature of the processes of datafication is the recognition of digital data as being essential for different practices in our everyday life (Gabrys et al., 2016; Goldstein and Nost, 2022). If this conceptualisation holds for farming, weather apps and their data would then be viewed as essential and integral to agricultural practices. Our study shows that they are, but to different degrees and in different entanglements. In fact, ambivalence concerning app data and their use keeps surfacing at the intersection of tacit and embodied knowledge, work routines, the farms' geographical locations, other weather devices, affect and social discourses.

All of our interlocutors used weather apps, and they were incorporated into working routines in different ways. While some farmers used one app, others used several and compared them. As Figure 1(a) shows, farmers used generic weather apps but also farming-specific and commercial weather station apps. Interlocutors read and interpreted weather parameters for a range of different farming activities (Figure 1(b)), pointing to the importance of weather data for professional practices.

Indeed, our interlocutors' use of weather data is embedded in routines. During morning coffee breaks, discussions about what different apps displayed prevailed. How to ascertain the most likely forecast for planning the day's activities emerged as a routine practice. As this farmer stated:

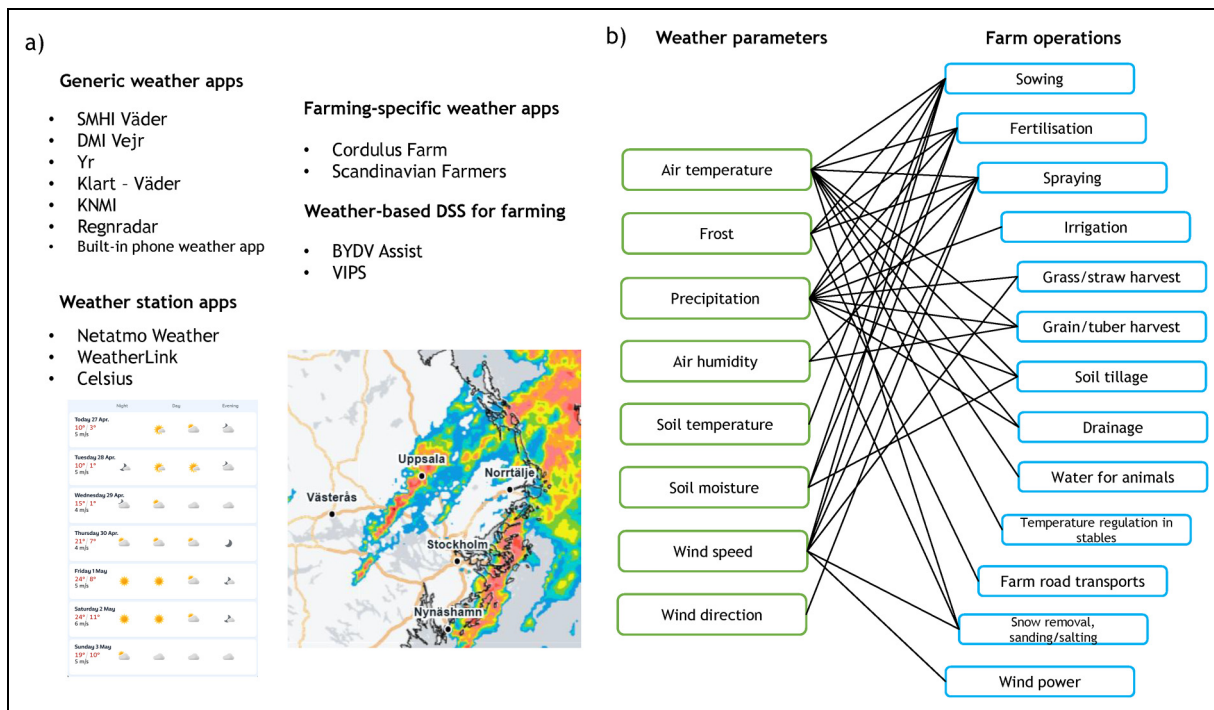


Figure 1. (a) Weather apps used professionally and (b) links between weather parameters (in green) and specific farm operations (in blue) mentioned by our interlocutors. DSS: decision support system. Images show representative screenshots from two weather apps with daily forecasts (Yr) and a rain radar (SMHI Väder).

