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Participatory and community-based approach in combating agri-food misinformation: A scoping review

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Abstract

The spread of ill information with or without the intention of deceiving or causing harm has negatively impacted agricultural development both in social and digital spaces. This has led to a lack of trust in adopting new technologies and practices, which has hindered the process of facilitating agricultural development. Although the study of agri-food misinformation is still in its early stages, this paper draws on a scoping review of existing literature and lessons learned from other fields, such as political science and public health, which have extensive experience in combating misinformation in social settings. The article explores how Farmer Field Schools (FFS), a popular participatory and community-based approach, can incorporate media literacy education and how a local agricultural information hub, platform approach and a relatively new approach called technology stewardship in agricultural extension can help those working in the agri-food industry combat misinformation.

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agricultural extension and advisory services (AAS); disinformation; farmer field schools (FFS); information hub; technology stewardship; misinformation; participatory approach

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Introduction and Problem Statement

Agricultural extension and advisory services (AAS) focus on providing authentic and reliable information to support the livelihood improvement of clients. As there is an increasing trend of digitalization of AAS (Sugihono et al., 2022), the generation and diffusion of agricultural information have become susceptible to misinformation and disinformation (Dilleen et al., 2023)—broadly defined as spreading false information to cause harm or deceive (Baines & Elliott, 2020; Lewandowsky et al., 2017; Wardle & Derakhshan, 2017)—especially within the digital spheres. With the increased penetration of the Internet and social media, the risk of ill information has increased, and it opens doors for everyone to become a producer and consumer of information (Allcott et al., 2019; Anderson & Rainie, 2017; Berriche & Altay, 2020). Misinformation has the potential to hinder the adoption of new technologies and practices as well as create division within the agricultural community (Pfeiffer et al., 2022). For example, myths that the controversial Golden rice, a product of agricultural development activities, was unnatural, unsafe, and risky have sown skepticism to hinder its diffusion and uptake (Purugganan, 2013). The rise of digital technology has enabled activists and advocacy groups to effectively promote their viewpoints on controversial topics, such as genetically modified (GM) crops. Unfortunately, this has sometimes led to controversies in the agri-food sectors, as seen in the case of Golden rice. Despite its invention in the 1990s, it took almost two decades, until 2013, for the controversy to amplify to a level where activists destroyed the research field in Bicol, according to the McGrath (2013). The inherent potential for misinformation within agriculture development makes it essential to understand the concept within the field (Chowdhury et al., 2023) but, as a matter of urgency, also develop practices of countering to strengthen the legitimacy of science and evidence-based decision-making.

In today's digital age, distinguishing between accurate information and misinformation is becoming more challenging. Misinformation refers to false or misleading information that is spread without any intention to deceive (Wardle & Derakhshan, 2017). This can be detrimental both to individuals and society as a whole, as it can lead to people making decisions based on incorrect information. Moreover, the increasing access to digital information has made it easier for people to spread disinformation and misinformation in non-digital spaces. For example, people may share false or misleading information on social media, which can be spread offline through word-of-mouth, print, or broadcast media. In addition, the proliferation of digital echo chambers has made it more difficult for people to be exposed to different viewpoints, leading to a greater susceptibility to disinformation and misinformation (Kabir et al., 2024). The increasing reliance on digital information has made it more difficult for people to distinguish between credible and non-credible sources of information (Shin et al., 2018). This can lead to people being more likely to believe and share disinformation and misinformation.

Hence, it is increasingly important for those in the agriculture industry to address and tackle misinformation (Chowdhury et al., 2023; Chowdhury & Gow, 2024). For example, extension scholars and agents have recently begun investigating misinformation in their practice (Dilleen et al., 2023; Klerkx, 2020; Leal et al., 2020). One proposed solution to this problem is to create networks that facilitate accurate information exchange within agriculture value chains and build

trust-based networks, as Stroud (2019) and Rijswijk et al. (2023) suggested. The strategies for combating misinformation specific to agriculture, particularly at the interface of AAS, remain somewhat limited. Nevertheless, there are opportunities for agri-food actors to learn from other fields that have well-established literature and approaches for addressing misinformation within social contexts, such as public health and political science (Chowdhury et al., 2023). It is essential to take a more comprehensive approach to address the issue of misinformation and disinformation production and dissemination.

Numerous studies have been conducted on the use of technical and computational solutions to tackle the problem of misinformation (Aimeur et al., 2023). On the other hands, researchers and practitioners recognize the cultural, political, economic, and social aspects contributing to this issue (Wasserman & Madrid, 2022). While fact-checking algorithms and social media filters based on Artificial Intelligence (AI) can be helpful, they often fail to address the underlying social, economic, and political factors that give rise to misinformation (Aimeur et al., 2023). There are various organizations that verify the credibility of information, such as fact-checking organizations like Snopes and PolitiFact and news organizations like Associated Press and Reuters. These organizations have teams of researchers who fact-check information and publish articles and reports on the accuracy of information. However, it is important to note that no single authority, strategy, or technique can definitively decide whether information is misinformation. This is because the phenomenon is socio-technical in nature, and contextual issues can often complicate the process of determining the accuracy of information.

