

Dissecting the Roles of Social Capital in Farmer-to-Farmer Extension: A Review

Colby J. Silvert, University of Florida
Willis Ochieng, University of Florida
Jose Perez Orozco, University of Florida
Ange Asanzi, University of Florida

Abstract

Various types of relationships within a farmer-to-farmer (F2F) extension system can influence farmers' access to advancement opportunities, resources, capacity building, and social and professional networks. Using a social capital theoretical lens, this review elucidates the nature of these relationships and networks to better understand how bonding, bridging, and linking social capital may be leveraged in positive and negative ways and how relationship dynamics relate to farmers' power, opportunities, and gender equity. This research demonstrates that all three types of social capital are instrumental but play different and often complementary roles in F2F extension. While bonding social capital is crucial for social cohesion, too few connections to outside actors and networks may cause farmer communities to become wary and unreceptive to innovation and change. On the other hand, outside linkages without sufficient bonding social capital to build trust may lead to inequitable distribution of desirable resources and power. Our most fundamental recommendation is to use social capital conceptualizations – specifically bonding, bridging, and linking – in the design, implementation, and evaluation of F2F extension systems. Participatory mapping of social capital, using a social equity lens, could help farmer groups identify where social capital is plentiful and where it is scarce. Building awareness among diverse farmer communities about social capital dynamics, especially linked to gender, may encourage shifts in attitudes and decision-making to reduce barriers and help marginalized farmers build social capital. Finally, we recommend making host communities and farmer groups attractive to outside interests, investments, and networks, to promote development and innovation.

Keywords: extension, farmer-to-farmer, gender equity, international development, social capital

Introduction

Agricultural extension plays a crucial role in developing rural individuals' and communities' livelihoods through capacity building and linkages to information, technologies, input distributors, and marketing opportunities (Birner et al., 2009; Maulu et al., 2021). In recent decades, agricultural development practitioners have promoted collective and group approaches with the aim to increase the reach, impact, and sustainability of extension (Suvedi & Kaplowitz, 2016). Consequently, many global extension programs have shifted towards farmer-centric, demand-driven, and participatory systems such as farmer-to-farmer (F2F) extension and farmer field schools (FFS), grounded in principles of bottom-up innovation and collaboration (Birner et al., 2009; Kiptot & Franzel, 2014).

F2F extension approaches date back to the 1950s and generally center around volunteer farmer trainers (often instead called lead farmers, farmer promoters, or model farmers) who support their peers using knowledge, demonstrations, and connections to resources (Masangano & Mthinda, 2012; Selener et al., 1997). Selener (1997) described farmer trainers as farmers "...who, through a process of training, experimentation, learning, and practice, increase their knowledge and become capable of sharing the knowledge with others, functioning as extension agents" (p. 7). The FFS approach embodies similar social learning-by-doing, and typically involves 20 to 25 farmers who learn how to solve problems together and adopt improved, more sustainable practices through experimentation and field activities. While outside facilitators usually assist with establishing a FFS, the approach intends for farmers themselves – after training and learning – to become teachers and manage the school (Food and Agriculture Organization of the United Nations, n.d.; Suvedi & Kaplowitz, 2016).

F2F extension systems are commonly embedded within community fabrics, leveraging the benefits of social networks to increase information access, reduce transaction and operational costs, and contribute to innovation (Wellard et al., 2013). Furthermore, farmer trainers' positioning inside the community – with an understanding of local culture, language, and their peers' needs – enhances trust, social cohesion, and learning among the farmer trainers and peer farmers (Anderson & Feder, 2004; Soniia & Asamoah, 2011 van Rijn et al., 2015).

Despite progress transforming extension through collaborative and collective approaches, the implementation of farmer-owned, participatory systems, such as F2F extension, has also led to inequities and divisions in farmers' engagement, leadership opportunities, and access to extension benefits (Bernard et al., 2010; Salem & Haugh, 2020; Katungi et al., 2008). Researchers have commonly investigated certain dimensions of the F2F model such as farmer trainer motivation, effectiveness, and selection (Kiptot & Franzel, 2014; Simpson et al., 2015; Selam & Haugh, 2020). However, a need persists to better understand how relations among farmer trainers, their peer farmers, and community and broader networks influence F2F extension systems' ability to provide equitable and impactful services and linkages for farmers and communities. Guided by social capital theory, we addressed this research need by using an integrative review approach to synthesize and analyze evidence on relationships and network dynamics related to F2F extension in smallholder farming contexts and interpret findings through social capital conceptualizations.