They [colleagues] are looking at their weather apps. I'm looking at one. You can have some comparisons there. You have your favourites. Yeah, so, C who works here, he has YR, the Norwegian one. And then I have SMHI. And so we compare. Yeah, and then we make decisions after that (Scania 1).

Our interlocutors' practices can be likened to Pink et al.' (2017) assertion that data become naturalised and entangled in everyday life through routines. At the same time, data do not necessarily introduce these routines (ibid.). Coffee breaks as a space for 'weather-talk' was not something app data had introduced. Rather, farmers' small-talk about weather during breaks was a continuation of a long-standing practice. As our interlocutors stated, before they used apps, they consumed weather forecasts through TV or radio broadcasts, during which a meteorologist presented radar images, forecasted temperatures, wind speeds and directions and precipitation. Past practices of directly contacting conscripts at local military airbases or meteorologists at public airports to obtain the best possible weather data also relied on said weather parameters. Since these parameters are also used in weather apps, they thus provide a continuation of a long-standing 'datafied' practice of weather consumption. One may speak of a *habitual data entanglement*: a continuation of the consumption of weather data in the everyday. Like Pink et al. (2017) state, participants live with data in habits and processes that pre-date a specific type of data, incorporating, improvising and adjusting

data in the everyday (p. 10). Thus, weather data as integral to farming practices is not a new phenomenon. But in comparison with previous forecasting technologies, apps present hitherto unparalleled features: hourly updates, more measurements (e.g. humidity) and constant data availability (Snow et al., 2024; Vaughn et al., 2023). That is, if weather data through TV and radio broadcasts were indispensable to farmers before, the constant data availability of apps has the potential to intensify such dependence.

Intensification was also something the farmers sensed, representing an affective dimension that induced feelings of ambivalence. The role of affect in making sense of data has been described as something positive, as it can increase depth of engagement with data, further understandings and enable data to become part of routines (Pink et al., 2017: 10). Affect is seen to help people *make sense* of data (Sumartojo et al., 2016). But what happens when affect is both prompting you to use data and to abstain from using it, pulling you in opposite directions? For instance, several of our interlocutors spoke of how vacation – a rare treat – did not entail a complete separation from work because weather apps bridged the distance between place of vacation and the homestead fields. Apps enabled a temporal and geographical connection that tied farmers to their work and diffused practices of work and leisure:

Farmer: If I'm here at the estate or if I'm sitting in the Mediterranean and sunbathing, it's my

responsibility that things move forward, and my responsibility here at home is to make sure that everything goes as it should. So the weather apps... yes, they... (interlocutor sighs).

Interviewer: So you're never off from work because you're always checking the weather apps?

Farmer: Yes, you are not [off] (sighs) (Scania 2).

While the farmers welcomed the temporal and geographical connection to the farm that the apps enabled – a feature they felt positive about and made use of – they also regretted it. These concurrent affective dimensions illustrate the entanglement between intensified use of data in the everyday, habitual historical attention to data and forecasts, professional roles, leisure and individual desires. Ambivalence emerges at the intersection of these entanglements and highlights an experience that slightly departs from previous studies. While affect may increase engagement and further understandings, as previous studies have shown (see e.g. Lupton, 2018; Pink et al., 2017), our interlocutors show that the multitude of feelings experienced may give rise to simultaneous and diverging understandings, causing confusion and ambivalence. Our interlocutor in the quote above uses their app extensively, but it also infringes on their leisure and creates a sense of never being off work – a feature our interlocutor finds hard to navigate.

