The role of social capital in adoption of risky versus less risky subsidised input supplies: an empirical study of cocoa farmers in Ghana

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Abstract

This study evaluates the effect of social capital on farmers' adoption of subsidised seedlings and fertilizer for cocoa farmers in Ghana. We distinguish three types of social capital: network social capital, relationship social capital, and community social capital. Network social capital refers to the peer-to-peer information flow about product benefits reaching farmers, therefore closing the information asymmetry that prevents farmers from social learning about crop risk management through inputs adoption. Relationship social capital considers the role of social status in getting facilitated access to inputs through connections with extension officers who facilitate information dissemination about input benefits, and moreover potentially help bypass the government criteria in getting access to inputs themselves. Finally, community social capital concerns the community collective income, community size and reachability relative to the cooperative main office.

We find that network social capital has a significant effect on adoption of subsidised seedlings, to an extent where it allows farmers to bypass subsidy qualification criteria for access to seedlings imposed by the government. This applies even more so for group and village leaders. Subsidized fertilizer uptake, on the other hand, is less dependent on social capital. We explain this difference by the risk involved in adopting seedlings versus fertilizer. In the case of seedlings adoption, relying on information provided by the social network promotes sharing of benefits of hybrid varieties, and thus reduces the risk of its application. Adoption of fertilizer, on the other hand, is not correlated with social capital because fertilizer application is less risky to farmers. They can easily switch from using fertilizer to not using fertilizer. Access to both inputs is influenced by government inputs' eligibility criteria, namely having mapped farm. However, we find that 15% and 29% of farmers respectively have access to seedlings and fertilizer, even though their farms are not mapped. Our findings suggest that for governments to stimulate uptake of substantive inputs, such as seedlings, subsidies should coincide with attention to social capital and fair distribution of inputs.

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Introduction

Differences in technology adoption across countries are amongst the main explanatory factors for differences in income per capita worldwide (Caselli and Coleman, 2003; Comin and Hobijn, 2004). Poverty reduction and sustainable development require an increase in productivity in the agricultural sector given that three out of four of the World's poor live in rural areas (Brune et al 2016; World Bank 2008). Adoption of modern technologies in agriculture, such as fertilizers and improved seeds, can significantly increase productivity (Just & Zilberman 1983; Besley & Case 1993; Simtowe 2006). Nakano et al (2018) find that adopting hybrid varieties can help farmers across Sub-Saharan Africa increase yields and reduce that productivity gap. However, the adoption of modern inputs among African farmers remains extremely low (Foster and Rosenzweig, 2010, Gollin et al. 2005).

There are many barriers resulting in low demand for agricultural technologies adoption for African farmers (see literature survey of Anderson 2003; Barnett et al. 2008; Dercon and Christiaensen, 2011; Foster & Rosenzweig, 2010; and Magruder, 2018). These range from heterogeneity in perceived (net) benefits and profitability (Foster and Rozenweig, 2010), time and risk aversion (Chetty & Looney, 2006, Dercon & Christiaensen, 2011, Emerick et al. 2016, Foster and Rozenweig, 2010, Yesuf & Bluffstone, 2012; Yu & Nin-Pratt, 2014), lack of liquidity, especially through the lack of availability of credit (e.g., Foster and Rozenweig, 2010, Karlan 2014, Magruder, 2018; Yesuf & Bluffstone, 2012), time-inconsistent preferences (Duflo, Kremer, and Robinson 2011) and psychological costs of changing habits (Banerjee & Duflo, 2007, Mankad et al. 2017). The only supply-side driven impediment to technology adoption identified in scientific literature is ineffective information dissemination systems to communicate the benefits of inputs adoption, which arises from the absence of effective agricultural extension systems (Doward, 2009 and Takahashi et al., 2020), limited enforcement of the regulatory framework (Joffre et al. 2018) or absence of social learning (Foster and Rozenweig, 2010, Mankad et al. 2017).