Theoretical Framework

The theory of social capital has become increasingly prevalent in development policy, practice, and research over the last few decades (Grootaert, 1998). Bourdieu (1986) is credited with first defining social capital as "... the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition" (p. 251). Bourdieu emphasized that different types of capital (i.e., economic, cultural, and social) exist within our social world, which are convertible and interconnected, and drive key power dynamics that underlie societal and educational outcomes (Bourdieu, 1986). Coleman and Putnam are widely recognized as additional seminal theorists who shaped the most cited definitions of social capital. In contrast to Bourdieu's concern with how the unequal distribution of social capital among individuals influences power and status, Coleman (1988) focused on social capital as a collective asset. He claimed social capital manifests in networks of relationships derived from human desires for utility-maximization and self-interest – aligned with sociology and mainstream economic theory (Coleman, 1988). Putnam (1993) contributed to popularizing the theory arguing social capital is a public good rather than primarily a feature of individuals; its key conceptual components – networks, norms, and trust – contribute to coordination and collaboration by individuals and organizations to achieve mutual benefits. More contemporary and internationalized social capital theorizations tend to concentrate on relations of trust, reciprocity, shared values, cooperation, and connectedness (Heemskerk & Wennink, 2004; Organisation for Economic Co-operation and Development, 2020). Researchers seem to agree across definitions and concepts that social capital and its benefits derive from different types of social relations and connections.

Integrating aspects of the different seminal approaches, three key classifications of social capital are now commonly cited: *bonding social capital*, *bridging social capital*, and *linking social capital*. Bonding social capital refers to relationships between people within groups or communities (Niles et al., 2021) "with a common social background [who] trust each other" (University of Minnesota Extension [UMN], n.d., p. 1). Bridging social capital constitutes relationships across distinct social (and often community) boundaries (Niles et al., 2021) and usually entails weaker ties (Granovetter, 1973), compared to bonding social capital (Saint Ville et al., 2016). Linking social capital is defined by connections with more distant outside or vertically located individuals or groups, such as financial institutions or governing bodies (Mayoux, 2001; UMN, n.d.). Contemporary and practice-oriented social capital models and frameworks also often describe outcomes and impacts. For instance, the UMN Community Social Capital Model (n.d.) posits that when different aspects of social capital are strong, "a community is more able to channel its human energy to solve problems" (p. 1). And UMN (n.d.) places *efficacy* — one's belief they can make a difference in diverse social contexts — at the core of its social capital model.

Additional theorists argue that social capital should be approached using a critical lens to infer potential negative consequences. Portes (1998) described the "dark side" of social capital as the concentration of power fueling community members' unequal access to benefits. This phenomenon may be most significant for linking social capital. For instance, local farmer groups may seek to benefit from vertical connections that provide resources from formal organizations and institutionalized networks outside of the community (Cofré-Bravo et al., 2019; İzmen & Gürel, 2020). However, forming these outside connections to powerful entities and individuals

may also enable some people to consolidate power – potentially in short amounts of time – creating imbalances and tensions. This risk of exclusion can also extend to “outsiders” establishing their own networks, which can suppress diversity potential and lead to groups divided and inaccessible from the local community (Collins, 1986). On the other hand, an imbalance of bonding social capital can also be problematic. While bonding social capital can build sense of community and social cohesion, in excess it can cause closure to new and different ideas and even constrain access to resources and innovation from outside sources (Burt, 2000). Similarly, Lin (2012) claimed that corruption, nepotism, and disruption of markets are critical concerns related to changes in social capital – especially relevant to mainstream development issues. He also alluded to these issues being exacerbated because development models commonly neglect to account for social capital (Lin, 2012).

There is also a growing body of literature by feminist and gender scholars on social capital. These scholars claim that the mainstream and contemporary theories of social capital largely fail to reference power and gender – especially how power is negotiated between and within groups and networks (Bruegel et al., 2005; Molyneux, 2002). Focusing on Latin America, Molyneux (2002) suggested that the absorption of social capital into policy agendas is not an end-all development solution and may, problematically, “...conceal structural issues, notably inequities in the distribution of power and assets, and the human and gendered costs of macro-economic policies” (p. 185). Thus, Molyneux advised employing a critical gender perspective in projects and policies aiming to build social capital. Without this, existing power relations and disparate structures can be reinforced. Other feminists have gone as far as arguing that social capital theory does not align with feminist theory (Baron et al., 2000; Molyneux, 2002). Bruegel (2005) proposed that instead of distinguishing social capital based on the three types of social capital (bonding, bridging, and linking), forms of social capital should be distinguished based on their transformative power. This work emphasizes that trust and reciprocity are highly gendered, and as a result can produce gender disparity/parity and unequal/equal communities.

