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# Social Agriculture: Examining the Affordances of Social Media for Agricultural Practices

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## ABSTRACT

This paper examines the experiences and perspectives of Kenyans who use social media platforms as part of their agricultural livelihoods. Through a mixed-methods study of 324 survey respondents and 81 interviews, we present data that demonstrates the significance and shape of “social agriculture” in the Kenyan agricultural landscape. We complement previous ICT4D/HCI4D literature that has primarily focused on purpose-built agricultural platforms through a novel focus on farmers’ appropriation of existing social media platforms to enter the agricultural sector and diversify agricultural livelihoods. Our study highlights new insights into the growing phenomenon of using social media platforms for agriculture practice, including how these platforms afford particular practices around the buying and selling of produce and information on social media platforms. We also identify challenges around trust and online abuse and describe the strategies employed by participants to counter them. Lastly, we build on our findings to highlight the affordances and constraints of using social media platforms, thus contributing to the field an initial conceptualization of social agriculture as a space of commerce. We offer eight design considerations for both technology designers and international development stakeholders to strengthen the potential for social platforms to afford social agricultural practices that enrich individual lives and livelihoods.

## CCS CONCEPTS

• Human-centered computing; • Human Computer Interaction (HCI); • Empirical studies in HCI;

## KEYWORDS

Farming, Social Commerce, HCI4D, ICT4D, Affordances



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## 1 INTRODUCTION

The use of social network platforms for everyday livelihood practices is an increasingly global phenomena [12, 27, 45]. The use of digital technologies for agriculture is the subject of increasing attention [34, 38, 58, 78] while the use of social platforms for specifically agricultural livelihoods is a rapidly growing and distinct phenomenon [68, 76]. Based on our exploratory research in this area, we propose the term *Social Agriculture* to refer to the set of practices composing the use of social media platforms to support agricultural livelihoods. We use the term *social media platform* to refer to technologies that act as bases on which varying social [46] and complementary networked activities take place [25]. Through our formulation of social agriculture as both an area of study and space for development interventions, we complement inquiry into dedicated platforms by focusing on the appropriation of existing social media tools for everyday agricultural activities. By analyzing data from a mixed-methods study (315 surveys and 81 interviews) conducted with actors in the Kenyan agricultural sector, we demonstrate the significance of social agriculture to the Kenyan farming landscape, the shape of social agriculture across multiple social media platforms, and how these platforms are used for the trading of produce and information. Additionally, we describe how agricultural actors navigate challenges of trust and online safety. We use Glover et al.’s [30] affordance-based framework to discuss the affordances of social media platforms that enable and shape new agricultural propositions, encounters, dispositions, and responses. We show how social media presents new agricultural *propositions* that users become aware of (*encounter*) through platforms’ various affordances. We unpack how gender- and trust-related characteristics shape actors’ *dispositions* towards these encounters and how these affordances culminate in multiple discrete pathways

(*responses*) that participants formulate and navigate. In doing so, we contribute the conceptualization of social agriculture and offer rich accounts of social agricultural practices and affordances as areas for further HCI for Development (HCI4D)/ICT for Development (ICT4D) inquiry and design.

## 2 RELATED WORK

We situate our conceptualization of and findings related to social agriculture at the nexus of HCI4D/ICT4D research on (1) digital agriculture, (2) social commerce, and (3) the use of social media to disseminate and share agricultural information. Furthermore, given that area of inquiry is focused on how individuals are opportunistically using social media platforms, and the ways in which these platforms are configured and adapted to engage in agricultural activities we discuss our findings through the lens of affordances as used within digital agriculture and HCI research.

### 2.1 Digital Agriculture

HCI4D and ICT4D have long been concerned with designing, deploying, and evaluating digital agricultural services and connected sectors [33] in the developing world. Research has explored the use of multiple technologies, including mobile phones [43, 52, 61], Interactive Voice Systems [58, 59], and sensors [13] to support the agricultural sector [19, 35]. Furthermore, a prominent strand within HCI4D/ICT4D has been the use of purpose-built technologies for disseminating and sharing information, such as market prices [7, 14, 78], expert advice [38], and experiential knowledge from peers [37, 45, 46, 51, 52]. Dedicated digital agricultural technologies have been deployed to promote the productivity and performance of individual farmers, as well as those of supporting services and connected sectors [33]. Within HCI4D/ICT4D, these technologies have predominantly aimed to ensure real-time communication on agricultural issues and best practices [21]. In India, Patel et al. [58, 59] deployed an Interactive Voice Response system that farmers can call to access agricultural information, including tips from peers and university experts. Voice-based chatbots [38] have been used to enable farmers to ask questions that agronomists respond to. Dedicated platforms have also been specifically designed to enable sharing information, such as *Krishi Kontho* [14] and *eSagu* [61], which support different media formats, and agriculture-focused social networking platforms to support peer learning have also been developed [43, 52]. Other research has been conducted on technologies and digital services launched by startups and telecommunications providers. In an evaluation of *MFarm*, developed by a Kenyan startup to disseminate agricultural information, researchers found that it had only a limited impact on users' trading relationships [7] and was underutilized by farmers [78]. Similarly, while the digital agriculture service *DigiFarm*, launched by telecommunications provider *Safaricom*, has more than 1.4 million registered users in Kenya [64], an evaluation found that only roughly 25% of registered users are active [57]. Despite this progress, the sustainable use of such technologies and services has been limited [19, 53]. This has been attributed to a mismatch between the information shared and farmers' individual information needs [11, 19, 35, 36, 67] and between platforms' methods of knowledge delivery and farmers' ways of learning and device usage, particularly mobile phones [78].

Some research has also found that the impact of ICTs on agricultural practices and livelihoods in developing countries has been minimal [2, 3, 22].

The key commonality across these examined digital agricultural technologies and services is their goal to mediate the sharing of market and other agricultural information. Evaluations have identified that farmers value the ability to access market information [7, 78], engage with their peers [59], ask questions [58], share farming activities [43], and receive expert advice [61]. Furthermore, the evaluations show how, despite valuing expert advice, farmers tended to prefer gaining experience-based knowledge from peers [58] in a conversational manner, rather than via one-directional messaging [38, 58, 59, 78]. Importantly, these studies distinguished this information-sharing from economic activity and trading practices. As such, the research highlights the value farmers place on social interactions with peers and experts through which they gain information, but does not account for the preference for information from peers over experts as a form of economic practice and activity. The incongruence between the reported value placed by farmers on the information provided by purpose-built agricultural technologies and their low usage of them has been attributed to: (1) information not corresponding with farmers' decision-making practices and complex livelihoods [11]; (2) contrasts between how farmers learn and how knowledge is delivered [78]; (3) farmers' higher expectations of platforms [38, 81]; and (4) technology implementers not accounting for the literacy, skills, culture, and demands of target users [19].

### 2.2 Social Commerce and Agriculture

Social commerce has been found to be especially prominent in Saudi Arabia [4], Kuwait [31], Thailand [8], and other emerging markets. This can be partly attributed to new functionalities that afford the marketing and purchasing of goods through social media platforms [27]. Furthermore, social commerce has been found to appeal to those in emerging markets as it typically involves minimal registration requirements, does not require a business license, requires little upfront investment, and offers flexible payment methods [50]. Several studies [12, 75, 80] have extended social commerce inquiry to Instant Messaging (IM) platforms such as *WeChat*; they found that users in China are increasingly posting and recommending products to their real-world friends in group chats. The research has shown that social commerce on IM platforms leverages preexisting social relationships, mutual trust, shared identity, and community norms to influence consumer decision-making processes [12]. Additionally, because IM-based social commerce creates new social relationships and maintains existing ones [12], Zhou et al. [80] identified it as fertile ground for young people to start new businesses and generate income. Furthermore, in Cambodia, Jack et al. [37] show how social media tools have been creatively integrated in to the existing trade infrastructures, such as motorcycle delivery, as part of an ad hoc and imaginative development of commerce.

Despite this growing body of research on social commerce, there has been limited research exploring the intersection of social commerce and digital agriculture. A 2015 Africa-wide study found that approximately 45% of young farmers and agricultural entrepreneurs

used social media to connect with agricultural stakeholders for business purposes, 32% to buy and sell products, and 28% to promote their services [49]. Accounts have documented the use of social media for agricultural transactions; however, they have been bound to specific events, such as the outbreak of COVID-19 [51], or to specific platforms, such as Instagram [73]. Farmers in Zimbabwe turned to social media when COVID-19 pandemic lockdown conditions disrupted typical sales avenues [51]. A study on fresh produce sellers in Indonesia found that paid Instagram ads failed to enhance content engagement, due to inexpert management of social media advertising campaigns by less tech-savvy sellers [73].

### 2.3 Social Media for Agriculture

While HCI4D/ICT4D research has yet to fully explore the use of existing social media platforms as economic tools within the agricultural sector, research has been conducted on the use of such platforms as modalities for the sharing of information by multiple agricultural actors.

The Agricultural Extension Sector—governmental and non-governmental organizations that aim to support farmers and the agricultural sector—has been found to use social media to reach large numbers of farmers [1, 65, 66, 68]. For example, Thailand's Department of Agricultural Extension uses Facebook and YouTube to publish agricultural information [40]. In their deployment of a Weather Information System in India, Chaudri and Kendall [13] report on how farming recommendations were forwarded from agricultural extension offices to community mobilizers and volunteers, who then used WhatsApp, SMS, and printouts to disseminate the information to farmers. However, recent research has shown that the use of social media by Agricultural Extension offices and staff is still underutilized [15, 40, 56, 68, 71] and often remains one-directional (social media is used to only disseminate information rather than interact with farmers) [68].

Studies have found that farmers use social media to find information related to crops, farming practices, weather forecasts, and subsidies [39, 42, 60, 66, 76]. A global survey assessing the advantages of social media for gaining agricultural information found that 75% of respondents use social media to find information, 74% to share information/ideas, 56% to discuss a new topic, and 35% to get suggestions from peers [68]. Furthermore, a study in Kiambu county, Kenya, found that 42.9% of respondents use Facebook as their main social media platform when looking for agricultural information [76]. In Njoro subcounty, 41.3% of participants also used WhatsApp for agricultural information [62]. However, access to information does not necessarily translate to improved livelihood opportunities, and not all information shared/accessed fits with farmers' decision-making practices or the situated complexity of their livelihoods [13]. Therefore, an economic lens is needed to analyze and understand how social media platforms are used in the agriculture sector to facilitate trade, i.e., social commerce.