This ambivalence – of being pushed and pulled in concurrent directions – also gave rise to reflections. Harvesting and spraying emerged as two agricultural practices that intensified app use to the extreme. Indeed, some farmers observed that they probably checked the apps more often than the weather forecast update, prompting a reflection on their app use:

People check much more often than they did 25–30 years ago. Back then, people were content to check the weather forecast the night before, maybe. Or if you go back even further. Then it took a day before they got the next piece of information. Now people check several times a day. Completely unnecessarily, really (Upland 4).

The interlocutor above was one of those who checked the apps several times a day but, as the quote shows, also found it unnecessary. Extensive and intense use, coupled with reflections about its actual necessity, illustrate another situation where the experience of digital entanglement – extensive app use, seasonal professional work activities, habitual attention to weather – intersect to produce a sense of ambivalence.

While scholars have noted how general discourses surrounding data generally are couched in an aura of accuracy and objectivity (Knorr and Pentzold, 2025; Smith, 2018), our interlocutors felt annoyance and frustration regarding

data inaccuracy and imprecision, prompting many farmers to wish for better data. This feature has also been noted by other weather app studies (Stewart and Bolton, 2023). At times, farmers acted on the forecasts with dire results, because the forecast turned out to be wrong:

It can be like this, for example, that you have a crop that is almost ripe or not quite, but... “this weekend it's going to rain so much, we have to make sure to drive now”. And then the weather gets much better, well, then you've threshed something that is way too wet and then you have to dry it and then it costs a lot of money (West Gothland 2).

Paradoxically, no one considered replacing the apps with other sources. Even if most farmers wished for better accuracy, they didn't stop using generic weather apps. Instead, most farmers wished for improved app data, thus also harbouring ideas and expectations of weather data as indispensable for their farming practice. The tension and ambivalence between, on the one hand, the extensive use of apps and its perceived usefulness, and on the other, their perceived inaccuracy and resultant frustration could be read through prevailing social discourses and imaginaries about data. Contemporary discursive ideas of data stress the importance and precision of data (Smith, 2018). Several farmers mentioned how their parents had demanded quietude during TV weather forecasts, imprinting a strong impression of the importance of weather data. Thus, widespread discourses surrounding data may have created expectations that weather data *should be* more precise and useful, causing unwillingness to abandon weather apps amid strong senses of frustration.

Decontextualised perspectives of weather?

In our study, the local weather data provided by apps are valued because of their granularity. Nonetheless, most farmers still stress the inaccuracy and imprecision of local app data. A problem seems to be that data are not sufficiently fine-grained. Datafication as fostering a process of decontextualisation is a way to describe how local variation, heterogeneity and subjective experiences are reduced to standardised sets of variables that are detached from experience and the full context of a phenomenon (see Mayer-Schönberger and Cukier, 2013; Mejias and Couldry, 2019). But weather apps and their data are supposedly meant to do the opposite – namely to contextualise. This is, however, not how farmers experience them. Decontextualisation is experienced to different degrees and entangled in various dimensions that make up everyday life. However, rather than framing this experience as decontextualisation, it can be called recontextualisation as farmers strive to overcome local weather data inaccuracy with sensory and embodied experiences. To navigate this inaccuracy and to further contextualise local app data, farmers used different means to supplement app data readings, for instance

through embodied knowledge of the local geography and common weather patterns. This entanglement between digital devices and tacit knowledge helps to recontextualise weather data to a specific location. It is a negotiation and articulation of meaning-making processes that combine embodied knowledge and data (cf. Pink et al., 2017; Taffel, 2019):

Sometimes they [the apps] can show that it's blowing a certain meter per second. But it doesn't do that everywhere either. It's so field-specific. We have some land that is protected by forest. You can handle that in a different way. If you think about wind drift and such (Uppland 4).

The sensory encounters with data (Abildgaard, 2025; Lupton, 2017) – explicit articulations of the entanglement between data, senses and embodiment – recontextualise data by taking features of the local terrain into account, thus providing meaning.