Participatory and community-based approaches (PCAs) provide a more comprehensive and long-term strategy for addressing this complex problem (Aimeur et al., 2023; Wasserman & Madrid, 2022). PCAs prioritize the involvement of communities in identifying, understanding, and addressing misinformation. By actively involving members of the community, we can build trust, which allows them to take ownership of the problem and create solutions that are tailored to their needs. PCAs can help enhance critical thinking and media literacy skills among citizens, which could encourage communities to evaluate information (Cheng & Chen, 2021). This empowers individuals to make informed decisions based on the information they encounter online. Moreover, PCAs can effectively address the root causes of misinformation. Misinformation often stems from underlying social, economic, or political issues often overlooked by top-down approaches. By working with communities to understand these root causes, PCAs can facilitate the development of strategies that address them more sustainably and effectively. Various participatory and educational AAS methods, such as Farmers Fields School (FFS), consider the cultural and societal dynamics of agricultural information and knowledge sharing (van de Fliert et al., 2007). This approach aligns with the holistic perspective needed to address the complex issue of agri-food (mis)information production and dissemination. This paper aims to draw upon established fields with proven strategies for combating misinformation to provide insights and a foundation for the AAS to facilitate agricultural development.

The study proposed several PCAs for combating misinformation in the agri-food context. The specific objectives are to (a) scope social strategies employed in fields with advanced literature

and practice on misinformation to deal with the phenomenon and (b) propose tailored and applicable participatory strategies that can be employed to combat agri-food misinformation.

Methods

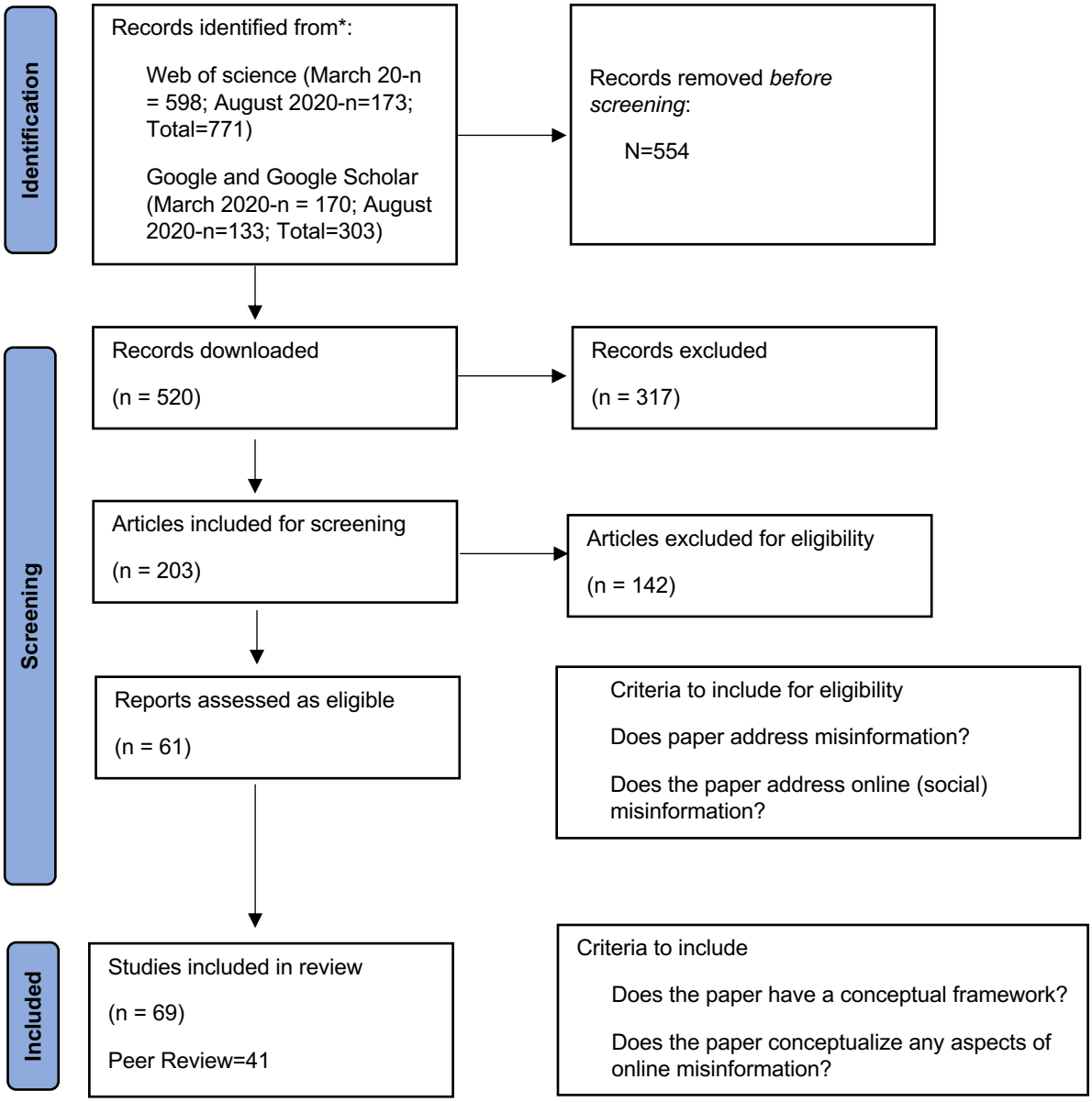
This paper is part of an ongoing study by the authors (Chowdhury et al., 2023) on combatting misinformation. This study adopted a scoping review (Grant & Booth, 2009) based on literature re-creation, a research approach that uses existing knowledge to draw insights on a particular topic (Murray & Begler, 2009). A scoping review is used when the nature and evidence of a particular topic are unclear. This type of review is designed to provide an overview of the existing evidence and help researchers better understand the nature and extent of what has been studied thus far. By doing so, a scoping review can be a valuable tool for ongoing research in a variety of fields.