This study dissects and expands upon previous research regarding social capital and relational concepts in smallholder F2F extension contexts. Core themes in such past literature have included rural households’ engagement in peer-to-peer learning, dissemination of agricultural practices, and mobilization for resource conservation (Bandiera & Rasul, 2006; Kiptot & Franzel, 2019; Saint Ville et al., 2016). However – justifying the present study – we did not locate an existing analysis of F2F extension in smallholder contexts that was fully guided/conceptualized by social capital.

Purpose and Objectives

The purpose of this integrative literature review was to apply a social capital theoretical lens to better understand and interpret the ways relationship and network dynamics influence smallholder farmers’ engagement in and outcomes from F2F extension. We employed the following research objectives:

1. To determine social capital dynamics linked to the identification and selection of farmer trainers
2. To examine how bonding, bridging, and linking social capital influence the effectiveness of F2F extension
3. To examine how social capital relates to gender-linked disparities and opportunities in F2F extension

4. To examine F2F extension outcomes related to social capital

Methods

We used an integrative literature review to elucidate the roles and outcomes of social capital in F2F extension systems and contribute insights to inform the direction of further research and practice (Torraco, 2005). This form of research can generate “new ways of thinking about the topic addressed by the integrative review” (Torraco, 2005, p. 363). In this regard, we believe thinking about F2F extension through the lens of social capital is novel and useful for many issues linked to the topic. Furthermore, given the apparent lack of previous synthesis using a social capital framework for this topic/context, an integrative review was well suited because it “addresses new or emerging topics that would benefit from a holistic conceptualization and synthesis of the literature to date” (Torraco, 2005, p. 357). The foci of this study were conceived from our (the authors’) diverse perspectives from working in different areas of international extension and rural development practice along with our research in relevant areas leading to our desires to verify perceived research gaps and synthesize literature to improve development practice and scholarship.

We first developed a theoretical structure for the review, which was modified slightly throughout the progression of the review (Torraco, 2005). The guiding social capital theoretical frame was constructed from peer reviewed seminal works by Bourdieu (1986), Coleman (1988), and Putnam (1993). Additionally, more recent theorizations and critiques, gender perspectives, and the UMN Social Capital Model (n.d.) were also incorporated into the frame. Namely, we concentrated on seminal and contemporary ideas that social exchange, relationships, and networks are mediated by trust, norms, and cooperation, which influence collective capacities as well disparities in power and status. We decided to organize our interpretations and writing using the bonding, bridging, and linking components of social capital because these variants integrate and classify the different seminal and contemporary dimensions of social capital in a concise way. Furthermore, in many cases, we believe literature has indirectly identified “social capital” or describes related concepts without social capital terminology. We attempted to enhance understanding and clarity by further breaking down evidence and reconceptualizing explicitly using the three components.

In the first stage of the review, we screened peer reviewed articles and reports by major international research and development organizations, such as CGIAR research centers and World Bank, that were included within academic search databases. Specifically, we examined abstracts, executive summaries, and conclusions for these search terms (used separately and in conjunction): smallholder farmers/farming/agriculture, rural development, F2F extension, FFS approaches, relationships, networks, social capital, outcomes of social capital, F2F efficacy, and social mobility. These terms were used because we determined they narrowed results per the technical and contextual foci of smallholder F2F systems while also representing evidence/research that is explicitly (e.g., social capital is described) or implicitly (e.g., types of relationships and networks are described but social capital is not named) relevant to social capital. While articles were prioritized from the past twenty years (2001-2021), we decided to include a few studies from before 2001 due to the lack of F2F specific research and their theoretical relevance. We used University of Florida library databases and Google Scholar to conduct the literature search. A key criterion was that research should be based in international rural developing and poor contexts and the F2F systems should be community-based. Thus, the

Farmer-to-Farmer international development program, funded by the United States Agency for International Development (USAID) to promote cross-cultural exchange and learning, was not included in the study. We included articles in English and articles translated to English from other languages to attempt to reflect an internationally inclusive scale. For this first stage, 96 articles and reports met our criteria.

A second stage of literature search was deemed necessary to deepen the review framework to also account for gender relations, norms, and barriers that may impact access to different forms of social capital in F2F systems. This expansion resulted from discussions about gaps and how to improve our structure during biweekly research team meetings in which we decided to pursue a more explicit focus on gender – recognized as a key realm in which social capital contributes to power inequalities and marginalization. We also expanded the criteria to include some analysis of peer-to-peer systems – not labelled as F2F extension – such as conservation groups, cooperatives, and community groups because we perceived the contexts and implications applicable for F2F extension. These additions were made because we felt insufficient literature was identified through a narrower concentration on standard community based F2F extension for smallholders. The addition of these related systems enhanced the evidence base and thus bolsters our implications and recommendations. The second stage resulted in 35 additional resources to screen for our review.