Local app data were also recontextualised through attention to the moon cycles, personal sensing of the weather by looking at the sky, when Easter falls and idiomatic expressions from the traditional Swedish farming calendar. The entanglement between app data and tacit knowledge helped farmers to recontextualise local weather data, as data is rendered meaningful through mundane tacit knowledge (Pink et al., 2017; Searle et al., 2024). This farmer explained why they always paid attention to the Easter period:

If I look at the forecasts, it will be wrong. So...you know we talk about it. We actually went around the table here one day. There was an electrician who was here. And then he said "Isn't it time to start sowing yet?" "No, Easter is late this year." "What do you mean?" Eight years out of ten there is spring farming at Easter. And that's just the way it is. (Scania 3).

While many farmers relied on such tacit knowledge to recontextualise weather data, others used global weather data for the same purpose. An effect of weather app data and its attempted contextualisation to a specific locality is the ensuing void of information concerning how global weather phenomena affect local conditions. Commonly, the standard display of weather data through numerical fields concerning temperature, wind speed, wind direction and precipitation come to decontextualise weather to isolated local data points. Some interlocutors also mentioned this issue – while apps give them data points of the assumed local weather, they are not presented with the broader global context of local weather patterns:

What are these apps really? They are very small squares, and they try to be precise in very small places. And when the weather is very local, it is clear that it may be an equation that is impossible, in principle. That is why it has become more interesting with this "big weather" with longer term forecasts (West Gothland 3).

In an effort to become locally relevant, the broader picture of weather as a global, interconnected system fails to be specified in the apps' standard displays of weather data.¹ Local weather, then, becomes a spatially isolated phenomenon; an issue which has also been observed when laypeople's understanding of air quality is influenced by the display of certain pollutant concentrations as isolated local data points in air quality apps (Graminius and Haider, 2025). To acquire an understanding of local weather patterns, some farmers used weather apps in tandem with Scandinavian Farmers – a specific weather service. Scandinavian Farmers provided their users with monthly forecasts presented by a meteorological expert, giving depth to local weather forecasts by describing weather conditions globally and their potential effect on local weather. This farmer reported how this weather service affected their weather knowledge:

So we use this service, and it has both short-term and long-term weather. And to some extent, I think you get these storms... It's the same as... Like, have there been hurricanes in... can I say the Gulf of Mexico anymore? [...]. 7–10 days after the storm is there, the weather will come here. And then you kind of have a week to prepare for it... (West Gothland 1).

The practices of these farmers could thus be seen as another way to recontextualise weather. Rather than being content with isolated local data points, farmers assert agency through their use of apps that are *not* tailored to local conditions in an attempt to recontextualise weather as an integrated, global system. The entanglement comprised of the use of various data sources illustrates how data are reshaped, recontextualised and made useful by their practitioners (cf. Pinel and Svendsen, 2023).

Detachment and managerial perspectives of weather and agricultural work

Datafication also describes how processes of quantification influence the modus operandi of related practices involved. In particular, the quantified phenomenon transforms into something to be managed and analysed, a phenomenon described as a data-induced managerial perspective of the world (Mejias and Couldry, 2019; Mayer-Schönberger and Cukier, 2013). These processes introduce what scholars have described as a distance between the quantified phenomena and the self – a detachment (Lupton, 2018). As such, detachment and managerial perspectives can be perceived as closely related and two sides of the same coin.