In our ongoing study (Chowdhury et al., 2023), we adopted a multi-stage review to use literature from other fields and pull together conceptual advancements in the field of misinformation research thus far. We started the research using the keywords such as ("social media" OR "online media") AND ("misinformation" OR "disinformation" OR "malinformation"), ("social media" OR "online media") AND ("misinformation"), ("social media OR online media") AND ("disinformation"), ("social media" OR "online media") AND ("malinformation") to search on the Web of Science. Using key terms such as ("online" AND "misinformation"), ("social media" AND "misinformation"), ("online fake news" AND "dealing with misinformation") returned 303 papers (including peer review, reports, and conference proceedings) from Google Scholar. The search was in two stages, first in January 2020 and another in August 2020. A total of 1074 was downloaded, with 458 and 588 documents retrieved in the first and second search, respectively. Of these, 711 and 303 were from Web of Science and Google (scholar). Through a title screening, 520 documents were downloaded into the screening stage.

The abstracts of the 520 documents were screened, resulting in the exclusion of 317 as not eligible for full-text screening. The abstract, introduction, and conclusions of the remaining 203 articles were screened based on two criteria: 1) Does the paper address misinformation? 2) Does the paper address online (social) misinformation? This assessment resulted in the further exclusion of 142 articles that did not meet the inclusion criteria. Hence, 61 articles were included in the full text of the analysis. However, we identified an additional 8 articles from reference tracings and recommendations, which were added to the full-text screening (Figure 1).

Figure 1

Scoping Review procedure



Note. Source for figure was Chowdhury, A., Kabir, K. H., Abdulai, A.R., & Alam, M. F. (2023). Systematic review of misinformation in social and online media for the development of an analytical framework for agri-food sector. *Sustainability, 15*(6). https://doi.org/10.3390/su15064753

Hence, 69 papers (Peer Review = 41; Reports = 10; Conference proceedings = 18) were included for full-text analysis to produce this paper. We analyzed the paper based on their broad conceptualization and discussion of online misinformation and specific strategies outlined to combat online misinformation. We draw lessons from those strategies and other relevant

resources related to participatory approaches in agricultural advisory services and propose four PCAs that fit the specific practice context of AAS in combating agri-food misinformation.

Findings

Approach for combating misinformation used in health and political context

Misinformation has become a widespread problem in various sectors, including health and politics. Experts are employing different techniques to address this issue. Social media platforms like Facebook, Instagram, Twitter, and WhatsApp have made it easier to spread ill information, making it essential to develop innovative approaches to combat misinformation (Lewandowsky et al., 2017). These strategies should be directed towards vulnerable groups at the community level. This article outlines some community-based innovative approaches that have been implemented to address misinformation in the fields of health and politics.

Educating community and utilizing the community library to improve information search literacy

Educating the community about recognizing and combatting misinformation has been deployed as a strategy in the health and political fields in the fight against misinformation. The approach has the potential to help build resilience against misinformation. Workshops, conferences, webinars, and specialized training in information tools can be effective ways to achieve this. Understanding the source and reasons behind misinformation is key to building resilience against it (European Commission, 2018). Empowering different groups in the community, such as children, youth, women, and religious groups, can improve media literacy and help people spot misinformation (Suwana, 2021). Misinformation can influence election results, undermine democracy, and impact decisions made by parents regarding their children's health (Einstein & Glick, 2015; Jolley & Douglas, 2014; Lewandowsky et al., 2017). In the political field, as highlighted by Jolley and Douglas (2013) in their findings on an experimental study, exposure to misinformation decreases people's involvement in politics.