The third stage involved thorough reviews of methods, findings, and conclusions, discussions, and/or recommendations of the articles identified from the prior two stages. This review and final screening resulted in a final set of 71 literature resources. The rationale for removal of papers included if they examined technical aspects or capacity development in F2F systems but not social and relational dynamics or social capital, or if the papers were contextually inappropriate (e.g., about private sector exchange models, not based in developing contexts, or not focused on smallholders). We transcribed the texts based on the presence/absence of social capital dimensions described with the theoretical structure, gender dynamics and issues, and recommendations and implications for future research or practice. We analyzed the data by organizing the literature based on common themes as well as emergent, unique themes. These themes led to the organization of the findings under broad headings and paragraphs. We also pursued novel integration by conceptualizing/reconceptualizing literature using social capital theory and language, especially where social capital was not referenced in the initial work (Torraco, 2005). To do this, some social capital theorists are cited throughout the findings to examine and explain rural development evidence based on their postulates.

Trustworthiness and credibility were established via peer debriefing with international development and extension researchers as well as social scientists who were not involved in the study but have demonstrated their expertise and scholarship on social capital in development and/or F2F extension approaches (Lincoln & Guba, 1985). These peer experts provided feedback about the accuracy and practical application potential of the findings, which we then used to refine and improve the study. We propose our integration and analysis of the review findings encourage greater appreciation and recognition of social capital's role in F2F extension as well as the utility of a social capital framework to examine F2F systems.

Findings

We open the findings by synthesizing the broader relevance of social capital – including benefits, issues, and challenges – linked to the foundations of F2F extension as an advent of

international development practice highly intertwined with social and gender dynamics. Then, the findings are organized to review the selection and characteristics of farmer trainers and key relationship and network dynamics in F2F systems. Our theoretical lens frames many findings as bonding, bridging, and linking social capital. Lastly, we include a brief synthesis of documented and pertinent F2F extension outcomes where we point to a gap in supporting literature.

Relevance of Social Capital for Farmer-to-Farmer Extension

Social capital is often recognized as a core driver of community social learning, which is embedded in observation and imitation of others and the cocreation of knowledge (Bandura, 1978; Storr et al., 2017). Researchers have demonstrated that social capital, by establishing norms of trust and cooperation, reduces the transaction costs of acquiring knowledge and information via social interactions (Widén-Wulff & Ginman, 2004). Social capital may also strengthen information reliability as information can be perceived as more valuable when coming from trusted people (Schuller & Theisens, 2010), and social capital may facilitate sharing of more closely guarded information that may not be shared more widely or broadcasted otherwise (Heemskerk & Wennink, 2004). Specific to smallholder agricultural systems, the linkages that produce social capital have been shown to boost adaptive capacity, promote innovation, and connect smallholders to sources of support and resources (Saint Ville et al., 2016).

Several gender constraints have been cited as impacting smallholder men and women farmers' access to social capital and its benefits. Social and cultural norms may prevent women from assuming leadership roles or speaking in public, which can impede their opportunities to build social capital (Cislighi, 2018). Additionally, women's engagement with groups and networks can be inhibited by time poverty and unavailability, unequal household dynamics, and lack of related policies (Katungi et al., 2008; Lau et al., 2021). Women commonly have restricted mobility, compared to men. Thus, women are likely to build close-by networks around friendship, which resultingly may comprise their key channels of information (Katungi et al., 2008). Furthermore, when men and women make similar investments in groups, women often face more challenges in transforming their social capital into tangible support, information, or access to markets (Gotschi et al., 2009).

Dynamics Around Farmer Trainer Characteristics and Selection

Agricultural innovations diffuse through social networks and information exchange may be influenced by individuals' attributes such as their age, educational background, gender, wealth, and social status (Katungi et al., 2008; Rogers, 2003). Therefore, farmer trainers' characteristics and how communities and peers perceive may significantly determine information flow and adoption within social networks. Relatedly, the existence of bonding social capital is commonly an enabling factor for information exchange as farmers are often more willing to adopt information from trusted sources such as friends and family with whom they share characteristics (Katungi et al., 2008). Heemskerk and Wennink (2004) claimed that appointing farmer trainers based on community/social status or political positioning should be avoided as their competing existing and political obligations may interfere with fair representation and service to the community. Such appointments of powerful "local elites" may increase bridging or linking social capital in the F2F system but can create a deficit in bonding social capital,

especially if the farmer trainers are perceived as belonging to a different social group or class than most other farmers in the group.