There are a number of studies that focus on the direct role of social learning on adoption of farm technologies (e.g. Barr 2000, Boahene et al. 1999, Coleman et al., 1966, Deaton, 1997, Grootaert and Bastelaer, 2002, Ryan et al. 1943). However, no studies to the authors' knowledge on the impact of social capital on adoption of subsidized farm technologies. Subsidizing productive inputs can potentially be important in enhancing technology adoption given that the subsidy is an equivalent to lifting farmers' credit constraints related to the adoption of inputs (Magruder, 2018). The aim of this paper is to study the impact of social capital on adoption of subsidized seedlings and fertilizer. This is primarily interesting because we see the value of social capital in inputs adoption under circumstances where credit constraint on input adoption has been lifted. Secondly, separately comparing the effect of social capital on adoption of subsidized seedlings and fertilizer is interesting for two reasons: both are free goods that require no capital investment; however, planting new seedlings has a higher risk than applying fertilizer. On the one hand, with free provision of inputs we can assume that farmers are more likely to adopt inputs given that investment costs and credit constraints have been lifted. Because the government reduces credit constraints to inputs adoption, we would expect that subsidies increase input adoption Social capital can then become important in dealing with the supply-side driven impediment to inputs adoption, where access to inputs becomes a privilege of a few who can overcome potential extension inefficiencies (Doward 2009). On the other hand, as much as social capital has the potential to

overcome extension inefficiencies by effectively disseminating product benefits information through peer-to-peer contact, the effect of it can depend on the riskiness and the effort required for the investment. For instance, the new, more productive cocoa seedlings take at least 12 months to bear first cocoa pods[2]. Furthermore, to plant new seedlings, farmers have to clear land, which is a labour intensive task. Bonjean (2019) argues that individual utility function is a profit function that is positively correlated with production and negatively with effort, and as such, farmer's utility is strictly proportional to the increase in quantity produced (no scale economies). The risk associated to planting new seedlings is sacrificing less productive old trees to plant new seedlings that take time to bear fruit, involve high effort and have associated labour costs and raise opportunity costs of an alternative crop that bears fruits sooner than 18 months. Fertilizer application, on the other hand, does not involve a high risk, neither does it force farmers to exert a high level of effort to increase productivity.

Another interesting reason for studying seedlings and fertilizer adoption separately is that the government banned commercial sale of seedlings, but not of fertilizer. Thus, we do not know whether there is demand for more seedlings beyond what is being provided for free, but we do find a number of commercial fertilizer suppliers in various communities, which indicates demand for fertilizer beyond government subsidies. If governments directly intervene in inputs markets through supply of subsidized inputs, there is a risk that the inputs do not arrive in time, in good quality, or in sufficient quantities (Dorward, 2009). Problems of timely delivery of modern inputs is seen as the most decisive hurdle to the diffusion of innovations (Bonjean 2019). It is therefore important to examine how social capital influences adoption of subsidized inputs.

Social capital is a broad concept that can be measured in various ways. In this paper, we focus on *network social capital*, *social status*, and *community social capital*. Network social capital refers to information flow or farmers' proximity and frequency of interaction with other individuals within a community. This type of interaction enhances peer-to-peer information sharing about the benefits of new technology adoption. *Status* refer to the social status and the strength of relationships across community and across value chains, and their resulting access to resources. Status in this case has the potential to overcome extension inefficiencies in distributing inputs. Finally, *community social capital* refers to the capital associated with belonging to a group, or a community in our case, including its geographical location and accessibility. Information dissemination is faster in dense groups, and group location and proximity to main roads might determine accessibility to extension officers. These are explained in more detail in the theoretical framework.

Our study investigates cocoa farmers in Ghana, the second largest producer of cocoa beans in the world. An estimated 30% of Ghanaian population depends on cocoa for their income (Gockowski et al., 2011). The production of cocoa in Ghana has historically been dominated by unorganised smallholder farmers (Gordon, 1976) with averages farm sizes of 2-3 hectares (Baah et al., 2012). The large number of smallholder farmers makes the administration of input subsidies a challenge for the government. The government regulatory organisation of the cocoa industry, Cocobod, and private sector partners joined forces in Public-Private Partnerships (PPPs) to increase

[2] Information provided by seedlings suppliers. The conventional seedlings take about 18 months to bear first cocoa pods, and even then, are less productive.

productivity of cocoa farmers on existing land and to increase income of Ghanaian cocoa farmers (Bitzer et al. 2012). These PPPs in various forms provide farmers with access to subsidized input supplies, like fertilizer and seedlings, and also with services, like pest control (farm spraying) and farm mapping[3]. While the government regulations and subsidies aim to enhance adoption of improved inputs, there is no evidence that these policies actually increased input use.