Recognizing misinformation is key to preventing its harmful effects. According to Lewandowsky et al. (2017), people can identify misinformation by understanding its underlying motives and recognizing discrepancies between the facts and what is being presented. Public health officials used this approach to tackle health-related misinformation such as vaccine misinformation, COVID-19, and other pandemic misinformation, termed an *infodemic* by the World Health Organization (Eysenbach, 2020). To combat misinformation in the health sector, officials use community education initiatives such as collaborative learning to educate the public. A classical example of this initiative is the "Ask Me Anything" (AMA) program, which invites experts to engage in two-way dialogues with the public on social media platforms, especially Reddit (Hara et al., 2019). These programs aim to address medical misinformation and promote accurate information in the public health sector.

Information literacy (De Paor & Haravi, 2020) is a valuable skill that helps individuals become knowledgeable citizens who can contribute to society. It involves knowing how to find and use information effectively. The library has been used to promote information literacy, particularly

among those who may not have access, such as the elderly and marginalized (Jaeger et al., 2021; Young et al., 2021). Librarians have the opportunity to assist library patrons in improving their search skills beyond just working at the front desk (Batchelor, 2017; Tripodi et al., 2023). Many individuals, including students, may not know how to properly search for and verify information they find while browsing. Most people do a vertical reading—scrolling up and down a website—and cannot click on buttons to see behind what they are reading (Breakstone et al., 2021; Brodsky et al., 2021). Unfortunately, propagandists take advantage of this weakness and spread false information online to gain political points (Tripodi, 2022).

Libraries have used approaches such as providing research-backed tools and educational training to help users recognize reliable sources and verify information (Koulolias et al., 2018; Tripodi, 2018; Tripodi et al., 2023). For instance, since misinformation is likely to spread when politicians are given a chance to increase propaganda, this approach has been successful in addressing misinformation in the political space. Thus, the electorate or community members often turn to libraries to verify political claims and seek accurate information. Also, in public health, approaches such as commissioning articles to review controversial health topics are key in combating medical misinformation online (Armstrong & Naylor, 2019; Trethewey, 2020). By improving information literacy, libraries can play a crucial role in fighting misinformation, as demonstrated in the 2016 US presidential election when librarians and information specialists stepped up to the forefront of the information war (De Paor & Haravi, 2020).

Integrate information literacy into the educational curriculum

Promoting information literacy education is essential, particularly within the formal educational curriculum. Information literacy encompasses knowing how and where to find and apply information daily (CILIP, 2018). Countries like Finland and Sweden have successfully integrated media and information literacy into their educational systems (Lord & Katya, 2021). Universities in the UK offer critical thinking programs that enhance media literacy skills (Kristin et al., 2021). Non-government organizations (NGOs), such as IREX, provide media literacy training to adults, significantly impacting the fight against misinformation (Craft et al., 2017; Guess et al., 2020). Another notable example is India's initiative to train citizens in media literacy to combat smartphone-driven misinformation (Chaturvedi, 2019).

In the health sector, a similar approach has been employed by the World Health Organization (WHO) since 2000 to promote public health literacy. A typical example of this initiative is digital health literacy, which has been introduced to help the public access, recognize, and interpret health information. This allows the public to make informed decisions concerning their health (Naeem & Boulos, 2021).

Establishing a community-owned information centre

In health and politics, community-owned information centers have reduced misinformation by broadcasting information to the community for free. These centers are managed by experienced local journalists and trusted community members who understand cultural and religious dynamics. Similar to the EU Situation Room, these centers share health and political information with the community for free (European Commission, 2018). To ensure the accuracy

of the information disseminated, the centers rely on experts, committees, fact-checking institutions, and health and political civil society groups to verify the information before broadcasting it to the public. Ghana's Emergency Preparedness and Response Plan (EPRP) during the COVID-19 pandemic is an example of this approach. The EPRP mobilizes national resources and implements local and internet-based risk and behavioural change communication strategies (Tabong & Segtub, 2021). The government and health experts give weekly and periodic national addresses to inform citizens about pandemic plans and strategies. Local radio stations and community information centers translate these messages into various ethnic languages for better understanding.

Engage local community leaders and youth and resume their role in information-sharing

Community engagement in health and political misinformation involves community members, groups, and organizations in decision-making, planning, design, and delivery of health or political services (Barker et al., 2020; Sacks et al., 2017). The fifth WHO virtual conference on health misinformation management highlighted the importance of community-level leaders and influencers in identifying vulnerability to misinformation (WHO, 2022a). These leaders possess a better understanding of the community's information needs, making them essential in the fight against health and political misinformation (Lewandowsky et al., 2017). For instance, during the Ebola outbreak in West Africa, community and religious leaders played vital roles in combating misinformation (Gilmore et al., 2020; Gillespie et al., 2016). However, the digital age has transformed the role of traditional community leaders, making it challenging to verify information (Domgaard & Park, 2022).