### 2.4 Affordances within Agriculture & HCI

The concept of affordances—i.e. the resources within an environment that enable the opportunity for interactions [28, 55] has been widely used within digital agriculture and HCI. Ditzler et al. [17] and Eastwood et al [18] posit that using the lens of affordances

enables the evaluation of agricultural systems analysis tools and agricultural co-design processes, respectively. Through their evaluation of three different tools Ditzler et al. [17] point to the capacities of these tools in providing the affordances of harnessing, naming, aggregating and framing of agricultural data and information (structural affordances) as well as integrating, quantifying, visualizing, analyzing, exploring, manipulating and visioning (functional affordances) within the problem space to which the data pertains to. More recently, Glover et al. [30] proposed an affordances-based framework that accounts for farmers' agency within their interactions with technological interventions that they theorize can improve the design of dedicated agricultural technological interventions. The proposed affordances-based framework [30] consists of propositions, encounters, dispositions, and responses that interplay when farmers are interacting with a technological intervention. *Propositions* are described as the *opportunities afforded by a technology that offer an alternative way of working and new or different outcomes* and *Encounters* are characterized as *the means through which farmers become aware of the propositions being afforded*. How farmers respond to propositions that are encountered is influenced by their *Dispositions*, which are the factors that influence whether an individual is positively disposed to the proposition and these factors can be a combination of cultural, economic, biophysical, spatial, temporal factors that shape how a proposition that is encountered is perceived. Lastly, *Responses* pertains to the *unique and diverse pathways through which farmers unpack, reassemble and configure propositions to meet their own aims*. As such, Glover et al's [30] affordances-based framework supports analysis of the use of digital technologies as well as the design of technologies that account for and center farmer's agency within their adoption of and interactions with digital agricultural tools. Therefore, given our focus on the opportunistic and farmer-led appropriation of social media platforms as part of their agricultural activities, we draw on Glover et al's [30] framework to structure our discussion.

While the above detailed framework provides us with an understanding of how affordances may be designed for within agricultural technological interventions, the exploration of affordances within HCI [5, 41, 70, 78] shows how the concept can be used to understand how the wider context beyond technology also plays a role in affording and constraining action in contexts such as the practice of social agriculture. Wyche et al. [77, 78] demonstrate that despite digital technologies affording new modalities for improving agricultural livelihoods, socio-economic factors such as the cost of mobile phones constrain women farmers from accessing such technologies and in turn from encountering the propositions presented through these technologies. Furthermore, HCI researchers [41, 70] have highlighted how when examining the properties of interactions between people and technologies affordances should be understood as relational in nature. The research indicates that rather than viewing the affordances of technologies as neutral and static aspects that stem from the technology itself, we should consider how affordances come about from the actions and interactions of users with the technology, one another and the wider environment in which the technology is being used. Kaptelinin and Nardi [41] further extend on the notion affordances by highlighting that given technological artifacts can be combined with other artifacts understandings of technological affordances and the interactions

they mediated should be understood through the lens of aggregation and users' capacity to navigate these aggregations. We use these understandings of affordances within HCI to augment Glover et al's affordances-based framework as we discuss and characterize the affordances of social media platforms in relation to agricultural activities.

### 3 RESEARCH METHODS

To investigate social agriculture, we conducted a mixed-methods study in Kenya. Kenya's economic growth is highly dependent on its agricultural sector [33, 76], which directly contributes 26% of the country's GDP [24]. Approximately 45% of government revenue is derived from agriculture [76]. ICTs and the emerging digital agriculture industry are key factors in the development of Kenya's agricultural sector. There is growing interest among businesses and governments to integrate ICTs into their national agriculture strategies [23]. Over the past 15 years, mobile-phone-based and/or internet-enabled agriculture services have been developed to offer solutions to various challenges within the Kenyan agricultural sector [33]. The transition to internet-enabled services is illustrated by a 2017 assessment of e-Extension platforms, which found that 75% of users preferred accessing the platforms via internet-enabled devices [29]. A 2021 study found that approximately 34% of Kenyan smallholder farmers own a smartphone [44].

#### 3.1 Data Collection

We conducted an online survey followed by a two-stage interview process. To recruit participants, we used a Facebook advertising campaign to target users over 18 years of age who live in Kenya and have an interest in agriculture. We also asked a small group of Kenyan farmers and agronomists who are active on social media to share the survey in their networks. Interviewees were recruited by one co-author, who works as a farmer in Kenya and owns one of the larger farming Facebook groups; she approached potential participants and obtained consent prior to interviews. We worked to maintain a balance among interviewees' range of roles in social agriculture, gender, and geographic location. Prior to commencing the study, robust ethical review was conducted by the ethical review department of the research consultancy granted funding for the research.

**3.1.1 Survey.** Our participant sample ( $n = 324$ ) consisted of farmers (43%), agronomists (24%), and students (14%). The remainder of participants were buyers (5%), farm managers (4%), Facebook group leaders—including Facebook group owners, moderators and administrators—(1.5%), and others (8.5%). It is important to note that while some participants identified their primary role as "Student" or "Facebook group leader," this does not necessitate that they do not practice farming and/or the buying and selling of agricultural products. The sample had an approximate 50:50 split in self-reported male and female sex. We asked participants to respond to questions on: their use of social media platforms as part of their farming activities and livelihoods; their preferences regarding different social media and digital agriculture platforms; their experiences of the 2021 Facebook, WhatsApp, and Instagram outage; and the challenges they face on social media.

**3.1.2 Interviews.** Interviews were conducted through a two-stage process. First, we carried out 15- to 25-minute interviews with 60 people involved in social agriculture. These served as initial scoping interviews that guided the second round of in-depth interviews. Twenty-one of the 60 respondents were selected for additional in-depth interviews that explored their social agricultural journeys. The selection of the 21 interviewees aimed to include a cross-section of roles related to farming and a broad representation of ages. Interviewees also varied in their length of involvement with farming and engagement with social media. All interviews were carried out via video call, recorded, and transcribed. The in-depth interviews were semi-structured and followed a topic guide that stimulated open conversations and encouraged interviewees to explore issues that were important to them. The interview schedule was based on topics drawn from the findings of the 60 short interviews and the literature review.

The 21 interviewees include individuals engaging in multiple agricultural activities, as well as owning and administrating social media groups and pages (Table 1).

The majority of the 21 interviewees had higher education qualifications at diploma or degree level, previously held white-collar jobs, and had family backgrounds in agriculture (their parents and/or grandparents had been farmers). All interviewees, if they had worked elsewhere, had returned to agriculture or closely related roles within the agricultural sector.

#### 3.2 Analysis

Survey responses were collated, and quantitative analysis was conducted using Windows Excel. Text-based survey responses were combined with the data corpus generated from interviews, and thematic analysis [9] was conducted. The corpus was manually coded (example codes: sharing information, selling, and referrals) and then grouped thematically. Themes were revisited in the process of writing this paper [10]. Findings from the survey and interviews were then examined together and thematically matched to provide a rich account of participants' social agricultural practices.

### 4 FINDINGS

In our analysis we present the significance of social media platforms to different agricultural actors in Kenya, the shape of social agriculture, and rich accounts of the trading of produce and information using social media. We highlight the use of multiple social media platforms in conjunction with one another and themes related to online safety and misinformation that were reported by participants which are then discussed through the lens of affordances.

#### 4.1 The Significance of Social Agriculture

Our survey showed that 75% of survey participants across all occupations, ages, and genders identified that social media has positively impacted farming. The significance of social media to participants' agricultural livelihoods was highlighted by 95% of participants, who stated that they are unlikely to stop using social media. Additionally, three in four participants indicated that they feel they must be on social media to conduct farming-related trade. The essentiality of social media to participants' livelihoods was further emphasized by 57% of participants reporting that lack of access to social media

**Table 1: The pseudonyms of in-depth interviewees and the roles that they hold**

Pseudonym	Roles
Jane	Farmer, Agronomist, WhatsApp (WA) group administrator
Paul	Veterinarian
James	Farmer, Consultant, Moderator for several social media groups
Anna	Farmer
Edward	Farmer
Mary	Farmer
Catherine	Farmer, Facebook (FB) page owner
Simon	Farmer, YouTube channel developer
Beatrice	Farmer, Agronomist, WA group administrator, FB group owner
Beth	Farmer, WA group administrator
Martha	Farmer, Video content developer
Susan	Livestock farmer
Luke	Tree planter, Conservationist
John	Farmer
Felicity	Urban “vertical garden” builder and installer, runs a model urban garden
Peter	Greengrocer, online and via brick-and-mortar shop
Mark	Agricultural consultant, FB group administrator
Florence	Agronomist, Aggregator and marketer via a WA group she administers
Alice	Middleman, buys and sells onions and potatoes, Student
Thomas	Livestock farmer, Engineer
Stacey	Farmer, FB group owner, WA group administrator

platforms would negatively impact their income, and 24.5% said that it might. Furthermore, 49% of participants indicated that the Facebook/WhatsApp outage experienced on October 4, 2021, negatively affected their commerce; one survey participant said, “I was to make an order of farms inputs through WhatsApp, but that didn’t happen.”

The qualitative interviews revealed how social media played a central role in introducing participants outside the agricultural sector to potential opportunities for agricultural businesses:

*“With COVID-19 going on around the country, it was a bit difficult for me in the engineering business. . . . So I went back to social media and that’s where I met so many guys who are farming pigs and they really helped. So after that, I did the construction of the structures and brought my first pregnant sows.”—Thomas*

*“We used most of the information we get from social media, from finding the market, finding the right seedlings, the varieties, finding out about diseases that majorly affect the production of capsicum.”—John*

For others, social media provided new ways to access markets in ways that enabled them to avoid the harassment and discrimination faced as a female traders in local markets:

*“I used to take my tomatoes to the market. . . . So as a woman, you are already scared at 3:00 AM at the market standing there waiting for your tomatoes to be sold.”—Beatrice*

Beatrice found that the men in the physical market intimidated her and would not give her a good price for her produce. Consequently, she found her way onto social media:

*“You post things there [on social media], people put their price. . . . So you can decide online, I’m going to sell it to this person or to this person or this other one. . . . you show them samples online. . . . Basically online you just need a good camera, take nice pictures of your produce and then post it to your people. So for online, it’s a bit calmer. . . .”—Beatrice*

Furthermore, Beatrice described running a successful Facebook page, a Facebook group with over 60,000 members, and a seven-year-old WhatsApp group. Beatrice also reported that she got a job with a seed development company after posting on LinkedIn, and therefore she reported being “on social media every hour”.