In our study, weather apps and other weather sources, such as TV and radio broadcasts, are tools that help farmers monitor and forecast the weather. Like Lupton's (2018) description, they may also detach and produce a distance between the phenomena measured and the self. They represent

a long-standing tradition of ‘outsourcing’ the forecasting of weather to scientific models and related devices, but does this mean that they have adopted a managerial perspective of weather and their profession? As established in previous sections, their use of weather apps was entangled with tacit and sensory knowledge of the local geography and local weather patterns. However, in this section, we highlight tension and ambivalence between embodiment and data – a general feeling among the farmers that digital weather tools infringed on their own capabilities of reading the weather by paying attention to their natural surroundings. This was especially clear when compared with previous generations of farmers:

- Interviewer: Do you think this digital system helps you to improve your “reading” of the weather?
- Farmer: No, you probably get worse. No, but I would say that these old practices, which the older generation had. It wasn’t quite...they didn’t blindly go and mow hay. They acted on some type of weather interpretation. Nature interpretation, so to speak. I think this digital system has probably made your natural reading worse. I would think so (Uppland 2)

In this specific context, data are made sense of through sensory and embodied experience, but data also make our interlocutors worse at interpreting their sensory experiences. Thus, while embodiment is an asset and integral part of sense-making, it also causes tension. Feeling your data (Abdilgaard, 2025; Lupton, 2017), or drawing on tacit embodied knowledge in the readings of mundane data (Pink et al., 2017), is thus not a process that inevitably enhances understanding and meaning-making. Instead, it is imbued with ambivalence, a feature we think is not fully embraced in previous studies of everyday data.

Generic weather apps were acknowledged as a potential source of tension between embodied knowledge and local data. This was also pronounced in interlocutors’ use of commercial all-purpose local weather stations apps and farming-specific apps. The data created in these commercial apps are generally owned by the company providing the device. Coupled with the farming recommendations of these apps, the devices are sometimes referred to as emblems of the commercialisation of meteorology and agriculture (Atasoy, 2025; Oui, 2022; Randalls, 2010). Local field-specific weather station apps were deemed indispensable among the farmers possessing them. The exact wind speed and wind direction over a given field are displayed, and thereby guide farmers’ movement over that specific field, e.g. where to start spraying and when to stop if the wind picks up. In part, this technological dependency and intensification of the use of data are driven by legal regulations concerning the use of chemicals at particular wind drifts. Local weather station apps thus also serve

a legal purpose, a way to safeguard against lawsuits. The field-specific weather data can corroborate claims that the use of chemicals was done within stipulated regulations (Scania 3). Yet, weather station apps were also frowned upon. Farmers often already had an intimate tacit knowledge of the field-specific data these applications displayed:

Well, it’s enough that there are three days of really sunny weather in the summer, then the crop burns down, it turns yellow and dies. There is no water. And, obviously, to grow a crop there that requires water without having great irrigation, that is a waste. It will fail. We don’t need a weather station for that. We know that. We just memorise this, and we will know about it (Scania 3).

In this quote, we can discern a reluctance towards field-specific weather data, even if, as stated in the rest of the interview, they used it. Using the lens of datafication and related processes that transform the measured phenomenon into something to be managed and analysed (Mayer-Schönberger and Cukier, 2013; Mejias and Couldry, 2019), the ambivalence the farmer expressed is seemingly related to the threat field-specific weather data pose to embodied knowledge of local weather manifestations, and to the close sensual relationship with the land a farmer traditionally possesses. As Lupton (2018) stresses, datafication may introduce a distance between the quantified phenomena and the self – a detachment. But in the context of farming, professional knowledge of one’s land and its reaction to different weather conditions is part of farmers’ unique professional skills (cf. Eastwood et al., 2019; Nyadzi et al., 2021). In this context, outsourcing assessments of weather and its local manifestations to a digital device detached from farmers’ tacit knowledge run the risk of undermining professional skills and identity. In fact, in the entanglement of tacit professional knowledge and other digital equipment, scholars have reported how farmers may experience a sense of loss of tacit knowledge and skills (e.g. Bear and Holloway, 2015; Preininger, 2024). In our study, the field-specific data generated by the commercial weather stations are closer to farmers’ tacit knowledge and thus have the potential to induce ambivalence. Indeed, to some interlocutors feelings of detachment induced by digital managerialism of local weather were highly present: ‘Because it becomes very...when you have it (weather) in a digitalised system (phone weather app)... it becomes very, yeah, it becomes like a driving schedule’ (West Gothland 2).²

While the farmer quoted above seemed resigned to the experience of their work and weather as a form of management, others welcomed managerial practices of datafied agriculture, specifically datafied decision-making and farming-specific weather apps. Interlocutors using generic weather apps expressed this idea accordingly:

- Farmer C: Yes I think, for us, it is important to know when to cut grass and when not to cut grass.