Health professionals now partner with community leaders to counter disinformation. An example is the Puerto Rico's COVID-19 vaccination misinformation tracking project (Mercy Corps, 2022). In that initiative, the project team spread community-specific vaccination messages through social media for community leaders and health promoters to share these messages. Feedback was collected from community leaders and health promoters weekly, and questions were answered via WhatsApp and other appropriate channels. Also, pastors, imams, and community leaders addressed misinformation through discussions with their congregations (Office of the Surgeon General, 2021). Another community engagement initiative used in the public health sector is the Arthur Ashe Institute for Urban Health's COVID-19 campaign. The Arthur Ashe Institute engaged barbers and hairdressers to educate customers about the virus during their visits (Korin et al., 2022).

Young people have the power to combat misinformation by sharing accurate information with their peers and on social media. Media literacy and critical thinking programs empower them to evaluate online information (Walton & Hepworth, 2011). Furthermore, the youth are potential important fact-checkers in community politics and health, which the elderly and marginalized groups can leverage in their information searching. Thus, teaching young people about media and information promotes open-mindedness and acceptance of diverse perspectives. Without this education, individuals may believe misinformation, as seen during the COVID-19 pandemic when some dismissed health experts' advice and relied on unproven treatments, such as warm weather and hydroxychloroquine (Bump, 2022).

Using Infographics in Communication

According to Walter et al. (2020), social media offers tools for educating the public about misinformation, such as audio-visual interventions and educational materials like infographics. Infographics are becoming increasingly popular in health and political contexts to promote digital news literacy (Tully et al., 2020). Infographics simplify complex information for wider populations, including marginalized groups, children, and the elderly (Comello et al., 2016; Domgaard & Park, 2021; Lewandowsky et al., 2017). Infographics are also used in community libraries to detect and verify political misinformation. For example, an infographic created by the International Federation of Library Associations and Institutions (IFLA) was translated into various languages and circulated globally as a checklist for identifying misinformation (Eva & Shea, 2018). Additionally, the Portuguese health ministry created a health information platform on Instagram and Facebook with over one million followers, where they shared simple COVID-19 infographics (WHO, 2022b).

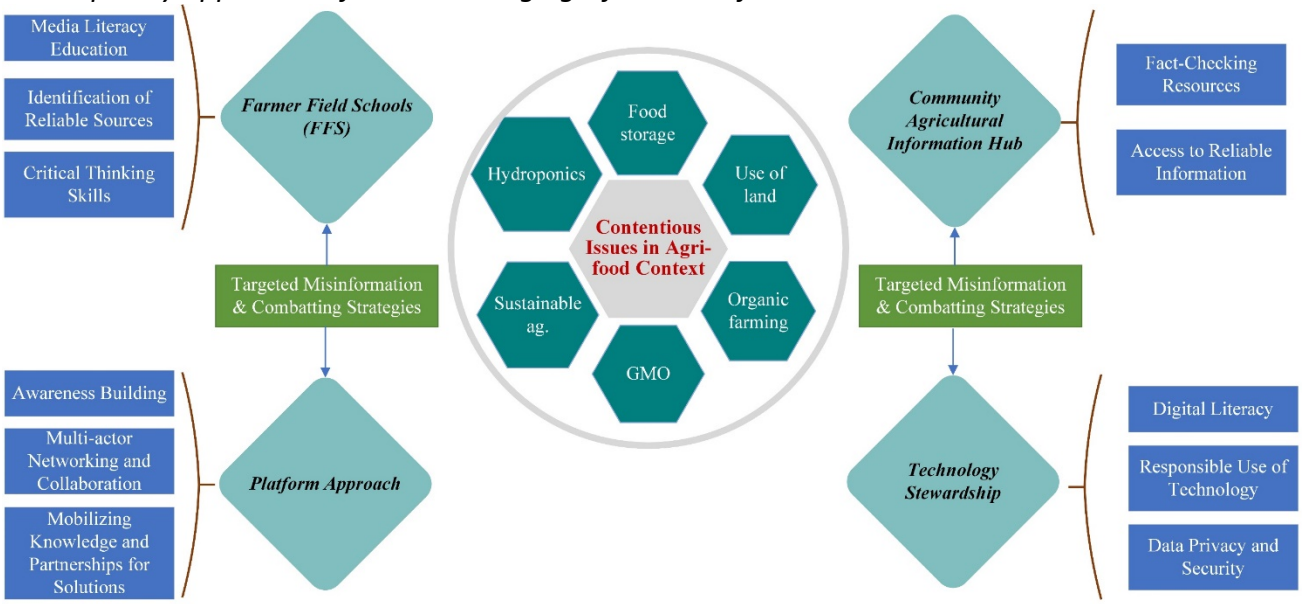
Participatory and community-based approaches to combat agri-food misinformation