These brief examples show the wide spectrum of engagement with social media. Our analysis found that beginners, like Thomas and John, found that the information they can access via social media to be crucial to their early farming ventures. Others, such as Beatrice, have moved quite rapidly into the social media sphere by becoming administrators and/or moderators for Facebook and WhatsApp groups.

## 4.2 The Shape of Social Agriculture: Platforms and Groups

The top three platforms used for social agriculture in Kenya were found to be Facebook (62%), followed by YouTube (16.15%) and WhatsApp (13.35%). Dedicated platforms for agriculture, such as those detailed in section 2, were only identified as preferred by ~3% of participants.

**4.2.1 Facebook.** Survey participants who favored Facebook highlighted its ubiquity in Kenyan rural areas, features that enable the buying/selling of information and produce, and live interactions with experts. When comparing Facebook to WhatsApp, participants

highlighted that on Facebook they can access and view information previously shared, even after long periods of time, and interact with individuals who are not necessarily their friends. From the perspective of generating income through social agriculture, some interview participants reported that they use Facebook to promote their produce and information services. Furthermore, interviewees who own and/or administer Facebook pages and groups recounted how they use these groups to get sponsorship deals from agriculture product companies (see section 4.3.1).

**4.2.2 YouTube.** Interview participants reported using YouTube for learning, often via videos explaining how to cultivate different crops or how to treat pests and diseases. Participants also use YouTube to advertise their informational expertise. Agronomist participants, for example, identified that they can build new business from viewers who visit their YouTube channel. Simon reported investing significant time and resources to build his YouTube channel; currently, he has over 3,000 subscribers and around 100 uploaded videos. Through a social media training course, Simon learned that, for his videos to be accessible and captivating, he needed to authentically tell his own story in his own words. Simon is steadily building his brand and in turn generating income through a regular flow of paid consultancies (expanded on in section 4.3.2). Interviewees also indicated that they use other social media platforms to direct people to their YouTube channels; Simon stated that: *“I use Facebook, TikTok, Twitter to post my videos and send people to my YouTube channel.”*

**4.2.3 WhatsApp.** Interviews showed that WhatsApp is popular due to its unique affordances (compared to Facebook and YouTube) that participants reported leveraging for social agricultural activity. Interviewees described using WhatsApp to conduct agriculture-related voice/video calls and to send messages with links to information or videos. They reported that WhatsApp offers the ability to compress data—which is not widely done via Facebook—so video calls are more affordable and easier. Additionally, interviewees considered the establishment of and participation in WhatsApp groups to be particularly important to completing transactions. While such groups are limited in size (up to 252 members), they offered interviewees closed spaces invisible to outside users, a more private alternative to Facebook groups, which they leveraged in multiple ways (see section 4.3 and 4.4). For example, Peter formerly used his personal Facebook page to promote his business, but highlighted that communicating with WhatsApp contacts enables more efficient transactions (see section 4.3).

### 4.3 The Trading Practices of Social Agriculture: The Buying and Selling of Produce and Information

When we asked survey participants about what they buy and sell using social media, 52% indicated buying information and 78% reported selling produce, advice, and/or services. Participants described using multiple platforms in conjunction with one another as strategies to increase their income and diversify their livelihoods. The high proportion of those who buy/sell information as a commodity guided our inquiry into the practice of buying/selling information in the interviews.

While here we present the buying and selling of produce as separate from the buying and selling of information, it is important to note that they are intimately linked. For example, three interviewees mentioned an incident where the marketing of quail eggs led to a decline in the value of the eggs. They described how someone had marketed on Facebook groups the profitability of quail eggs and described their willingness to share their expertise with those interested in farming quail eggs. The posts gained a lot of traction as people widely shared and commented on them, further increasing Facebook’s weighting of the value of the content. Indeed, interviewees indicated that the post became very visible on Facebook and cascaded to the increased practice of buying and selling of quail eggs, with several people using the information to invest in them. However, the consequence of the increase in people selling quail eggs was to saturate the market and decrease the price of quail eggs. This example shows how the way information is marketed and sold on social media has a direct relationship with users’ agricultural practices and the market in which they trade.

**4.3.1 The Buying and Selling of Produce.** Produce was found to be the most sold item on social media (33%), and 54% of farmers participating in the survey indicating that it was the top item that they sold through social media. Interviewees highlighted how they use social media platforms and groups to advertise their products to large audiences:

*“My main market is online. If I’m not on Facebook, I’m missing out. So I have to post something on either my timeline or on my page for people to know that Catherine is selling this at this particular time.”—Catherine,*

*“Let’s say that I’ve posted that I’m selling tomatoes . . . Mostly on my [Facebook] wall there are not many buyers. So I post it to our [Facebook] group. There are farmers groups, there are brokers groups. Yeah. So after posting it on a group, there’s maybe clients saying I can only buy these at these shillings.”—Jane*

Furthermore, some participants identified that sharing photographs and videos of their farming practices enables them to build a trusted brand that attracts buyers:

*“. . . clients really love to see what you are doing . . . Because if you tell somebody your tomatoes are organic, they won’t believe it until they see how you’re doing it . . . So I take a lot of videos and pictures as I am doing farming. Then I post on the platforms . . . my main market comes from people who viewed my content on social media.”—Mary*

While these open advertising and brand-building activities take place on Facebook and in Facebook groups open to a large number of users, transactional interactions often take place separately on WhatsApp:

*“That way [through Facebook] I’ll get referrals. . . And once one gets my number, I add them to my contact list. Then on my WhatsApp, we communicate from there.”—Catherine*

Susan and Jane explained how they bring potential clients from Facebook over to WhatsApp to confirm they are genuine buyers and arrange the sale:

*“You know, [moving] from Facebook to WhatsApp ... I see the kind of the person you are, by using your real name, your real addresses, your real contacts . . . it gives me a way . . . to assess you again, if you are really in . . .”*—Susan

*“When you have found clients on Facebook and then you negotiate further and then they get your contact. You go to WhatsApp, you send pictures or videos of the produce. And then from there you can make arrangements on when you can meet or the client can come visit your farm.”*—Jane

Most of our interviewees followed a similar process. Those with Facebook business account pages, like Felicity, even placed direct links to their WhatsApp on Facebook. Felicity indicated that she provides this link because she finds that her Facebook inbox is too “open” and often full of unwanted communications. Interviewees that are Facebook group owners/administrators also indicated that they often generate income through sponsorship deals with agricultural companies that sell products such as fertilizers. By leveraging their Facebook groups these individuals can market and sell the products of such companies.

**4.3.2 The Buying and Selling of Information.** Our survey found that a high proportion of participants (52%) bought agricultural information through social media. Further, 27% indicated that they used social media to sell information. The proportion of buying and selling of information did vary across occupation (i.e., agronomists vs. farmers) but did not vary across gender. Agronomists were found to be the highest buyers (73%) and sellers (34%) of information. Furthermore, agronomists were found to be the most negatively impacted if social media platforms were unavailable. Indeed, 3 out of 4 agronomist participants reported that a social media shutdown would negatively affect their income. This is not surprising given that agronomists’ main source of income is selling expert information and advice to farmers, whether online or offline. Agronomists provide reliable information free via social media, often with in situ videos, to build their reputation and generate further training and consultancy work. As Martha, a farmer and video content developer, put it: *“seeing is believing, watching videos is almost like doing an offline farm training session.”* Capitalizing on the information market, Martha is building a business providing YouTube content for consultants and other farmers who want to provide photographic evidence of their farms’ progress so potential clients can see the success for themselves.

Forty-six percent of farmers indicated that information was the top thing that they buy on social media and identified that social media enables access to agricultural information that is a critical first step to those starting out in farming and/or diversifying existing agricultural practices. When Edward decided to switch from his office job to farming, he first found out about permaculture through YouTube. Then, through social media, he found a permaculture training course that he paid \$350 to attend. Like Edward, other interviewees were able to purchase training on social media that helped them diversify their crops:

*“I found out on social media that some farmers were going to be trained to grow asparagus. Without social media, I would never have known that’s possible ... I wouldn’t have had the thought of planting asparagus and being a small-scale farmer, asparagus and other higher*

*value crops are really good for me . . . So I get a lot of my training through social media.”*—Beth

Interestingly, 19% of farmers also said that they sell their advice. This highlights how farmers are not only buying information but also selling it. Typically, farmers will pay agronomists for expert information and consultation visits to their farms. However, social agriculture blurs distinctions between experts and farmers; our interviews found several examples of farmers taking on the role of consultant agronomists. When asked about how farmers are selling information, we found that it was not a simple transaction in which an individual sells information shared through social media to the buyer. Instead, as with the selling of produce, they employed multiple social media platforms and online and offline interactions to sell information. One farmer, James, recounted how he advertised his expertise on social media, which resulted in him delivering a course on cultivating asparagus to around 50 farmers. Similarly, Edward described how he now uses social media to advertise his ability to teach and run training sessions for others on his own farm. Our interviews identified that farmers who sell information usually start by building their reputation as experienced farmers on Facebook groups, which they often own and/or manage. Then, like Edward, they advertise their availability to provide offline training on their farms:

*“People came to know me, Beatrice, the farmer who is online.”*—Beatrice

These farmers then transition to WhatsApp to organize training and/or consultations with people who have expressed interest in attending. Interestingly, some participants indicated that, while most farmers who sell information request payment for their services, some do not:

*“. . . mostly, they sell the information, in terms of consultation. They charge some consultation fee because they call it a mentorship program. They charge, if you get lucky, a few people will give you the information for free, but mostly they charge.”*—Mary

In summary, participants used social media platforms in an interlinked manner. While Facebook and WhatsApp are the main pair, participants use other platforms too. For example, some use TikTok, Twitter, and Facebook to direct people to their YouTube channel. Felicity says: *“Facebook is actually one of our main routes, but all of them definitely, they are all intertwined in helping you gain more clients.”* The gradual diversification of platforms seems to be a significant trend; interviewees reported awareness of a wide range of platforms, even if they do not currently use them all.