Researchers have claimed desirable qualities for farmer trainers, across most community contexts, include respect for others, honesty, a dynamic personality, formal education and literacy skills, and sufficient time to dedicate towards sharing knowledge with the community (Heemskerk & Wennink, 2004). Kiptot and Franzel (2014) identified key additional qualifications for effective farmer trainers as possessing technical farming background and skills, membership in a farmer organization/group, residence within the host community, willingness to set aside land for learning and demonstration plots, interest in their role, and the abilities to interpret extension materials for peers and disseminate technologies and knowledge – all on a volunteer basis. While community power structures and dynamics may favor certain farmers to lead, other types of farmers may better contribute to promoting innovation. For instance, younger farmer trainers tend to be more mobile and interact with diverse networks, increasing their information access and sharing abilities, as opposed to older farmers who may be limited to only receiving rather than providing important and current information (Selam & Haugh, 2020). However, younger farmers may face more challenges or need more time to build status and gain the trust of the wider community. An additional consideration is that farmer trainer selection criteria, especially when based on assets, may result in exclusion of major segments of the community such as poor farmers who may not be able to afford resources or land for demonstration plots, or women who often do not enjoy the same rights to land as men due to customary law and/or local and household norms (Boogaard et al., 2015; Johnson et al., 2016; Lastarria-Cornhiel, 1997).

Broadening and Diversifying Farmer Connections and Networks

Literature implies that weak ties, between distinct groups, that constitute bridging social capital play are crucial for the diffusion of new information within networks (Granovetter, 1973), which is essential for a robust and effective extension system (Suvedi & Kaplowitz, 2016). Moreover, researchers posit that bridging and linking social capital strengthen knowledge networks and help small farmers receive more and important information through their diversity of connections (Saint Ville et al., 2016). In fact, studies have concluded that while communities with a high degree of bonding social capital have strong group identity and social cohesion, they lack the responsiveness to innovation and change from external sources that communities with greater bridging and linking social capital exhibit (Burt, 2000; Saint Ville et al., 2016). In other words, bridging and linking social capital in a F2F system can mitigate what Burt (2000) termed *network closure*, or the closure to outside ideas and technologies.

A study by Niles et al. (2021) produced novel findings on potential influences of bridging social capital in F2F networks by examining how smallholder household and community social capital are associated with food security in 11 low-income countries in West Africa, East Africa, and South Asia. The study, corroborating theory, suggested that smallholder farmers connected with diversified *shared networks* that include different types of actors (e.g., community and international actors) may have improved access to resources and capacity building opportunities. This bridging (also relevant for linking) social capital, which expands beyond the local community to different types of organizations, can address needs where smallholders' bonding and individual-level social capital falls short (Karlsson & Hovelsrud, 2015; Niles et al., 2021). For example, Niles et al. (2021) found that rural credit groups are more impactful when

embedded within such shared, broad networks and that bridging social capital can fill voids experienced by resource constrained close-knit community or household units.

Katungi et al. (2008) examined social capital in F2F networking and communication among banana growing households in Rural Uganda and found gender disparities were impacting men's and women's resources to build a broad and productive social network. Relatedly, the opportunity costs – especially in terms of time and mobility – for women to engage with some social networks that involve traveling or new commitments may be too high to afford, compared to men. Therefore, women tend to join peer groups that require less resources than the groups men may join (Maluccio et al., 2007). Thus, geography may be an indicator of social constraints associated with how men or women farmers engage with F2F extension networks, which has implications for information and technology access. Women's social mobility is commonly constrained to their tightly connected informal networks that are geographically near them (Meinzen-Dick et al., 2014). These networks may also be linked with gender expected tasks such as collecting water, caring for children, and fetching wood. These roles and expectations may decrease women farmers' ability to travel distances and devote time toward building bridging and linking social capital (Katungi et al., 2008). In contrast, men's access to additional social capital is often made possible through their stocks of time and resources (Maluccio et al., 2003). Community and broader social norms tend to also promote participation by men in community projects, civil engagement in addition to interaction with geographically dispersed social networks (Maluccio et al., 2003). Social capital theory suggests engagement and connectivity facilitate men's access to information relevant to agricultural innovation – benefits women may not share (Granovetter, 1973).

Linking to Outside and Powerful Actors and Networks

Micheels and Nolan (2016) suggest farmers' bridging and linking social capital help them connect with knowledge about modern technologies and innovations made available via outside channels. Furthermore, linking social capital can boost access to knowledge and financial and capacity building resources (Ruiu et al., 2017; Saint Ville et al., 2016; Yu et al., 2013). Farmers may also benefit from linking capital through access to external, timely information to better respond to shocks and ecological disasters such as drought, frost, or fires (Cofré-Bravo et al., 2019). Additionally, Kiptot's and Franzel's (2019) research on the sustainability of the volunteer farmer-trainer approach in Kenya concluded linking social capital was gained through collaborations between development organizations and benefitted farmers with both technical and "soft" skills (i.e., communication and facilitation). The study in Kenya also indicated that linkages between local networks and "higher-level," influential actors increased access to technical support, resources, and a diverse array of information, which the authors claimed improved the sustainability of the peer farmer training system (Kiptot & Franzel, 2019).