It is evident that participatory and community-based strategies have played a critical role in mitigating misinformation in the fields of health and politics across the globe. However, the use of these strategies in addressing agriculture misinformation is still a grey area. Misinformation is pervasive in every aspect of society, including the agri-food sector. Researchers and academics are employing various strategies to tackle the problem, but a participatory and community-based approach could potentially yield more positive results in the agri-food system. This approach has been successful in health and politics and can be adapted to the agri-food system by aligning with existing participatory and community-based approaches like FFS, Community Seed Banks, Participatory Guarantee Systems, and Common Interest Groups. These approaches can improve social learning and networking among farmers and help them address complex issues like insect-pest management, locally adapted crop varieties, and climate change (Karim & Thiel, 2017; Porcuna et al., 2020; Ton et al., 2015; van de Fliert, 2007).

Misinformation combating techniques can be integrated into these well-established approaches, while adopting methods from the health and political space to enable agri-food community members to counter misinformation effectively. We proposed the following PCAs to empower agri-food communities and value their local experience and knowledge, leading to solutions that work for them and include them in life-changing activities (Figure 2). The approaches may be used in any combination, and these should not be considered as linear or sequential approaches to combat misinformation.

Figure 2

Participatory approaches for combatting agri-food misinformation



Incorporate media literacy education into Farmer Field Schools (FFS)

FFS can help combat misinformation in the agri-food system, similar to efforts in health and politics to integrate information literacy into formal education. FFS is a community-based approach that has received recognition and is widely adopted in the agri-food sector to solve challenges such as insect and pest control, farm maintenance, climate variation consequences, input, credit, and marketing and storage of agricultural produce. FFS is an extension service that works in a bottom-up approach, treating farmers as co-equals and sharing experiences instead of instructing them (Sarapura et al., 2018). It was introduced in the 1980s in Asia by FAO to address challenges in rice production and uses adult education principles to educate farmers at the community or farm level. FFS has been successful in various situations, including communication, farm enterprise development and marketing, and nutrition, and with different groups like illiterate, women, adults, and youth. The approach also promotes the integration of local and indigenous knowledge with the latest scientific ideas and technology to boost the agri-food sector (FAO et al., 2021). Recently, the approach has been tested in the digital sphere to support individual and collective learning for cocoa production and certification in Sierra Leone (Witteveen et al., 2017).

The use of both traditional and social media has been beneficial to the food value chain, as farmers can access information through various platforms such as the Internet, radio, television, and mobile phones (Ceccarelli et al., 2022). However, the spread of misinformation through social and online media (Gibson et al., 2022; Rampold et al., 2023) and the risks of eroding trust in digitally mediated relationships (Rijswijk et al., 2023) have caused harm and offset some of the benefits gained by the digitalization of the agricultural sector. New studies

have revealed that social media platforms can be useful for sharing agricultural and food-related knowledge. Unfortunately, the public, including farmers, cannot always verify or authenticate information found on social media, leading to an increase in misinformation (De Paor & Haravi, 2020; Schwarzenegger, 2020; Tandoc et al., 2018).

Providing media literacy education to farmers at the community level, such as through FFS, would go a long way in combating misinformation. By being media literate, farmers can better discern the information consumed. However, incorporating media literacy education into FFS requires identifying relevant media channels, creating a curriculum, employing technology, and supporting farmers afterwards, just as IREX has provided media literacy training to adults and digital health literacy by WHO, as earlier reviewed.

A similar approach has been experimented with in Tanzania in a project study in 2014 by Shao and Edwards, where farmers were taught how to use mobile app systems to verify the authenticity of agro-inputs. Introducing information literacy into the FFS approach will be crucial in fighting misinformation in the agri-food sector. Farmers would be taught how to search and access information to boost their capacity, just as it has been done in other agri-food areas, such as pest management. Facilitators of FFS, such as extension workers, can assist participants in identifying the sources of information they use and consume. The role of extension workers is evolving to adapt to the digital world. They now serve as informants, consultants, advisors, facilitators, mediators, and promoters. Additionally, they will take on new roles as content creators, influencers, gatekeepers, big data analysts, creators of artificial intelligence, and developers of gamification strategies (Sugihono et al., 2022). They can teach farmers how to determine the accuracy and reliability of the information, recognize media biases, and critically analyze media techniques used to persuade and influence audiences. Individuals can avoid accepting information without proper verification by understanding technical aspects, such as algorithms and bots behind the spread of information on social media platforms like Facebook, Twitter, and WhatsApp. By incorporating media literacy strategies in group-based approaches like FFS, participants can gain valuable critical thinking skills that enable them to make informed decisions and navigate complex media landscapes. Moreover, they can utilize the power of media to promote their interests and communicate effectively with others, such as farmers marketing their products or sharing their experiences and knowledge through radio and television interviews. By teaching farmers critical thinking skills to assess information sources, identify media biases, and understand digital channels, they are better equipped to combat misinformation, as illustrated in Figure 2.