- Farmer A: Yes but that's not something that the weather app can say, haha.
- Farmer C: But if I think about a perfect app, a dream app. If I think now about your question, what (functions) would you like the app to have? And then it's, well, should we chop grass today or not? Or should we do it on Thursday? (Scania 5c)

Desires and new expectations from data have been labelled data imaginaries (Beer, 2019; Knorr and Pentzold, 2025) – a way to illustrate how discourses surrounding data affect visions of what data can achieve and reveal. Data imaginaries, like data discourses, are often imbued with positive connotations of data and a belief in the progress, precision and objectivism of data; they are also tools of power, often disseminated by governments or tech firms (ibid.). In the example above, ideas of the potentiality of weather devices to not only monitor but also analyse weather data for a specific task reveal a common positive discourse surrounding data that is also frequently proposed by agricultural tech firms (e.g. Cordulus). Instead of viewing weather as an integral part of farming knowledge, it becomes a distant condition that is 'managed' by digital devices owned by commercial companies. Here, weather is still important to agriculture, but also further detached from the farmer's knowledge and sensory experiences of weather. The longing for a datafied decision-making process concerning weather forecasts indicates a change in how weather is viewed and approached. Instead of making decisions based on the entanglement of different sources – weather apps, tacit knowledge, experience, physical immersion in the landscape, the seasonal crop cycle – agricultural decision-making becomes outsourced to a digital device.

The ongoing transformation of agriculture into a data-driven agricultural industry has been argued to represent a power-shift, subordinating farmers' needs, knowledge and practices to the power of tech firms and venture capitalists (Praise, 2025). The datafied agricultural environment has raised questions about the changing roles of farmers (Ofstehage, 2018). Commonly, agency is removed from farmers as their new role is to execute the plan indicated by commercial digital devices (Preininger, 2024). In our material, this was not necessarily how farmers experienced the situation. As the examples above illustrate, some saw these devices as desirable and empowering, a substantial help in their farming operations. To others, detachment and ambivalence emerge in the intersection of weather app use, legal requirements and tacit knowledge, sensitising farmers to the power of external actors.

Concluding discussion

This study serves to unravel farmers' apprehensions of weather and agricultural practices in relation to their use of

weather data. We illustrate how weather data are entangled in embodied and tacit knowledge, social discourse, legal requirements, habits, routines and other weather forecast sources. This results in instances where facets of datafication are more pronounced – such as in the importance farmers' attach to weather data, and the managerial perspectives and senses of detachment experienced among farmers. However, there are also instances where the meaning-making of data is recontextualised or fraught with ambivalence. The contextual digital entanglements provide a space for a multitude of experiences, and among those, also entanglements where certain facets of datafication are pronounced.

In some regard, farmers' data interactions are experienced as decontextualising weather to a specific locality, downplaying understandings of weather as an interconnected, global system. Weather becomes understood as a granular, point-based system of questionable reliability. This does not stop farmers from using weather apps – far from. They actively seek such data and recontextualise it through tacit knowledge, sensory experiences and other data sources. As scholars before us have noted, making sense of weather is a continuing process of contextualising and recontextualising (e.g. Pink et al., 2017; Searle et al., 2024).

Furthermore, to some extent, weather data turns weather into analytical units, further detached from farmers' sensory experiences, impoverishing farmers' skills in reading the physical weather in the process. Weather, as a physical phenomenon, thus becomes further detached from farmers' immediate experiences and on-the-ground observations, even if these latter aspects are also still present. However, there are also instances where weather app data help farmers to connect with the local weather. The diffusion of temporal and geographical boundaries in apps enable farmers to connect to local weather manifestations regardless of their geographical location. Datafication does not induce detachment by default, it can also promote a closeness to the phenomenon measured (Searle et al., 2024).