Evidence suggests that farmer groups and communities often do not (and should not) build linking social capital in isolation. Rather, for instance, a group's existing bonding and bridging social capital can facilitate opportunities to access and achieve linking social capital. Dahal and Adhikari (2008) conducted a qualitative exploration about how social capital impacts community governance over natural resources in the Kalahan Forest in the Philippines. They found that bridging social capital via a pastor from abroad, who had long settled in the community, was crucial to connect to sources of linking social capital. Specifically, the pastor who had become a key figure in the community was able to tap into his relationships with the

nonprofit and government sectors and use his status to voice concerns of the community. The linking social capital the pastor catalyzed for the community encouraged “...government policy makers to create an enabling policy environment for collective action at local level” (Dahal & Adhikari, 2008, p. 14). Relatedly, Cofré-Bravo et al. (2019) argued that farmers can often link with outside sources for innovation and new knowledge using their existing bonding and bridging social capital (e.g., via a trusted researcher in the community or a local farmer leader). In addition to bridging social capital, Karlsson and Hovelsrud (2015) suggest that bonding social capital can improve smallholders’ access to external assistance by increasing collective capacity and power through formation of local associations and cohesive groups.

Two-way exchanges between the local farmer extension providers and outside actors and networks appear crucial to strengthen linking social capital and encourage outside interest and investment. An effective two-way exchange would entail both farmers benefiting from outside actors providing resources, information, and/or innovation *and* external actors benefiting from linkages to local networks through which they can diffuse technologies or information (Leeuwis, 2004; Taylor & Bhasme, 2018). Key for private sector engagement, product marketing can be more effective when the outside actors – such as input dealers that want to assess potential markets – can receive accurate information about the local farmers and community (e.g., their needs, interests, etc.). Aligning with these findings, Katungi et al. (2008) recommended two-way complementary mechanisms be built into extension programs and community associations.

Although linking social capital appears instrumental to help smallholder communities advance and respond to challenges, potential negative implications should be considered. Contemporary extension systems have shifted away from public, centralized programs (Norton & Alwang 2020) toward increased services from seed and input and other private companies targeting agricultural commercialization (Paalhaar & Jansen, 2011). While the trend toward pluralism and privatization can boost innovation, smallholder communities may not possess nor attract the same access to linking social capital (e.g., to connect with companies and outside actors) as commercial or larger farmers. Carpenter and Brock (2008) emphasized that many smallholder farmers continue to rely on highly vulnerable agricultural systems, unable to emerge from “poverty traps,” with a general lack of connectedness and resilience. Additionally, even in the cases of communities with ties to outside powerful actors and resources, the external forces are often intertwined with gender, class, and ethnicity issues (Mosse, 2010). And in F2F extension, these inclusion/exclusion dynamics frequently center around the farmer trainers making decisions, leading networking, and providing services (Pattenden, 2011). Titeca and Vervisch (2008) described a common challenge being that linking social capital tends to become concentrated among a few individuals who act as the gatekeepers and may exercise privilege in only sharing with select community members. Niles et al. (2021) suggested that this dynamic – when communities concentrate their connections to powerful sources – can contribute to social stratification and weakened mobilization and group cohesion.

Defining and Measuring Social Capital Outcomes in F2F Extension

The majority of F2F and FFS efforts in the literature identified in our review focus on measuring immediate technical outcomes such as increased innovation adoption, farm income, and profitability (e.g., Nakano et al., 2018; Todo & Takahashi, 2013; Davis et al., 2012). However, a few studies documented how F2F extension projects accounted for “soft skills” and outcomes more relevant to social capital. Taweekul et al. (2009) assessed the impact of a F2F

project in Northeast Thailand that encouraged farmers to observe and contrast their peers' farming with their own. The project explicitly focused on motivating farmers to pursue farm diversification by "experiment[ing] with new technology" (Taweekul et al., 2009, p. 130), and proposed that an effective F2F learning process should build participants' capacities to become local trainers to support and disseminate knowledge to their peers. Although efficacy or related outcomes were not directly measured, the authors reported that, through the approach, farmers felt "more confident in implementing diversification based on adaptation of new technologies" (p. 139). In a follow-up publication, Taweekul et al. (2010) concluded the project "encouraged reflection and enhanced the capacity of farmers for effective problem solving and for developing their own technical and social solutions" (p. 50).