Collaborate with other organizations to set up a community agricultural information hub

The public health sector, in particular, has leveraged community resources (leaders, youth) to promote accurate information sharing, as indicated in the review above. In the same way, the agri-food sector taps into these resources to combat misinformation related to agri-food by working together with community members. Misinformation often arises from government policies, new technologies, and other developments outside the farming community, particularly regarding topics such as organic products and genetically modified organisms (GMOs). Experts from various fields, such as researchers, academics, producers, policy analysts,

and NGOs, must provide their expertise to tackle these issues and identify misinformation. This can follow similar approaches as those employed in the health sector to combat the *infodemic* (e.g. Puerto Rico's COVID-19 vaccination misinformation tracking project). NGOs, for instance, have strong connections with communities, making them ideal partners in fighting disinformation. An example of this approach in the agri-food sector is the establishment of a partnership involving the government, private organizations, and NGOs in Bolivia (Sarapura et al., 2018). As suggested by WREN Media (2010), facilitators or farmer organizations can collaborate with local traditional media companies or journalists to learn about agriculture during interactive sessions. By complementing each other, they can improve the fact-checking and trustworthiness of agricultural information and reduce the spread of misinformation in the industry.

Farmers need easy access to accurate and reliable agricultural information. To address this need, a community agricultural information hub can be established. An information hub is a single point of reference providing members with various issues (FAO, 2010). The hub aims to raise awareness of quality information sources and prevent the spread of misinformation in the agri-food sector. The hub can take the form of a newsstand in the center of the community or a section in the community library dedicated to agricultural-related information. It can be managed by a team of agricultural extension officers, information experts, and other trusted community members. Farmers and farmer groups are encouraged to share new information, experiences, and knowledge with the hub and seek support from the team. The agricultural hub is a reliable source of accurate information in the agri-food sector. It aims to address contentious issues that may lead to misinformation. The hub collaborates with agricultural extension officers, information experts, and other trusted community members. They work together to fact-check information and gather reliable information from credible sources, even if it requires connecting to national-level resources (as shown in Figure 2). This approach is similar to the "rumor tracker or fact-checking" used in Puerto Rico to counter COVID-19 misinformation and the EPRP in Ghana during the COVID-19 pandemic in strengthening farmers' capacity to access and share information; the hub reduces their vulnerability to misinformation.

A similar approach has been used in Egypt under the Rural and Agricultural Development Communication Network (RADCON), which was launched in 2004 as a build-up on the Virtual Extension and Research Communication Network (VERCON) pilot project (FAO, 2010). VERCON is a pilot project designed to help strengthen farmers' communication capacity. It was started in 2000 by Egypt's Ministry of Agriculture and Land Resources (MALR) and the UN Food and Agriculture Organization. Another example, however, that works differently but has a similar goal is the Access Agriculture panorama. With Access Agricultural, agricultural training videos translated into international and local languages targeting audiences in the Global South are produced and distributed through social media platforms and emails upon request (Access Agriculture, 2023).

Technology stewardship

A relatively new approach, called "technology stewardship," was tested to enhance the capacity of extension workers to lead the adoption processes of low-cost ICTs in the global south (Gow et al., 2020). The term *technology stewardship* comes from the *Communities of Practice* literature, and it refers to a method of training and supporting groups of people known as technology stewards who work within their communities to promote and sustain innovative practices using accessible, low-cost digital technologies (Jayathilake et al., 2015; Wenger et al., 2009). The concept of a technology steward involves identifying individuals responsible for selecting, deploying, and managing technology tools within a community or organization. The role of a technology steward is an intermediary, which can be a part-time voluntary, self-appointed, or organizationally assigned position that is filled in response to an urgent need in the community (Gow et al., 2020).

Researchers are exploring adapting technology stewardship that involves utilizing technology to support fact-based decision-making for those involved in the agri-food industry. Tech stewards can make it simpler for people to access and understand data about food production, safety, and quality that is already publicly available. This can help prevent the spread of false or misleading information through various online and offline channels, ultimately improving public trust in the food system. By reducing the dissemination of misinformation on social media, technology stewards can play a vital role in ensuring the accuracy of information about food.

In the agri-food industry, extension workers as technology stewards can play a crucial role—as that played by librarians in the health and political space—in identifying and utilizing effective technological tools to combat misinformation. They can collaborate with industry experts to determine the most prevalent forms of misinformation and create plans to counteract them. By using available resources, they can identify and implement social media monitoring software, fact-checking tools, and content management systems, which that can be utilized to combat misinformation. They ensure famers are educated on the responsible use of these tools. As stewards, they monitor the movement of information to and from these systems so that external information can be quickly detected and verified (Figure 2). Therefore, ensuring these stewards have the necessary resources and training is crucial for successful technology stewardship in the agri-food sector. This includes providing access to cutting-edge technology and equipping them with the skills to identify and correct misinformation. Collaboration and information sharing among technology stewards, agri-food experts, and other stakeholders are also important to develop and implement practical solutions. Incorporating technology stewardship into efforts to counteract misinformation can build a community that better addresses this issue in the agri-food context.