## 4.4 Emergent Issues of Trust and Online Safety

Our study also identified issues of trust and online safety in relation to social agriculture. In this section we present data demonstrating these issues and participants’ responses to them.

**4.4.1 Trust.** Despite the reported importance of social media to generating and diversifying livelihoods, participants acknowledged the potential for incurring financial loss through social agriculture due to commen:

*“If you suspect it is a pseudo [Facebook account] just run otherwise you might lose everything.”*—Farmer\_Survey



*“I almost delivered 2 Tonnes of Onions to a conman in Nairobi. I am glad I sensed the danger before delivering. This could have brought my farming business on its knees.”—Farmer\_Survey*

Such statements highlight the issue of trust that arises when engaging in social agriculture. Only 18% of participants indicated trusting Facebook; the majority expressed higher levels of trust in information platforms run by Safaricom (42%) and the Department of Agriculture (40%). Participants attributed their high level of distrust towards Facebook to the presence of misinformation and the inability to reclaim money if they have been scammed:

*“There is a lot of wrong information on Facebook.”—Agronomist\_Survey*

*“Facebook being without many restrictions and global is prone to fraud information for the sake of making sales.”—Student\_Survey*

*“Kenya department of agriculture is approved, and you can trust it where else Facebook you can be conned you can't trust it 100%.”—Agronomist\_Survey*

*“Safaricom can reverse your money if someone tries to con you, but on Facebook people can give misleading information.”—Farmer\_Survey*

Participants indicated that they perceive only 42% of people who post agricultural-related information and/or conduct agricultural transactions to be trustworthy and 62% of information shared on social media to be untrustworthy. Our interviews also found that most participants had suffered some form of loss from scams on social media early in their agricultural career. One interviewee recounted being scammed over the sale of onions. When they tried to deliver onions to a buyer they had encountered on social media, the buyer was nowhere to be found. As a result, they had to sell their onions elsewhere at a much cheaper price, thus incurring a loss. Interviewees reported that such early experiences of losses taught them to be much more cautious. To counter the problem of conmen, interviewees described carrying out checks on anyone unknown to them. Checks included a range of strategies including: (1) viewing a person's Facebook profile, since conmen often lack photos or other relevant details on their profile and (2) checking their Facebook activities by viewing their posts, comments, or contributions in groups. Interviewees also reported that membership in too many Facebook groups can indicate a user's untrustworthiness. Additionally, participants reported relying on referrals made by members in trusted WhatsApp groups: *“In WhatsApp groups farmers know each other ... So they will say don't sell to that person, not unless he maybe pays first ... you get recommendations from farmers regarding the client.”—Jane*

After conducting checks, interviewees reported exchanging phone contacts with the person in question to talk over WhatsApp. Several interviewees said that talking through WhatsApp helps them discern if the person is genuine or not. One participant, James, even goes as far as to visit the farm of the person he intends to buy from before making a purchase. Additionally, Facebook groups (e.g., “buyer beware”) have been established to name and shame conmen and provide screenshots as evidence of their scams. Interestingly, some trusted members of Facebook groups have also taken on the role of escrow to help mitigate financial loss due to scams. Florence described how a woman in the Digital

Farmers Kenya Facebook group holds buyers' funds, releases them to sellers once a transaction is satisfactorily completed, and takes a commission for her services.

**4.4.2 Trust in Facebook Groups.** Our in-depth interviews also highlighted the issue of trust related to Facebook group management. Trust in Facebook group posts is intimately tied to the trust that interviewees place in the group owners and administrators (i.e., they rely on these actors to ensure that the posts being shared in the group are trustworthy). Several participants further explained that the position of group owner and/or moderator comes with a certain power over other group members. Indeed, through moderating what is shared in a group, owners and moderators have the power to promote and/or silence certain individuals, thus gatekeeping the economic benefits of membership in the group. As one participant stated, *“Most groups end up being one-sided where the main objective [of the owners and moderators] becomes selling farming inputs.”—Stacey*

When Beatrice first started using Facebook for social agriculture, she found that her posts in groups of which she was a member were refused by the group moderators. Therefore, she resorted to starting her own group, which has proven to be successful. Additionally, three interviewees recounted how they had created Facebook groups in partnership with others and leveraged their own networks to expand the groups' membership. However, once the groups became successful, the other group owners ousted them from the group, thus limiting their ability to market themselves and sell their produce and/or information. Interviewees highlighted that such incidents can severely impact those who rely on Facebook groups to market their produce and information and those who generate income through sponsorships.

**4.4.3 Online Safety.** Other issues identified by participants in both the survey and interviews included online safety, bullying, and discrimination. Three in four survey participants reported observing bullying behaviors on social media in relation to agriculture. Thomas, for example, described how he was strongly criticized when he sought advice for his sick pigs: *“There is nothing worse than when you are suffering. You're really suffering down there. And then someone instead of coming to assist ... they're out there sacrificing you, saying all the bad things to you.”*

Women were reported to be the most impacted by bullying and abuse on social media by 40% of all survey participants. Additionally, 27% of participants who self-identified as female reported being bullied or abused on social media. Participants attributed these experiences to the undermining of women as professionals in the agricultural field:

*“Society tend to undermine woman's professional knowledge in agriculture.”—Farmer\_Survey*

*“Being as a woman online is sometimes hard, because people tend to diminish you and they're like, no, you cannot do this, this, the work that is done by man, you cannot succeed.”—Alice*

*“A man will make a certain comment and it is taken lightly. If the same comment is made by a lady, all hell is open for her all ... the social media, it's very unfair ground when it comes to gender and females are really finding it hard to survive there, they have to be very careful with what they say.”—Thomas*

Susan explained that she often receives unsolicited messages from people on Facebook whom she blocks, but they often reappear under pseudo accounts, which makes her feel quite uneasy. Mary further elaborated on this by saying, “*You find on Facebook you’ve posted things to do with agriculture, then someone comes to your direct messages posting things like nudes there, and you are like, it is not even related (and) without your consent.*” Due to these negative encounters, many female interviewees reported that they avoid posting or commenting on Facebook and instead directly message people or use WhatsApp, so that their communications are more private. Jane reported that people tend to be more “*well-behaved*” on WhatsApp, as they know each other; however, on Facebook strangers send “*funny messages.*” Most interviewees indicated that there are far fewer women than men who participate in social agriculture and that online harassment is a contributing factor. However, despite the bullying and harassment that women reported facing on social media, our interviewees provided examples of strong women who were not dissuaded by these encounters. Beatrice, for example, is very active on social media and says her negative experiences have made her a “*tough nut to crack.*” Female interviewees described creating women-only WhatsApp groups as a strategy against the negative treatment of women in social agriculture. These groups are safe spaces for women to engage in social agriculture and mentor one another. One interviewee highlighted that she found that women buyers tend to support other women sellers and farmers.

## 5 DISCUSSION

Our findings show how our participants utilize social media platforms to improve and diversify agricultural livelihoods. These findings extend social commerce research [12, 26, 48, 79, 80] by demonstrating the intersection between commerce and agriculture as fertile ground for ICT-enabled livelihoods. Additionally, through leveraging multiple platforms, participants reported being able to facilitate transactions, build themselves as trusted brands, and access/provide training and information as economic activities. These findings contrast with existing digital agriculture literature [38, 43, 58, 61, 81] that has yet to view the sharing of information as a practice of trade being monetized by peers and experts alike across multiple platforms. Lastly, our findings highlight how agricultural actors on social media are mitigating the challenges of trust and online safety.

The shape of social agriculture and strategies for engaging in it presented in our findings interplay with the affordances of the social media platforms being used. Therefore, we use Glover et al.’s [30] affordance-based framework for technology and smallholder farmers as lens to analyze our findings. Building on Gibson’s [28] definition of affordances—resources available in a particular context that offer opportunities for functional interaction—Glover et al.’s framework is particularly useful because it accounts for individuals’ agency. As such, the affordance-based framework allows us to understand the opportunities farmers identify in the social media technologies available to them and to explain their use, as well as to identify challenges and opportunities for further design efforts. Glover et al.’s affordance-based framework consists of four aspects—propositions, encounters, dispositions, and responses—that they

theorize can improve the design of dedicated technological interventions for agriculture. However, the framework does not account for the organic use of technologies by users and the affordances they engage with. Therefore, while we use Glover et al.’s framework to discuss the affordances derived from our findings, we augment the framework with HCI literature on affordance that has explored and examined technological affordances [5, 41, 70, 78], aggregated affordances [41], and proposed relational approaches to affordances to account for the social and cultural contexts of individuals interacting with technology [70].

### 5.1 Propositions

Glover et al. [30] describe the term *proposition* as referring to “*the possibility of an alternative way of working or making to achieve new or different outcomes*” (p. 174). Our analysis shows how social media platforms offer new propositions for both those with existing agricultural livelihoods and those new to agriculture. Our findings show that social media platforms propose changes to existing practices around agricultural livelihoods. For example, they afford an online space to market goods and produce as an alternative to traditional markets, which some female participants considered to be safer (section 4.1). This aligns with existing research that demonstrates the opportunities provided by social commerce [12, 79, 80]. Indeed, in our survey a majority of respondents felt they had to be on social media to conduct agricultural trade and that not using social media would negatively impact their income.