Research by Van den Berg and Jiggins (2007) concluded investments are essential in farmer education to prepare farmers to adapt, innovate, and build resilience. These authors reviewed several FFS Integrated Pest Management (IPM) projects across Asian countries. They suggest that the FFSs aimed to achieve more than "increasing farmers' technical capabilities, and have sought to enhance their educational, social, and political capabilities" (p. 666). Six of their cases reported qualitative evidence of farmers' "increased self-regard, increased control over their assets, social skills, and their interaction with other farmers, service providers, and local government" (p. 672). It was inferred that these increased capacities led to non-project adoption of new behaviors such as establishing farmer associations and savings associations, increases in farmer experimentation, as well as protesting the inclusion of pesticides in a credit package. Similarly, Friis-Hansen and Duveskog (2012) studied FFSs in three East African countries using a lens of "farmer empowerment" and concluded that – in addition to direct technical benefits – there is evidence of a pathway from participation in FFSs to increased empowerment which then leads to farmers' improved well-being. Although these findings relate to boosting confidence and decision-making, we did not locate studies or projects which directly assessed farmers' efficacy or explicit "social capital outcomes." Furthermore, our search points to a lack of systematic F2F evaluation and research focusing on how smallholder farmers leverage their relationships and networks.

Discussion and Conclusions

A central takeaway from this research is that all three types of social capital (bonding, bridging, and linking) play instrumental and often complementary or intersecting roles in F2F extension systems. For an optimal F2F system, bonding social capital should be complemented by bridging and linking social capital. The review illustrates that without connections to outside actors and institutions, farmer groups and communities may become wary and unreceptive to innovations and change (Burt, 2000; Saint Ville et al., 2016). Relatedly, Silvert et al. (2021) suggested that pluralism of extension sources may boost smallholder farmers' self-reliance compared to dependence on a centralized, single extension source that could discontinue or lose funding leaving the farmers without support, and Lowitt et al. (2015) recommended extension systems shift toward decentralization to reach small farmers more effectively. These claims imply that a robust F2F system should link to a diverse network of service and resource providers. On the other hand, extensive outside linkages (linking and bridging social capital), without bonding social capital shared amongst the localized group of farmer participants, may lead to inequitable distribution or hoarding of important resources and power and deepen social and economic divides (Portes, 1998; Salem & Haugh, 2020).

Bonding social capital may be considered the foundational glue that holds together a community centered F2F system. Diminished or lacking social cohesion and trust may dissuade farmers from working with their peers (Lowitt et al., 2015); bonding social capital can help address this issue by strengthening relations and promoting a tight-knit local community of farmers. Furthermore, the formation of agricultural cooperatives and producer groups has been shown to improve small farmers' access to input and output markets through increased collective capacity (Arias et al., 2013; Campos et al., 2005; United States Department of Agriculture Foreign Agricultural Service, 2018). This underscores the importance of bonding social capital for a F2F extension system to catalyze bottom-up leverage and power in numbers, which can link farmers with opportunities such as new markets, technologies, information, or technical assistance.

The review of farmer trainer characteristics points to potential barriers for some farmers – especially those at the margins of rural communities – to assume leadership roles in F2F systems (Selam & Haugh, 2020). When possible, women and younger farmers should be encouraged to be farmer trainers and leaders to strengthen both equity and innovation outcomes. Specifically, innovation may come from younger farmers who have greater mobility from their engagement with a diverse array of networks and ideas (Selam & Haugh, 2020). While women can also play key roles and improve the system, they may face barriers to F2F leadership because they may not meet criteria for farmer trainer selection due to constraints to their mobility and limited ownership or control over assets and resources (Johnson et al., 2016; Lastarria-Cornhiel, 1997). Unsurprisingly, Nordhagen (2022) claimed women struggle to connect to agricultural mentors and networks led by other women, which impedes their ability to become entrepreneurs and leaders. The lack of women mentors demonstrates the need for F2F systems to promote pathways through which women can advance.

As for any development or extension approach, it is essential to weigh the costs against the benefits of F2F extension. Building and maintaining social networks is costly in terms of time and resources, which often inhibits social capital accumulation (Katungi et al., 2008). However, a need persists to better understand whether social capital investments are more self-sustaining than other capital investments. Such research would justify outside practitioners directing resources and efforts toward building social capital for F2F systems. Some research has indicated that FFSs help communities solve problems, adopt more sustainable practices, and boost social cohesion (Sonni & Asamoah, 2011). However, special attention needs to be directed to FFS' externally paid costs and provision of inputs, which may diminish prospects for scaling and sustainable farmer ownership (Arnés et al., 2018). More broadly, research is needed to empirically compare inputs and outputs and outcomes of F2F extension with other models (e.g., public, private, nonprofit models).