This paper is divided as follows. In Section 2 we describe the existing theory of social capital and form hypotheses based on that theory; Section 3 describes the context of the study; Section 4 discusses the model, methods and variables used; Section 5 summarizes the results, Section 6 presents conclusions and policy recommendations.

Theory and hypotheses

Social networks are the arrays of connections that join individuals. The individuals' actions are rooted in, and affected by the social ties joining individuals to other people (Granovetter, 1985). The information and support that individuals acquire from their social networks and the characteristics of their acquaintances constitute an individuals' social capital (Coleman, 1994). As such, social capital arises from non-market interaction between parties, but has an economic effect on individuals (Coleman 1994). More precisely, social capital enables individuals to access and use resources embedded in social networks to gain surplus value from their economic activities (Lin, 2017). The main sociologists that stand out in this arena of research are Coleman Putnam, Burt, Marsden and Flap, which are summarized in a recent literature review of Lin (2017) and explain agents' investment in- and economic payoffs of social capital. The study also defines social capital as a crucial part of capital, framing it as a part of neo-classical capital theory, termed "neocapital theory" by Lin (2017). Similarly to Coleman, neocapital theory describes social capital in terms of social relations that enhance access to and use of resources embedded in social networks, where the capital itself is investment in social networks.

Network or *information access as social capital*. A number of researchers show that the probability of agricultural innovation adoption increases as farmers get more information about the agricultural innovation (Banerjee et al. 2013; Conley & Udry, 2001; Dercon and Christiaensen, 2011; Feder et al. 1985, Foster & Rosenzweig, 2010; Hiebert, 1974, and Magruder, 2018). Information allows agents to discover opportunities and choices that they would have otherwise not known about. Grootaert and Bastelaer (2002) defined this positive information flow as 'cognitive social capital' which facilitates and potentially lowers transaction costs of a particular agricultural innovation. Transaction costs related to making informed choices is likewise reduced. This information can be conveyed through observation of neighbouring farms, other group members or through extension officers. A few economists have highlighted the importance of education and training offered by extension officers in hybrid crops adoption (Birkhaeuser et al., 1991; Azhar, 1991; Lin, 1991). However, farmers' ability to decipher and process this information depends on the level of their skill (Hilbert 1974), which can be measured by years of experience in farming or years of education. Farmers who lack the means or capacity to acquire or decipher information through

[3] Measuring the exact farm size and location with a GPS device.

education or training turn to their social networks for information (Boahene et al. 1999, Coleman et al., 1966). Ryan et al. (1943) found that social network, specifically neighbouring farms have a high influence on hybrid corn seed uptake in the US. Young (2009) further breaks down the influence of neighbouring farms on inputs adoption to contagion, social influence and social learning. Contagion refers to a phenomenon of people being more likely to adopt hybrid seeds if they have come in contact with others who have adopted it, a phenomenon elaborated in more detail by Centola & Macy (2007). Social influence, on the other hand, refers to farmers adopting hybrid seeds based on seeing a growing number of other people adopt it. Finally, social learning refers to adopting seeds once having seen evidence that the hybrid seed actually delivered the promised improved yield. Nakano et al. (2018) show that farmer-to-farmer learning increases both the adoption of hybrid varieties of crops and productivity of their respective farms.

One could argue that farmers grouped in a cooperative already have high network social capital, because of regular community meetings of the cooperative where they raise awareness of the existence and the use of farm inputs. Moreover, all farmers in our study have already been trained on good agricultural practices as part of their certification scheme, where the benefits of using productive seeds and fertilizer are communicated to all farmers. However, one of the impediments to seedlings' adoption is higher risk aversion (Chetty & Looney, 2006, Dercon & Christiaenson, 2011), which makes farmers less willing to undertake activities and investments even when they have high expected returns (Lipton 1968; Rosenzweig & Binswanger 1993). There might be some uncertainty about the yields of hybrid seedlings, which can be overcome if farmers have more information from their peers. Given the riskiness of the investment and the opportunity costs associated with it, farmers might rely on their social networks for information before they make a decision to (re)plant a tree. Banerjee et al. (2013) highlighted the influence of "centrality" of a social network position for the information flow on access to services. They highlight that communities where leaders (self-help group chairs, shopkeepers etc.) occupy central positions in the village network, the adoption of microcredit was higher. Deaton (1997) defines social capital in terms of quality and frequency of social interaction, which can improve allocative efficiency through knowledge copying and knowledge pooling. Copying can be a one-way (non-reciprocal) communication where one group member acquires knowledge from higher-ranked members in a grapevine group model. According to Collier (2002), in smallholder farmer setting, copying is very common, as information between similar groups of people flows fast. Knowledge pooling, on the other hand, depends on reciprocal social exchange of information caused by frequent interaction with different networks (Barr 2000). Our first hypothesis tests whether increased exposure to information flows generated through frequency of interaction with various farmer groups improves inputs' adoption.