Additionally, social media platforms present users with propositions that motivate and support them in entering the agricultural sector. Our findings highlight that some participants were initially propositioned with agricultural opportunities on social media platforms such as Facebook. Moreover, several participants described Facebook as an open platform, with Facebook groups providing a centralized space for organizing agriculture information. Facebook’s timeline feature affords the open sharing of propositions: one message can be seen by all members of a group. As such, social media platforms afford the trading of information in new ways, including the presentation of agriculture as a proposition to people new to the sector. Importantly, this is distinct from the purpose-built platforms referred to in the literature review that do not allow for propositions to nonfarmers, because purpose-built platforms require individuals to first self-identify as farmers and then register to access the information and encounter the propositions offered by these platforms. In contrast, our findings show that social media platforms, through their open visibility of agricultural propositions, act as a new on-ramp to agriculture.

Furthermore, by affording the trade of information as an asset (section 4.3.2) social media platforms present agricultural consultancies as an attractive proposition. This is particularly significant in terms of presenting agriculture to people who might not otherwise consider it to be attractive proposition and reframing it as an opportunity to those who might otherwise dismiss it in favor of more “modern,” urban, “white collar” work. As such, social media affords the diversification of livelihoods beyond farming to agricultural consulting. Our findings further highlight how social media platforms afford farmers to themselves proposition their agricultural information and individual expertise to others, as individuals market

themselves as sources of insight into new agricultural techniques and practices (section 4.3.2), thus diversifying their livelihoods. As Mary noted, farmers who successfully establish a reputation for expertise are sought after and commonly charge a “consultation fee” significant enough for online engagement to be as valuable as growing and selling produce.

Social media’s affordances for propositioning are not without challenges. Maintaining trust is in tension with the very design of Facebook groups and the power inherent to the roles of group owners/administrators/moderators, which has been found to contribute to the marginalization and exclusion of individuals [20, 32, 63]. While Facebook’s openness enabled participants to be propositioned, the nature of the propositions and identities of proposition-makers were another matter. Participants identified that the affordances of Facebook groups introduced particular power dynamics, as group owners and moderators can exercise control over who gets to join—or is excluded from—a group and whose posts are approved (see section 4.4.2). As such, moderators and group owners serve as powerful gatekeepers of propositions and can monetize their propositional power in the form of sponsorship from companies selling agricultural products.

## 5.2 Encounters

An *encounter* is the process through which members of a “*farming community become aware of a new proposition*” and the “*arena*” in which the awareness is established [30]. While Glover et al.’s [30] notion of encounters draws on agricultural extension work on deliberate, choreographed, and orchestrated encounters, and how agricultural extension offices use social media [40, 74], our findings show how spontaneous, organic encounters are central to the use of social media in agricultural practice. Existing social media use increases the possibility of organically encountering social agriculture as an attractive proposition; as Thomas described, his existing social media use led him to meet “so many guys” active in pig rearing. Additionally, our findings show that social media platforms afford encounters between potential buyers and sellers. These encounters are shaped by the particular affordances of specific platforms, for example, Facebook’s groups feature. Many newly propositioned farmers do not have potential buyers in their social networks and so turn to dedicated groups where their produce will more likely be encountered by potential customers (section 4.3.1). Our findings also show that participants learned to exploit particular affordances to increase the chance of a successful encounter, such as sharing photos and videos of farming activities to build themselves as a trusted brand that sells both produce and information.

However, our findings also show that social media platforms’ affordances for encounters vary. Indeed, while participants described Facebook as offering an open platform conducive for marketing and brand promotion, they described WhatsApp as being more trustworthy and affording encounters that lead to successful sales. For most respondents WhatsApp affords more valued encounters because it affords conversational encounters, which farmers prefer [58, 61], with more trusted individuals. A WhatsApp account requires a SIM card, which serves as an authentication process that affords greater trust that the other party is who they say they are, and WhatsApp is a more familiar medium from which to initiate

direct contact to buy and sell information. Furthermore, encounters are highly influenced by actors’ ability to access propositions in order to encounter them. In the context of Kenya, research has shown that access to both devices and data is characterized by income and gender disparity [77, 78]. Women in the agricultural sector are less likely to have access to a smartphone compared to men [77]. Thus, social media’s affordance for encounters can be exclusionary through its dependency on access to digital devices and data. Interestingly, in the face of the cost of data, participants reported moving encounters from Facebook to WhatsApp, because WhatsApp uses data compression which reduces costs (section 4.2.3). This highlights how the technological affordances of one platform can shape encounters on other platforms. Indeed, we found that participants use social media platforms in conjunction with one another, thus showing that social agricultural encounters are arranged by users in a process of engagement that places each platform according to the forms of interaction it affords.

Additionally, encounters are shaped by social media platforms’ algorithms. The algorithmic structuring of information that constitutes people’s timeline poses a challenge. Indeed, when we asked survey participants to share opinions about Facebook, the tension between a vapid attention economy and useful information exchange for agriculture was apparent; participants highlighted how, without restrictions, information shared on Facebook is prone to fraud (section 4.4.1). Facebook’s algorithm can also afford the distortion and influence of the shape of markets [47], and research has also explored how user awareness of algorithmic moderation impacts trust [67]. As presented in section 4.3, a social media post about the profitability of quail eggs was widely shared and commented on. We can assume that the post’s high level of engagement increased the algorithm’s ranking of its “interest” to users and its placing of the information in individual user’s timelines. The result of the algorithm’s widespread profiling of the post increased users’ encounter with the proposition of buying and selling quail eggs. This in turn caused people to start producing quail eggs to the point that the market became saturated and the price dropped, leading to significant financial losses. Facebook’s timeline algorithm is designed to optimize attention, which very successfully affords ad-driven business models—including agricultural ones. But it also introduces significant challenges to maintaining trust in the platform, in content and in other users, which is critical to the successful realization of peoples’ livelihood aspirations.

## 5.3 Dispositions

*Dispositions* are the factors that determine whether an individual is disposed to positively react to a proposition they encounter [30]. The factors that make dispositions a relational affordance include the individual characteristics and circumstances of people engaging in the encounter, the quality of the encounter, and the features of the proposition being encountered [70]. Examining such factors allows us to account for individuals’ contexts and the broader ecosystem in which they exist, which is important to understanding how individuals relate to the technological affordances of social media platforms and their reaction to the propositions they encounter there.

Our findings show that gender in particular influences social media users' dispositions in relation to agriculture. Participants indicated that some on Facebook are negatively disposed to propositions made by women in social agriculture, because women are not perceived to be experts. In turn, due to the discriminatory dispositions held by others on Facebook, many female respondents described Facebook encounters as problematic, leading them to use the platform for one-way "marketing" and avoid more interactive activities, such as commenting. We found that women were more disposed towards taking up the propositions they encountered on WhatsApp. This provides another example of how different platforms afford different experiences: Facebook is linked to greater discrimination and harassment than "cleaner" WhatsApp (section 4.4.3). Increased control, the ability to police membership, and trusted women-only WhatsApp groups were key affordances enabling social agricultural encounters to which women were more likely to be disposed. Furthermore, through the lens of relational affordances [70], our findings showed that participants' dispositions to encounters were heavily influenced by their past experiences with scams. Participants highlighted how the perceived trustworthiness of others in the encounter influences their disposition towards the proposition being encountered. To be positively disposed, participants engaged in multiple strategies to assess the trustworthiness of the other individual in the encounter. These strategies included checking an individual's profile, asking trusted members on WhatsApp about the individual, engaging with the individual over WhatsApp, and even going and visiting the individual's farm. Additionally, "buyer beware" Facebook groups were spaces in which participants could check others' trustworthiness. These factors all enabled participants to assess the quality of the encounter and the features of proposition being made; trusted WhatsApp and "buyer beware" groups became integral to the broader ecosystem.

## 5.4 Responses

*Responses* describe how individuals who are positively disposed to a proposition "embark on a process, and create a discrete pathway" through which the proposition is "unpacked, reassembled and configured" [30]. Importantly, "the array of responses available in principle to farmers is potentially wide and diverse" [30]. Furthermore, the relational view of affordances "looks beyond program functions to inspect the social capabilities that certain communication technologies enable. Here the shift is toward an interest in social interactions surrounding (and giving rise to) affordances" [70]. As our findings demonstrate, identity, personal context, and history of experiences with social platforms are important contextual factors that shape responses to the proposition of social agriculture.

Our research shows how social media affords new pathways for conducting established agricultural practices. Many participants described how social media functioned as an alternative digital marketplace to the previous venues in which they bought and sold produce. Like literature on social commerce that describes how social network platforms afford using existing relationships to form new markets [12, 80], our research shows that those who can access and use these platforms increasingly value the new marketplaces they are afforded. Importantly, our research also shows how these new marketplaces are not simply replicas of their analog equivalents, as

the particularities of platform design afford particular practices. For example, as our empirical findings demonstrate, Facebook's open nature affords brand- and trust-building through sharing photos and videos of produce.

Social agriculture is also introducing pathways for new agricultural practices in response to the propositions individuals encounter through social media. These new forms reflect how social agriculture is a relational phenomenon emerging from the "*properties of interactions between people and technologies*" [70]. For example, the increasing turn to the purchase and sale of information is one of several distinctive new practices that make up social agriculture—or rather, a distinct transformation of established agricultural roles, as social media blurs the lines between traditional agronomists and those who develop a social position from which they can sell agricultural information, reshaping who is considered an expert and who can make a living as one. Our research shows how the affordances of social media platforms for sharing expertise transform the one-way and top-down information sharing practiced by traditional agricultural extension and agronomy services [6, 16] to create new markets for information characterized by peer-to-peer trading of information and expertise. Another new pathway is through the gap presented by the absence of particular platform features, a gap that individuals substitute with their own practices. For example, as we showed, social media platforms are limited in their affordance of trusted encounters, which opens up pathways of response to address this deficit. Participants reported how these pathways are characterized by assemblages of tactics to verify the trustworthiness of others in an encounter; one participant described how a woman on Facebook has taken up the role of "escrow" through which she generates income. These response pathways align with existing literature that highlights the importance of community in building trust within social commerce [54] and the communal countering of disinformation [69]. Furthermore, the lens of relational affordances helps clarify the role of social factors, such as identity, in affording particular responses to the proposition of social agriculture. For example, we showed how Facebook's affordances for encounter and disposition are characterized by both gender inclusion (female participants feel safer on social media than in traditional markets) and exclusion (women experience abuse and discrimination). We also showed how female participants carve out their own response pathways across multiple platforms to the wider proposition of social agriculture by, for example, starting their own Facebook groups and women-only WhatsApp groups and engaging more actively on WhatsApp. This shows how social context and platform-specific affordances interact to afford different social agricultural pathways, emphasizing the importance of designs and other interventions that incorporate a relational view of affordances [70] to address issues of inclusion and exclusion, particularly for the most vulnerable.