The most salient feature of data-induced changes in relation to farmers' practices is the *intensification* of weather forecast consumption coupled with a more intimate attention to unfolding weather conditions as displayed by apps while engaging in farm-work. Routines, habitual practices and social discourses rooted in the importance of weather data also facilitate this change. Farmers express facets related to datafication processes, but they also continue with practices and understandings that pre-date weather apps and express understandings of weather that are not in line with datafication processes.

In particular, farmers' experiences of weather data entanglements are somewhat characterised by ambivalence and the co-existence of conflicting feelings, practices and attitudes. Farmers see weather data as extremely important, but are at the same time critical towards their increased use of data and the perceived inaccuracies in the data. They are both frustrated and pleased with changing professional practices and routines that weather app data consumption has introduced. This


ambivalence is in many ways characterised as a sense of constantly being ‘in between’ – of shifting entanglements pulling in different directions. Thus, while digital entanglement conceptually describes the interaction with data and contextual processes of meaning-making, we propose the term ‘digital betweenness’ to capture the in-between space where agency, data, discourses, routines and embodiment intersect. In comparison with entanglement, digital betweenness can be likened to a specific space produced by the processes of entanglement. Digital betweenness relates to the practices and understandings experienced at this specific space, but also to aspirations and feelings. More specifically, digital betweenness is characterised by ambivalence: it captures the sense of being pushed and pulled in conflicting directions in relation to data and their entanglement. As displayed in our empirical material, digital betweenness is both a specific intersectional space where agency, data, embodiment and knowledge meet, and an articulation of the ambivalence this space may generate.


Everyday data does not only constitute a space where interlocutors integrate, recontextualise and negotiate understandings in their routines and practices in ways aimed at aligning diverging experiences, as described in previous literature (see Lupton, 2018; Pink et al., 2017; Sumartojo et al., 2016). Rather, people’s interaction with everyday data can be a concurrent experience of negotiation and rejection, recontextualisation and decontextualization. It is a space where different emotions, practices and attitudes coexist, and where the assertion of agency is pursued in different directions. Drawing on Abdilgaard (2025) and Lupton (2017), we stress the everyday as a space to explore the ‘data feel/sense’, but not only for reflections around one’s own data habits and practices. The intersectional space where digital entanglements meet – the digital betweenness – carries potential for reflections on larger socio-political issues, power relations and discourses tied to data. Indeed, ambivalence can sensitise data-users to the world around them. We see the emphasis on ambivalence – the digital betweenness – as an expansion of existing scholarship on mundane data, and a sensitising entry point to citizens’ data encounters – environmental and beyond.


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This research was approved by the Swedish Ethical Review Authority, reference number 2024-06023-01. All the participants in this study have read and signed informed consent statements.

Author contributions

CG was responsible for conceptualisation, writing, editing, material collection, material analysis, and project organisation. BE was responsible for writing, material collection, material analysis, and editing. OL was responsible for writing, material analysis, material collection. RW was responsible for material collection, material analysis, editing.

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Data availability statement

The transcribed interviews have been stored according to the stipulated recommendations in the ethical review and are not made publicly available.

Supplemental material

Supplemental material for this article is available online.

Notes

1. Admittedly, rain radar, a satellite view map and a feature of some apps, invites farmers to inspect larger geographies outside their immediate locality, placing the local weather into a larger context. However, this is not the standard app view, and not available in all apps.
2. In some cases, it is not data that fuel a managerial approach, but the organisational structure of the farm enterprise. For instance, interlocutors spending most of their time in the office as managers tended to only check the weather data to reach decisions about the timing of different farming operations, disregarding other ways of knowing the weather (Uppland 3).

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