Status, or relationships, as social capital. There are two reasons why strength of relationships is an important source of social capital. First, strong social ties have the power to influence members' choices and thus economic action (Coleman, 1994). BenYishay & Mobarak (2015) similarly point out that social identity of the communicator influences others' innovation adoption. Second, whereas network capital is associated to higher learning about a product, strong social ties can facilitate access to both inputs and information about inputs through extension officers, thereby facilitating adoption. Putnam (2000) defines 'structural social capital' as bonding and bridging capital. Bonding refers to horizontal ties (within community), whereas bridging refers to vertical

connections which include connections across the value chain (connection to cooperative management, or government etc.). Bourdieu (1986) defines social capital in the context of social relations that increase the ability of an actor to advance her/his interests. Ajuha (1998) measures social capital in rural Cote d'Ivoire in terms of ethnic heterogeneity. In line with that, Mueller et al. (1999) argue that minorities face negative social capital. Coleman (1994) explains how hierarchy, originally referred to as grapevine organisational structure, plays a critical role in decision making. There are clear signals that this form of social capital should be present in our study, given that the cooperative management distributes subsidized input supplies. Therefore, we have to take into consideration that being a member of the cooperative management team will probably significantly affect access to extension officers and inputs' benefit information. Putnam et al. (1994) show that greater social capital, defined as the degree of horizontal relationships, improves government efficacy in delivering services. Translated to the context of smallholder cocoa farmers in Ghana, we hypothesise that relational social capital measured in terms of social status within a community and cooperative increases adoption of input supplies (seeds and fertilizer) within the cooperative because of improved information delivery (second hypothesis). The effect of social status on fertilizer adoption is expected to be lower because it is a less risky investment.

Community social capital. One of the variables that was greatly undermined until recently, was the distinction between individual social capital and group social capital. In this recent study on social capital theory, Lin (2017) distinguishes individual versus group social capital. This could have direct implications on access to input supplies, through both flow of information and through relationships. For example, in the context of information flows, bigger communities have a clear advantage to their smaller counterparts, because they have a broader flow of information and more agents (farmers and extension officers) involved in the information flow. On the other hand, Jackson & Roggers (2007) find that group size alone does not determine information flow in the community, but rather its connectedness to external networks. If the group itself is geographically disconnected from an external network which is the source of information, information aggregation within the group remains quite ineffective. Beaman and Dillon (2018) show that less connected communities are excluded from new information diffusion.

In the context of relationships, Lin shows that collective capital within a group is more important than farmers' individual capital. Narayan and Pritchett (1999) also separate individual social capital to community social capital, arguing that "social capital may facilitate greater cooperation in the direct provision of services that benefit all members of the community" (p.4). This goes in hand with Bourdieu's (1986) structural view that social capital is represented by aggregating (1) the size of the group or network and (2) the volume of capital possessed by members (Bourdieu 1986, p. 248). However, the main assumption of Bourdieu is that community members maintain strong and reciprocal relations (a completely dense or institutionalized network), arguing that the strength of relationships within the community does not enter the equation. We however argue that both community social capital as well as individual relationships are important determinants of farmers' adoption of inputs. Furthermore, there are infrastructural advantages to some communities versus others, which are of course not related to individual strength of relationships. We thus hypothesize that high community social capital increases the likelihood of adopting subsidized seedlings and fertilizer (third hypothesis). Because of lower risk of fertilizer, the effect of social capital on fertilizer adoption is expected to be lower.