Finally, our findings describe social agriculture as a phenomenon characterized by a bricolage of platforms and practices bridged by the affordances that arise from their interaction. Our research shows how discrete response pathways are taking place across multiple social media platforms, thus highlighting participants' ability to navigate "aggregate" affordances [41] as they leverage the varying affordances of technological platforms in conjunction with one another and in relation to their own social context. We found that this is critical to progress from propositions to responses and in doing

so generate income and value from social agriculture. Our research highlights how participants understand the specific affordances of Facebook and YouTube (for brand building and marketing, but also misinformation and scams) and WhatsApp (for trust, transactions, and social relations) and integrate them into a strategy of practices that constitute value-generating social agriculture. As Kaptelin and Nardi [41] point out, utility based on aggregation requires an extended set of capacities that individuals need to understand—which, as the successful social agriculture practitioners we interviewed demonstrate, requires extensive digital literacy and skill. Importantly, the affordances of social network platforms also include the opportunity for those without those skills to encounter others who can transfer insights and strategies and then employ that information their own response to the opportunity of social agriculture.

## 5.5 Directions for Design

Our research has focused on exploring and describing these emergent practices around the use of social media platforms as part of agricultural livelihoods. We draw on these insights to outline future directions for design that can inform the work of policymakers, technologists, and practitioners who might further strengthen social agriculture—acknowledging that further research and insights are required to deepen and detail these recommendations, and that achieving changes, particularly by large social media platform companies, can be challenging and exist within a political economy that has few points of influence. We draw on the relational affordances [70] perspective that reflects the interrelated nature of technology and social contexts and so make recommendations for design work to support individuals as well as platforms.

People are forced to develop specific capacities to successfully respond to the propositions they encounter, so we recommend the following efforts to strengthen individual capacity to make successful responses:

- Development actors can strengthen social agricultural livelihoods by developing guidance for people on how to best market themselves and their products and understand the affordances of each platform, particularly through strengthening those already doing this as part of their agricultural livelihoods.
- Development actors can increase the effectiveness of social agriculture livelihoods by developing briefs for new entrants to social agriculture that share how people, such as our participants, are successfully establishing a bricolage of affordances to enable the achievement of livelihood goals.
- Development actors can mitigate some of the constraints around social agricultural livelihoods by designing training to strengthen social agriculturalists' ability to verify individual credibility and authenticity, building on the expertise and strategies demonstrated by our participants to enable others to further establish trust in the practice of social agriculture.

We also make recommendations for platform design—both for new platforms as well as for the (re)design of existing platform, recognizing the challenges to successfully advocating to large platforms for significant redesign:

- Design platforms to best enable access for those with divergent dispositions. This is particularly important for gender

considerations, for example, efforts to reduce data cost as a barrier to women and those unable to afford internet access.

- Design measures that increase confidence in the trustworthiness of social agriculture sector participants to address the exploitation of “false” or anonymous accounts for scams and abuse. Importantly, these measures should not reduce the value of the easy access to social agriculture afforded by existing social media platforms.
- Design flexible content management algorithms that enable platform owners to alter the attention optimizing-algorithmic sorting of content in some groups to better facilitate trust and reduce scams and misleading information.
- Design efforts to mitigate the erosion of information integrity is critical. Design efforts could include ways to amplify and formalize existing community referral and verification practices to strengthen information integrity and user trust.
- Designing for flexibility, incorporating the recognition that people will purpose platforms to their own ends, such as establishing escrow facilities, and that platforms should afford this as much as possible.

## 6 CONCLUSION

This paper examines the use of social media platforms as part of agricultural livelihoods and proposes the term *social agriculture* to describe the use of social platforms in agricultural livelihoods. We show how social media has become central to the agricultural livelihoods of the people who use platforms, and describe the different platforms that people use and the practices afforded by these platforms. Our research describes the benefits and challenges of the use of social media platforms for agriculture, particularly around issues of trust and safety, especially for women. We draw on the concept of affordances as used in both HCI and agricultural literature to make sense of these findings and propose eight starting points for design efforts to further strengthen the potential for the use of social media platforms as part of agricultural livelihoods.

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## REFERENCES

- [1] Agrilinks. Knowing “WhatsApp” With Food Security. Retrieved February 11, 2022 from <https://agrilinks.org/post/knowning-whatsapp-food-security>
- [2] Jenny C. Aker and Christopher Ksoll. 2016. Can mobile phones improve agricultural outcomes? Evidence from a randomized experiment in Niger. *Food Policy* 60, (2016), 44–51. DOI:<https://doi.org/10.1016/j.foodpol.2015.03.006>
- [3] Jenny Aker and Marcel Fafchamps. 2010. *How Does Mobile Phone Coverage Affect Farm-Gate Prices? Evidence from West Africa*.
- [4] D. Almashabi and V. Nereim. 2017. Saudi businesswomen tap Instagram to bypass men, attract clients. *Bloomberg*. Retrieved from <http://www.bloomberg.com/news/articles/2015-08-17/saudi-businesswomen-tap-instagram-to-skirt-men-attract-clients>
- [5] Ian Arawjo, Ariam Mogos, Steven J. Jackson, Tapan Parikh, and Kentaro Toyama. 2019. Computing education for intercultural learning: Lessons from the Nairobi play project. *Proc. ACM Human-Computer Interact.* 3, CSCW (2019). DOI:<https://doi.org/10.1145/3359154>
- [6] Aliyu Akilu Barau and Md. Safiul Islam Afrad. 2017. An overview of social media use in agricultural extension service delivery. *J. Agric. Informatics* 8, 3 (2017), 50–61. DOI:<https://doi.org/10.17700/jai.2017.8.3.395>