Bukachi et al. (2021) posited “the rural community can never be treated as a homogenous entity; these elements of inter- and intra-group dynamics characterize their existence and, by extension, influence patterns of access...” (p. 678). This review demonstrates that social capital is multifaceted and responsive to an array of factors and actors. Contextualizing social capital research and practice is crucial to acknowledge the unique factors that can shape relationships and networks in different rural communities and settings. Furthermore, while social capital has been described as a vital resource for poor communities that lack other forms of capital (Njuki et al., 2008), community members' identity and positionality must be dissected to truly understand their differentiated access to types of social capital. Evidence points to the importance of accounting for gender norms and dynamics, which in many cases present barriers for women to

gain social capital (especially bridging and linking social capital). For this, Katungi et al. (2008) encouraged tapping into the potential of men as brokers to leverage their social mobility and relay information and benefits to women. Similarly, Gotschi et al. (2009) cautioned against women-only groups which may diminish the benefits of social capital men can provide with differentiated access to outside sources. These solutions begin to account for gender disparities, but more work is needed to develop gender transformative techniques to target and shift underlying gender dynamics, structures, and barriers.

Recommendations

Our most fundamental recommendation from this study is to leverage social capital conceptualizations – specifically bonding, bridging, and linking – in the design, implementation, and evaluation of F2F extension systems. van Rijn et al. (2015) identified a need to better understand causal links and pathways through which social capital is created via development interventions. These should also be identified for extension efforts, especially at the grassroots, community levels relevant for F2F. Additionally, based on our review, indicators and evaluation metrics have not adequately captured unique outcomes reflecting influences of social capital on farmers and communities. Moreover, building social capital is often mentioned as an aim by projects but only technical or economic outcomes are measured. While technical outcomes are important, we suggest exploring the advent of novel social outcomes focused on bonding, bridging, and linking social capital. It should be stressed that no single roadmap to achieving social capital exists for development engagements, and social capital is not an all-encompassing solution – especially to social and gender disparities (Molyneux, 2002). Rather, different communities and groups experience unique social and power dynamics that should be inductively examined to infer how social capital can be integrated within projects and policies. Moving toward standardized social capital indicators and metrics could strengthen project planning and evaluation. Yet, given the need for contextualizing efforts, we recommend employing mixed methods – and not quantitative measures alone – to meaningfully explore the complex norms, relations, and structures that may influence social capital in diverse settings.

While discussion around mapping social capital has occurred over the last few decades, we recommend innovative and participatory techniques to map social capital in localized F2F extension contexts. A social equity approach is important for these exercises, and practitioners may learn from concepts and techniques used in gender development practice such as the *gender balance tree* (Farnworth et al., 2018). A social capital map that concentrates on equity could illustrate where and for whom social capital is plentiful and where and for whom social capital is scarce. Building awareness among community members, through involvement in mapping and reflection, about gender and power dynamics and their consequences may encourage shifts in attitudes and decision-making to reduce barriers and facilitate opportunities for marginalized farmers to build social capital. Practitioners should consider facilitating mapping before selection of farmer trainers, near the establishment of the F2F system or FFS, to encourage a more equitable process for appointing leadership.

A relevant area that has not been examined sufficiently in the literature is how the “digitization of agriculture” may impact smallholder farmers’ social capital. While digitization has been hailed a panacea to boost food production without major societal consequences (Lioutas et al., 2021), contention exists as to whether smallholder farmers have been included (or appropriately accounted for) in the development of relevant digital technologies and applications

(Lajorie-O'Malley et al., 2020; Lioutas & Charatsari, 2020). In F2F extension, researchers are encouraged to examine farmers' access to digital technologies and associated issues around inequity or social relations. Another, related need is to explore whether digital technologies could be leveraged to increase social capital. Could, for instance, smallholder farmers increase their bonding social capital through e-communities of practice and digital relationship-building and their linking or bridging social capital via digital networking to outside actors?

Finally, we recommend efforts and techniques, embedded within design and evaluation, to ensure F2F systems link to outside networks, ideas, and sources of innovation and resources. Doing this successfully and sustainably involves farmers not only approaching and building relationships with outside actors and institutions, but also making their community and farmer groups attractive to outside interests and investment (Leeuwis, 2004; Taylor & Bhasme, 2018). Notably, low farm productivity/output is commonly cited as a key barrier that inhibits smallholder farmers from commercialization and marketing opportunities (Arias et al., 2013; Campos et al., 2005). Hence, farmers in small communities may benefit from building social capital by connecting with other communities to boost quantity and collective capacities, which could strengthen the marketing orientation of a F2F system and help link with outside actors and markets.

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