Methodology and Empirical Application

Study context

This section summarizes the industry context to better understand the source of subsidies from Cocobod, the government cocoa regulatory agency in Ghana, and compliance criteria to getting access to inputs subsidies. Cocoa prices in Ghana have been managed by Cocobod since 1947 (Kolavalli & Vigneri, 2011, Laan, 1987, Quarmine, 2013, Ruf 2009). However, Cocobod's level of involvement with farmers in service provision as well as government tax revenue extracted from cocoa bean sales has varied over time. Government agencies have historically been involved in guaranteeing the market for every cocoa bean produced and fixing annual cocoa prices annually (Gordon, 1976, Quarmine, 2013). This implies that the government guarantees to purchase all cocoa produced, and moreover ensures price stabilisation to protect farmers from world market-price fluctuations. Furthermore, the government has incentivized programs that increase productivity of farmers and quality of their beans. In the last decade, these efforts have been a combined effort of government and private-sector efforts (Shapiro & Rosenquist 2004, Lopez et al. 2015). These Public-Private Partnership (PPP) programs intend to enhance farmers' adoption of inputs, such as hybrid cocoa seedlings and fertilizer, and services, such as farm mapping and spraying (pest control). The price farmers pay for receiving these services has varied to a great degree over the years. For instance, in the late 1960s, the price Ghanaian farmers received for their cocoa was less than half of the world market cocoa price (Simmons, 1976). Today, farmers receive on average around 70% of the world cocoa price (Quarmine, 2013, Cocobod, 2018) in return for having a guaranteed market for their beans, a fixed farm-gate price and access to free farm services, such as farm mapping and pest control, and free farming goods, such as access to free hybrid seedlings and fertilizer (Cocobod.org, 2018). However, availability of these services provided by extension officers, and availability of goods provided vary per region and even per community.

To facilitate buying of cocoa beans across the country, Cocobod issued cocoa buying licences to 28 Licenced Buying Companies (LBCs, Ministry of Agriculture, 2018[4]), but the top 10 covers 96% of the market (Baah et al. 2012). The top-10 LBCs also include the largest cocoa trading companies in the world which expanded vertically by acquiring a buying licence from Cocobod. Examples of those LBCs are Armajaro (Armajaro was taken over by Ecom in 2013[5]), Olam Ghana Limited, and Cargill Kokoo Sourcing Ltd. LBCs send Purchasing Clerks (PCs) directly to farm gates to purchase cocoa[6]. Cocobod Marketing Company (CMC) pays a fixed percent-based fee to LBCs, LBCs likewise pay a percent-based fee to Purchasing Clerks, and PCs pay farmers in cash, based on a fixed price set by Cocobod. The purchase system has received praise by international communities and multilateral organisations for successfully managing a complex value chain, improving farmer organisation, productivity and incomes, and limiting corruption (Kolavalli & Vigneri, 2011). This is, however, an ongoing challenge since only 12.5% of all cocoa farmers are actually organised in an association or farmer cooperative (Baah, 2012). For that reason, LBCs often play the role of a farmer group. For example, LBCs which are interested in buying sustainably certified cocoa group farmers under the

[4] http://mofa.gov.gh/site/?p=11406
[5] https://www.ft.com/content/020b18d2-4ad8-11e3-8c4c-00144feabdc0
[6] For a complete list of all 28 LBCs, refer to http://mofa.gov.gh/site/?p=11406

umbrella of the LBC. Here farmers receive training and support in implementation of good agricultural, social and environmental practices, which ultimately helps the LBC to obtain a sustainability certificate.

Cocobod subsidiaries and their roles

Cocobod has a few subsidiaries designed to service cocoa farmers: Cocoa health and Rehabilitation Department (CHED), Cocoa Research Institute of Ghana (CRIG) and Seed Production Division (SPD). (CHED) is the unit of Cocobod concerned with control of Black Pod Disease and Swollen Shoot virus. Black pod disease is reported to cause on average about 40% of annual pod losses in Ghana (N'Guessan 2013), while Swollen Shoot virus could substantially reduce yield by about 70% (Ameyaw et al. 2014). The role of CHED is to send extension officers to train farmers on good agricultural practices, to detect and treat (spray) diseased farms, and assist farmers with replanting treated farms with disease tolerant and improved hybrid varieties (Cocobod, 2018). In practice, however, farmers receive only training from extension officers at best, and farmers are expected to pay a fee for training. Farmer trainings are often paid for by the LBCs from certification premiums. Certification training has also received a significant amount of foreign attention and aid in the last couple of years by a number of NGO.