- [7] Heike Baumüller. 2015. Assessing the role of mobile phones in offering price information and market linkages: The case of M-Farm in Kenya. *Electron. J. Inf. Syst. Dev. Ctries.* 68, (2015), 1–16. DOI:https://doi.org/10.1002/j.1681-4835.2015.tb00492.x
- [8] Mark Bivens. 2015. How Line is turning Instagram into an ecommerce app in Thailand. *TechInAsia*. Retrieved February 11, 2022 from https://www.techinasia.com/line-instagram-ecommerce-thailand
- [9] Virginia Braun and Victoria Clarke. 2013. *Successful Qualitative Research: A Practical Guide for Beginners*. SAGE.
- [10] Virginia Braun and Victoria Clarke. 2019. Reflecting on reflexive thematic analysis. *Qual. Res. Sport. Exerc. Heal.* 11, 4 (2019), 589–597. DOI:https://doi.org/10.1080/2159676X.2019.1628806
- [11] Jenna Burrell and Elisa Oreglia. 2015. The myth of market price information: mobile phones and the application of economic knowledge in ICTD. *Econ. Soc.* 44, 2 (2015), 271–292. DOI:https://doi.org/10.1080/03085147.2015.1013742
- [12] Hancheng Cao, Zhilong Chen, Mengjie Cheng, Shuling Zhao, Tao Wang, and Yong Li. 2020. You Recommend, I Buy: How and Why People Engage in Instant Messaging Based Social Commerce. *Proc. ACM Hum.-Comput. Interact.* 5, April (2020), Article 67. DOI:https://doi.org/10.1145/3449141
- [13] Bidisha Chaudhuri and Linus Kendall. 2021. Collaboration without consensus: Building resilience in sustainable agriculture through ICTs. *Inf. Soc. 37*, 1 (2021), 1–19. DOI:https://doi.org/10.1080/01972243.2020.1844828
- [14] Lars Rune Christensen, Hasib Ahsan, and Eshrat Akand. 2018. Krishi Kontho: An agricultural information service in Bangladesh. In *Proceedings of the 10th Nordic Conference for Human-Computer Interaction (NordChi'18)*, ACM, New York, NY, 203–214. DOI:https://doi.org/10.1145/3240167.3240225
- [15] K. Davis, A. Bohn, S. Franzel, M. Blum, U. Rieckmann, S. Raj, K. Hussein, and N. Ernst. 2018. *What Works in Rural Advisory Services? Global Good Practice Notes*. GFRAS, Lausanne. Retrieved from https://wocatpedia.net/images/f/7/GFRAS\_GGP\_book.pdf#page=105
- [16] Leonard Dharmawan, Pudji Muljono, Dwi Retno Hapsari, and Bagus Priyo Purwanto. 2020. Digital Information Development in Agriculture Extension in Facing New Normal Era During Covid-19 Pandemics. *J. Hunan Univ. (Natural Sci.)* 47, 12 (2020). Retrieved from http://jonuns.com/index.php/journal/article/view/482
- [17] Lenora Ditzler, Laurens Klerkx, Jacqueline Chan-Dentoni, Helena Posthumus, Timothy J. Krupnik, Santiago López Ridauro, Jens A. Andersson, Frédéric Baudron, and Jeroen C.J. Groot. 2018. Affordances of agricultural systems analysis tools: A review and framework to enhance tool design and implementation. *Agric. Syst.* 164, September 2017 (2018), 20–30. DOI:https://doi.org/10.1016/j.agsy.2018.03.006
- [18] C. R. Eastwood, F. J. Turner, and A. J. Romera. 2022. Farmer-centred design: An affordances-based framework for identifying processes that facilitate farmers as co-designers in addressing complex agricultural challenges. *Agric. Syst.* 195, November 2021 (2022), 103314. DOI:https://doi.org/10.1016/j.agsy.2021.103314
- [19] Ezinne M. Emeana, Liz Trenchard, and Katharina Dehnen-Schmutz. 2020. The revolution of mobile phone-enabled services for agricultural development (m-Agri services) in Africa: The challenges for sustainability. *Sustainability* 12, 2 (2020). DOI:https://doi.org/10.3390/su12020485
- [20] Hayley I. Evans, Marisol Wong-Villares, Daniel Castro, Eric Gilbert, Rosa I. Arriaga, Michaelanne Dye, and Amy Bruckman. 2018. Facebook in Venezuela: Understanding Solidarity economies in low-trust environments. In *Proceedings of the Conference on Human Factors in Computing Systems (CHI'18)*, ACM, New York, NY, Paper 228, 1–12. DOI:https://doi.org/10.1145/3173574.3173802
- [21] M.A. Even and P. Nyathi. 2020. Maintaining critical extension services for smallholders during COVID-19. *IFAD Blogs*. Retrieved August 21, 2021 from https://www.ifad.org/en/web/latest/-/blog/maintaining-critical-extension-services-for-smallholders-during-covid-19
- [22] Marcel Fafchamps and Bart Minten. 2012. Impact of SMS-based agricultural information on Indian farmers. *World Bank Econ. Rev.* 26, 3 (2012), 383–414. DOI:https://doi.org/10.1093/wber/lhr056
- [23] FAO. 2015. e-agriculture 10 year Review Report Implementation of the World Summit on the Information Society (WSIS) Action Line C7. ICT Applications: e-agriculture. Retrieved from www.fao.org/publications
- [24] FAO. 2021. FAO in Kenya. Retrieved August 27, 2021 from http://www.fao.org/kenya/fao-in-kenya/kenya-at-a-glance/en/
- [25] Annabelle Gawer and Michael A. Cusumano. 2014. Industry platforms and ecosystem innovation. *J. Prod. Innov. Manag.* 31, 3 (2014), 417–433. DOI:https://doi.org/10.1111/jpim.12105
- [26] Omer Abdelhamid Ibrahim Gibreel, Byungjoon Yoo, Dhari A. AlOtaibi, and Seongmin Jeon. 2015. Will insta-business be the electronic contemporary bazaar?: An exploratory analysis on electronic commerce in Kuwait. In *Proceedings of the 17th international conference on electronic commerce (ICED'15)*, ACM, New York, NY, 1–6. DOI:https://doi.org/10.1145/2781562.2781573
- [27] Omer Gibreel, Dhari A. AlOtaibi, and Jörn Altmann. 2018. Social commerce development in emerging markets. *Electron. Commer. Res. Appl.* 27, (2018), 152–162. DOI:https://doi.org/10.1016/j.elerap.2017.12.008
- [28] James J. Gibson. 1977. The Theory of Affordances. In *Perceiving, Acting, and Knowing*, R.E. Shaw and J. Bransford (eds.). Lawrence Erlbaum Associates, Hillsdale, 67–82.
- [29] Amos Gichamba, Peter Waiganjo Wagacha, and Daniel Orwa Ochieng. 2017. An Assessment of e-Extension Platforms in Kenya. *Int. J. Innov. Stud. Sci. Eng. Technol.* 3, July (2017), 36–41.
- [30] Dominic Glover, James Sumberg, Giel Ton, Jens Andersson, and Lone Badstue. 2019. Rethinking technological change in smallholder agriculture. *Outlook Agric.* 48, 3 (2019), 169–180. DOI:https://doi.org/10.1177/0030727019864978
- [31] Rebecca Greenfield. 2013. In Kuwait, Instagram Accounts are Big Business. *The Atlantic*. Retrieved February 11, 2022 from https://www.theatlantic.com/technology/archive/2013/07/kuwait-instagram-accounts-are-big-business/313382/
- [32] Oliver L. Haimson, Daniel Delmonaco, Peipei Nie, and Andrea Wegner. 2021. Disproportionate Removals and Differing Content Moderation Experiences for Conservative, Transgender, and Black Social Media Users: Marginalization and Moderation Gray Areas. *Proc. ACM Human-Computer Interact.* 5, CSCW2 (2021), Article 466. DOI:https://doi.org/10.1145/3479610
- [33] J. Henz and C. Ulrichs. 2016. The Potential and Limitations of Mobile-learning and other services in the Agriculture Sector of Kenya Using Phone Applications. In *12th European International Farming Systems Association (IFSA) Symposium*, 1–11.
- [34] Syed Ali Hussain. 2016. ICT4Agriculture lessons Learned from Developing Countries. A Systematic Review Protocol. In *Proceedings of the Eighth International Conference on Information and Communication Technologies and Development (ICTD'16)*, ACM, New York, NY, 1–4. DOI:https://doi.org/10.1145/2909609.2909636
- [35] M. Sirajul Islam and Åke Grönlund. 2010. Agriculture market information services (AMIS) in the least developed countries (LDCs): Nature, scopes, and challenges. *Lect. Notes Comput. Sci. (including Subser. Lect. Notes Artif. Intell. Lect. Notes Bioinformatics)* 6228 LNCS, (2010), 109–120. DOI:https://doi.org/10.1007/978-3-642-14799-9\_10
- [36] M. Sirajul Islam and Åke Grönlund. 2010. An agricultural market information service (AMIS) in Bangladesh: Evaluating a mobile phone based e-service in a rural context. *Inf. Dev.* 26, 4 (2010), 289–302. DOI:https://doi.org/10.1177/0266666910385556
- [37] Margaret Jack, Jay Chen, and Steven J. Jackson. 2017. Infrastructure as Creative Action: Online Buying, Selling and Delivery in Phnom Penh. In *In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI'17)*, ACM, 6511–6522. DOI:https://doi.org/10.1145/3025453.3025889
- [38] Mohit Jain, Pratyush Kumar, Ishita Bhansali, Q. Vera Liao, Khai Truong, and Shwetak Patel. 2018. FarmChat: A conversational Agent to Answer Farmer Queries. *Proc. ACM Interactive, Mobile, Wearable Ubiquitous Technol.* 2, 4 (2018), Article 170, 22 pages. DOI:https://doi.org/10.1145/3287048
- [39] Kamani K C, Ghodasara Y R, Soni N V, and And Parsaniya. 2016. Empowering Indian Agriculture With Whatsapp – a Positive Step Towards Digital India. *Int. J. Agric. Sci.* 8, 13 (2016), 975–3710.
- [40] S. Kanjina. 2021. Social media adoption and use by public agricultural extension organizations in Thailand. *Int. J. Agric. Technol.* 17, 1 (2021), 129–142.
- [41] Victor Kapteinin and Bonnie Nardi. 2012. Affordances in HCI: Toward a mediated action perspective. In *Proceedings of the Conference on Human Factors in Computing Systems (CHI'2015)*, ACM, New York, NY, 967–976. DOI:https://doi.org/10.1145/2207676.2208541
- [42] Nawab Khan, Badar N. Siddiqui, Nanak Khan, Farhatullah Khan, Naqeeb Ullah, Muhammad Ihtisham, Rahmat Ullah, Sohaib Ismail, and Syed Muhammad. 2020. Analyzing mobile phone usage in agricultural modernization and rural development. *Int. J. Agric. Ext.* 8, 2 (2020), 139–147. DOI:https://doi.org/10.33687/ijae.008.02.3255
- [43] Hendrik Knoche, P. R. Sheshagiri Rao, H. S. Jamadagni, and Jeffrey Huang. 2015. Actions and advice in coli - A mobile social network to support agricultural peer learning. In *Proceedings of the 17th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct (Mobile'15 Adjunct)*, ACM, New York, NY, 1191–1198. DOI:https://doi.org/10.1145/2786567.2801608
- [44] N. T. Krell, S. A. Giroux, Z. Guido, C. Hannah, S. E. Lopus, K. K. Caylor, and T. P. Evans. 2021. Smallholder farmers' use of mobile phone services in central Kenya. *Clim. Dev.* 13, 3 (2021), 215–227. DOI:https://doi.org/10.1080/17565529.2020.1748847
- [45] Ying Feng Kuo and Fei Lung Chen. 2020. Social Commerce Research: A Literature Review. In *Proceedings of the 7th Multidisciplinary in International Social Networks Conference and The 3rd International Conference on Economics, Management and Technology (MISNC2020&IEMT2020)*, ACM, New York, NY, Article 10, 1–7. DOI:https://doi.org/10.1145/3429395.3429405
- [46] Daniel Lambton-Howard, Patrick Olivier, Vasilis Vlachokyriakos, Hanna Celina, and Ahmed Kharrufa. 2020. Unplatformed Design: A Model for Appropriating Social Media Technologies for Coordinated Participation. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems (CHI'20)*, ACM, New York, NY, Paper 52, 1–13. DOI:https://doi.org/10.1145/3313831.3376179
- [47] Kyunghye Lee, Byungtae Lee, and Wonseok Oh. 2015. Thumbs up, sales up? The contingent effect of facebook likes on sales performance in social commerce. *J. Manag. Inf. Syst.* 32, 4 (2015), 109–143. DOI:https://doi.org/10.1080/07421222.2015.1138372
- [48] Yi Liu and Juliana Sutanto. 2015. Online group-buying: Literature review and directions for future research. *Data Base Adv. Inf. Syst.* 46, 1 (2015), 39–59.