Platform approach

The platform approach has become a popular solution for many socio-technical problems in the agriculture sector. One such approach is called the innovation platform, which is considered a social space for multiple actors to interact and share their ideas, knowledge, and opinions to come up with new solutions (Schut et al., 2018). The core idea is to stimulate and facilitate partnerships and collaborations for development solutions. Platform-based initiatives like

https://covid19misinfo.org/ have become increasingly important in combating misinformation. These initiatives can reach a large audience and be customized to address different types of misinformation. However, they are not a silver bullet and must be used in conjunction with other strategies, such as fact-checking and media literacy education. Furthermore, it is necessary to consider management and maintenance costs for sustaining the initiative. Misinformation is a complex social and technical issue that requires interdisciplinary and transdisciplinary collaborations to find solutions that consider many factors (Kabir et al., 2024; Aimeur et al., 2023). This problem cannot be solved by an individual alone, and we need the collaboration of various stakeholders, including scientists and practitioners, who are interested in this issue and willing to share their knowledge, expertise, and resources. Researchers at the University of Guelph have taken the initiative (https://www.misinforesearch.com/) to provide tools and resources to study and address agri-food misinformation. They share fact-checks and other credible information with the public to build awareness, network, and collaborate with multiple actors, mobilize knowledge and partnerships for solutions to the problem. The platform initiative includes several elements: curating relevant literature in a database, tracking myths and misinformation, showcasing global scholars and practitioners of misinformation, and facilitating curated conversations through webinars and podcasts. Platform-based initiatives are increasingly being used to promote critical thinking and media literacy skills, which are essential tools for combating the spread of misinformation. It is crucial to evaluate these initiatives carefully to ensure their credibility and effectiveness. Moreover, these initiatives should be transparent about their methods and goals to build trust among their audience.

Conclusions, Discussion, and Recommendations

The agricultural industry faces a major threat from misinformation, and there are no specific measures to deal with this problem. To address this issue, this scoping study recommends using four proven PCAs that have successfully addressed various agricultural development challenges. We proposed these PCAs to integrate ideas and experiences from other fields, such as health and politics, to build trust and social capital and empower communities in agriculture.

FFSs are excellent examples of PCAs that agricultural extension professionals can use. FFSs are designed as learning-by-doing programs where farmers come together to share knowledge and learn from each other. However, the application of FFSs to combat misinformation has not yet been fully explored. In the context of misinformation, we propose that the approach can help farmers share their experiences, identify and verify information, and develop critical thinking skills. FFSs can be used to raise awareness about misinformation and its potential consequences. We recommend incorporating media literacy education within FFSs to assist farmers and other stakeholders in honing the necessary skills to critically identify and evaluate information. This includes understanding the various types of misinformation, identifying the sources of misinformation, and assessing the credibility of information.

In addition to FFS, we have proposed three other PCAs for addressing misinformation in agriculture. Government agencies, extension services, or non-profit organizations can establish local agricultural information hubs to provide reliable and up-to-date information on

agricultural practices, technologies, and markets. Technology stewardship is a concept that involves the responsible and ethical use of technology to support the dissemination of accurate information and promote sustainable agriculture practices. This includes leveraging technology to create and share educational materials, connect farmers with experts, and monitor and track the spread of misinformation. Creating awareness of issues and sharing accurate information with farmers and stakeholders is critical. Platform-based initiatives can help achieve this by mobilizing stakeholder partnerships, connecting farmers with experts, and providing guidance and support. Additionally, these initiatives can help identify and flag misinformation and educate farmers and other stakeholders on identifying and avoiding it.

The suggested approaches provide potential solutions to tackle misinformation in agriculture. However, their effectiveness needs to be further investigated, particularly in the context of the digitalization of agriculture. The insights from the study are expected to spark further exploration and advancement in this area, with significant implications for agricultural advisory services. In future research, some of the following specific questions should be considered to combat agri-food misinformation:

- How can Farmer Field Schools (FFS) be utilized to combat misinformation?
- What are the most effective ways to educate farmers and other stakeholders on media literacy?
- How can local agricultural information hubs be used to promote the dissemination of accurate information and combat misinformation?
- How can technology be responsibly and ethically used to combat misinformation in agriculture?
- How can platform-based initiatives be utilized to combat misinformation in agriculture?'

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Author contribution statement

A.Chowdhury - conceptualization, writing – review & editing, supervision, methodology, funding acquisition; **K. H. Kabir** - conceptualization, methodology, writing – original draft, writing – review & editing, visualization; **E. K. Asafo-Agyei** - writing – original draft, **A.-R. Abdulai** - writing – original draft.

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