- DOI:<https://doi.org/10.1145/2747544.2747548>
- [49] Ken Lohento and Oluwabunmi D. Ajilore. 2015. ICT and Youth in Agriculture. In *Africa Agriculture Status Report*. 118–42. Retrieved from [https://www.researchgate.net/profile/Oluwabunmi-Ajilore/publication/308968253-ICT\\_and\\_Youth\\_in\\_Agriculture/links/57fb693808ae280dd0c4b31a/ICT-and-Youth-in-Agriculture.pdf](https://www.researchgate.net/profile/Oluwabunmi-Ajilore/publication/308968253-ICT_and_Youth_in_Agriculture/links/57fb693808ae280dd0c4b31a/ICT-and-Youth-in-Agriculture.pdf)
- [50] Edison W. Lubua and Philip D. Pretorius. 2019. Factors determining the perceived relevance of social commerce in the African context. *SA J. Inf. Manag.* 21, 1 (2019), 1–8. DOI:<https://doi.org/10.4102/sajim.v21i1.959>
- [51] Andrew Mambondiyani. 2020. “It’s lucrative”: Zimbabwe’s farmers turn to social media to stop the rot. *African Arguments*. Retrieved February 11, 2022 from <https://africanarguments.org/2020/04/its-lucrative-zimbabwes-farmers-turn-to-social-media-to-stop-the-rot/>
- [52] I Medhi-Thies, P Ferreira, N Gupta, and J O’Neill. 2015. KrishiPustak: A social networking system for low-literate farmers. In *In 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (CSCW ’15)*, 1670–1681. DOI:<https://doi.org/10.1145/2675133.2675224>
- [53] Ezra Misaki, Mikko Apiola, Silvia Gaiani, and Matti Tedre. 2018. Challenges facing sub-Saharan small-scale farmers in accessing farming information through mobile phones: A systematic literature review. *Electron. J. Inf. Syst. Dev. Ctries.* 84, 4 (2018), 1–12. DOI:<https://doi.org/10.1002/isd2.12034>
- [54] Carol Moser, Paul Resnick, and Sarita Schoenebeck. 2017. Community Commerce: Facilitating trust in Mom-to-Mom sale groups on Facebook. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (CHI ’17)*, ACM, New York, NY, 4344–4357. DOI:<https://doi.org/10.1145/3025453.3025550>
- [55] Donald A. Norman. 1999. Affordance, conventions, and design. *Interactions* 6, 3 (1999), 38–43. DOI:<https://doi.org/10.1145/301153.301168>
- [56] Victor Akwu Otene, Jacob Oto Okwu, and Agada Jude Agene. 2018. Assessment of the Use of Facebook by Farmers and Agricultural Extension Agents in Otukpo Local Government Area of Benue State, Nigeria. *J. Agric. Food Inf.* 19, 4 (2018), 354–361. DOI:<https://doi.org/10.1080/10496505.2017.1400976>
- [57] Martin C. Parlasca, Constantijn Johnen, and Matin Qaim. 2022. Use of mobile financial services among farmers in Africa: Insights from Kenya. *Glob. Food Sec.* 32, November 2021 (2022), 100590. DOI:<https://doi.org/10.1016/j.gfs.2021.100590>
- [58] Neil Patel, Deepti Chittamuru, Anupam Jain, Paresh Dave, and Tapan S. Parikh. 2010. Avaaj Otalo - A field study of an interactive voice forum for small farmers in rural India. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI ’10)*, ACM, New York, NY, 733–742. DOI:<https://doi.org/10.1145/1753326.1753434>
- [59] Neil Patel, Krishna Savani, Paresh Dave, and Scott R Klemmer. 2012. Power to the Peers: Authority of Source Effects for a Voice-based Agricultural Information Service in Rural India Categories and Subject Descriptors. *Inf. Commun. Technol. Dev.* (2012), 169–178.
- [60] Nor Sabila Ramli, Md Salleh Hassan, Norsida Man, Bahaman Abu Samah, Siti Zobedah Omar, Nur Atikah A Rahman, Sarina Yusuf, and Muhamad Shamsul Ibrahim. 2019. Seeking of Agriculture Information through Mobile Phone among Paddy Farmers in Selangor. *Int. J. Acad. Res. Bus. Soc. Sci.* 9, 6 (2019). DOI:<https://doi.org/10.6007/ijarbs/v9-i6/5969>
- [61] P. Krishna Reddy, G. V. Ramaraju, and G. S. Reddy. 2007. eSagu: A data warehouse enabled personalized agricultural advisory system. In *Proceedings of the 2007 ACM SIGMOD international conference on Management of data (SIGMOD ’07)*, ACM, New York, NY, 910–914. DOI:<https://doi.org/10.1145/1247480.1247586>
- [62] Khumoetsile O. Sebotsa, Agnes Nkurumwa, and Miriam Kyule. 2020. Effect of utilization of social media platforms on youth participation in agriculture in njoro sub-county, Kenya. *Int. J. Agric. Ext.* 8, 3 (2020), 235–250. DOI:<https://doi.org/10.33687/ijae.008.03.3400>
- [63] Joseph Seering. 2020. Reconsidering Community Self-Moderation: The Role of Research in Supporting Community-Based Models for Online Content Moderation. *Proc. ACM Human-Computer Interact.* 4, CSCW2 (2020), 28 pages. DOI:<https://doi.org/10.1145/3415178>
- [64] Matt Shakhovskoy, William Saab, and Clara Colina. 2021. *Agricultural “Platforms” In A Digital Era: Defining the Landscape*. Retrieved from [https://isfadvisors.org/wp-content/uploads/2021/03/ISF\\_RAFLA\\_Agricultural\\_Platforms\\_Report.pdf](https://isfadvisors.org/wp-content/uploads/2021/03/ISF_RAFLA_Agricultural_Platforms_Report.pdf)
- [65] Gurdeep Singh, Pritpal Singh, Devinder Tiwari, and Kulwant Singh. 2021. Role of Social Media in Enhancing Agricultural Growth. *Indian J. Ext. Educ.* 55, 3 (2021), 69–72.
- [66] Manjeet Singh Nain, Rashmi Singh, and J. R. Mishra. 2019. Social networking of innovative farmers through WhatsApp messenger for learning exchange: A study of content sharing. *Indian J. Agric. Sci.* 89, 3 (2019), 556–558.
- [67] Janaki Srinivasan and Jenna Burrell. 2013. Revisiting the fishers of Kerala, India. In *Proceedings of the 6th International Conference on Information and Communication Technologies and Development (ICTD ’13)*, ACM, New York, NY, 56–66. DOI:<https://doi.org/10.1145/2516604.2516618>
- [68] Bhattacharjee Suchiradiptra and Raj Saravanan. 2016. Social media: Shaping the future of agricultural extension and advisory services, GFRAS interest group on ICT4RAS discussion paper. January 2016 (2016), 37.
- [69] Sharifa Sultana and Susan R. Fussell. 2021. Dissemination, Situated Fact-checking, and Social Effects of Misinformation among Rural Bangladeshi Villagers during the COVID-19 Pandemic. *Proc. ACM Human-Computer Interact.* 5, CSCW2 (2021). DOI:<https://doi.org/10.1145/3479580>
- [70] Huatong Sun and William F. Hart-Davidson. 2014. Binding the material and the discursive with a relational approach of affordances. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI ’14)*, ACM, New York, NY, 3533–3542. DOI:<https://doi.org/10.1145/2556288.2557185>
- [71] N.M. Tendov, S. Varas, and M. Zheng. 2019. *Digital technologies in Agricultural and Rural Areas*. DOI:<https://doi.org/10.1007/s00132-021-04156-y>
- [73] Risqo Muslimin Wahid. 2021. Implementation of Paid Instagram Ads for Fresh Produce Sellers Affected by Covid-19 Pandemic in a Traditional Market in Palembang. *Int. J. Innov. Sci. Res. Technol.* 6, 1 (2021), 322–328.
- [74] Nuwan Waidyanatha, Gordon A. Gow, Chandana Jayathilake, and Timothy Barlott. 2015. Technology stewardship, text messaging, and collaboration in agricultural work: Preliminary results from an action research study in Sri Lanka. In *Proceedings of the 18th ACM Conference Companion on Computer Supported Cooperative Work & Social Computing (CSCW ’15 Companion)*, ACM, New York, NY, 203–206. DOI:<https://doi.org/10.1145/2685553.2699007>
- [75] Hong Wang, Yixin Wang, Ting Guo, Yibin Wang, and Yikun Ou. 2021. An empirical study of social e-commerce platform on users’ intention: Take wechat e-commerce group as an example. In *The 2021 12th International Conference on E-business, Management and Economics*, 54–61. DOI:<https://doi.org/10.1145/3481127.3481237>
- [76] Kuria Catherine Wangu. 2014. Use Of Social Media As a Source Of Agricultural Information by Small Holder Farmers: A Case Study Of Lower Kabete, Kiambu County. University of Nairobi. Retrieved from [http://erepository.uonbi.ac.ke/bitstream/handle/11295/76029/Kuria\\_Catherine\\_Wangu\\_Use\\_of\\_Social\\_Media\\_as\\_a\\_Source\\_of\\_Agricultural\\_Information\\_by\\_small\\_holder\\_farmers%3B\\_a\\_case\\_study\\_of\\_LowerKabete%2C\\_Kiambu\\_County.pdf?sequence=3&isAllowed=y](http://erepository.uonbi.ac.ke/bitstream/handle/11295/76029/Kuria_Catherine_Wangu_Use_of_Social_Media_as_a_Source_of_Agricultural_Information_by_small_holder_farmers%3B_a_case_study_of_LowerKabete%2C_Kiambu_County.pdf?sequence=3&isAllowed=y)
- [77] Susan Wyche, Nightingale Simiyu, and Martha E. Othieno. 2016. Mobile Phones as Amplifiers of Social Inequality among Rural Kenyan Women. *ACM Trans. Comput. Interact.* 23, 3 (2016), 1–19. DOI:<https://doi.org/10.1145/2911982>
- [78] Susan Wyche and Charles Steinfield. 2016. Why Don’t Farmers Use Cell Phones to Access Market Prices? Technology Affordances and Barriers to Market Information Services Adoption in Rural Kenya. *Inf. Technol. Dev.* 22, 2 (2016), 320–333. DOI:<https://doi.org/10.1080/02681102.2015.1048184>
- [79] Fengli Xu, Zhenyu Han, Jinghua Piao, and Yong Li. 2019. “I think you’ll like it”: Modelling the online purchase behavior in social E-commerce. *Proc. ACM Human-Computer Interact.* 3, CSCW (2019). DOI:<https://doi.org/10.1145/3359167>
- [80] Rui Zhou, Shengxi Wu, Susan Faulkner, and Betsy Disalvo. 2020. Marketplace for Choice and Independence: Young Chinese’s Social Commerce Practices on WeChat. In *The eighth International Workshop of Chinese CHI*, 10–20. DOI:<https://doi.org/10.1145/3403676.3403678>
- [81] Matt Ziegler, Lokesh Garg, Shailesh Tiwary, Aditya Vashista, and Kurtis Heimerl. 2019. Fresh insights: User research towards a market information service for bihari vegetable farmers. In *Proceedings of the Tenth International Conference on Information and Communication Technologies and Development (ICTD ’19)*, ACM, New York, NY, Article 3, 1–11. DOI:<https://doi.org/10.1145/3287098.3287115>