CRIG and SPD develop and distribute hybrid seedlings, respectively. The distribution of seedlings takes place through one of the 27 SPD service centres across the country (Cocobod, 2018). In some cases, LBCs – usually large trading companies – finance opening and expansion of SPD service centres and scaling up of hybrid seedlings distribution. These service centres also provide a one-stop-shop for farmers where farmers can buy all their input supplies, from rubber boots and cutlasses to fertilizers and fungicides. However, farmers purchase these inputs at a cost. Only hybrid seedlings have consistently been provided for free. Farmers only had to pay for transportation costs of seedlings from the service centres to farms. Government policy on fertilizer subsidies has varied over the years, but even in years when fertilizer was subsidized, there were limited quantities of free fertilizer available, limiting farmers' access to it (Bymolt et al, 2018).

Cocoa farmers in this study and their access to inputs

This study investigates a cooperative of Fairtrade-certified farmers in Fanteakwa district in the Eastern region of Ghana. The cooperative, Fanteakwa Union, has approximately 2,200 members across 25 communities, with a management team which groups farmers, and coordinates certification and value-chain collaboration, including access to inputs. Fanteakwa's main long-term buyer has been Mondelez, one of the top three biggest chocolate manufacturers in the world. However, farmers do not sell produce to the cooperative or to Mondelez directly, but to LBCs of their choice. The role of the cooperative is to organise farmers and help them obtain a voluntary standard certificate (Fairtrade). To ensure certification it is necessary that all farmers within the cooperative have access to certification training on good agricultural practices, and traceability and origin paperwork. Training farmers as well as providing free hybrid seedlings is a blend of PPP efforts. Extension officers are commissioned to train farmers by private sector partners. The role of the cooperative is further to ensure that farmers comply to extensive certification requirements of Fairtrade, and to ensure correct use of input supplies, as defined by Fairtrade requirements.

A trustworthy cooperative and good relationship with value chain partners is a classic example of high structural social capital which positively influences agricultural innovation diffusion (Putnam, 2010). However, even though the cooperative is well managed, access to hybrid seedlings and fertilizer is still very low. In the period between 2016 and 2018, Fanteakwa Union received 165,600 free hybrid seedlings from Tree Global, Mondelez-subsidized improved seedlings, which were delivered directly to farmers upon payment of transportation fees or pickup at the seedlings garden. Moreover, the cooperative also received 120,000 free hybrid seedlings from CHED where, again, farmers had to either pick up the seedlings at the CHED seedlings garden or pay for transportation fees. Finally, the cooperative received only a few dozen bags and bottles of free fertilizer from CHED, and those were delivered directly to the cooperative HQs in Osino. However, not more than 26% of cooperative farmers have had any access to hybrid seedlings[7], and around 50% of cooperative farmers are estimated to have had access to some form of fertilizer[8]. One of the impediments to farmers' access to inputs was not meeting the requirements of inputs access. Namely, Cocobod issued a policy for free access to hybrid seedlings only for farmers who have had their farms mapped and who have cleared sufficient land for new seedlings. Farm mapping is one of those PPP activities that is supposed to be taken up by Cocobod extension officers, however, the availability of that service also varies significantly.

By taking a broad look at our survey, we can obtain some preliminary information about the reasons why farmers don't have access to (more) seedlings.[9] It appears that 25% of farmers do not want more seedlings, meaning they either have sufficient access or they are not interested in uptake at all. This implies that 75% of the farmers want more seedlings. We asked all farmers who want to have more seedlings "is there something that prevents you from getting (more) seedlings?" Surprisingly, of the 75% farmers who want more seedlings, 43% answered this question with a "no". Hence, a considerable group of farmers seemingly wants to have access to (more) seedlings, but at the same time there are no clear reasons as to why they do not have access to (more) seedlings. We can only speculate about the underlying reasons. Maybe they misinterpreted the question; it may also be the case that our survey made them aware of the potential advantages of using these seedlings. If so, these farmers simply lacked information to make the optimal decision. It is also surprising that only 15% answered "Yes, but seedlings were not available." Hence, only a small group of farmers who want to have access, do not get access because of a supply constraint. A larger group of farmers did not get access because either their land is not cleared (18%) or their farms are not mapped (15%). [10] This implies that around 25% of all farmers do not comply to government criteria for getting access to seedlings, by either not having mapped their farm or by not having cleared their land. However, it should be noted that the survey also shows that 15% of the farmers that have access to seedlings and 29% of the farmers that have access to fertilizer, have not mapped their farms. Somehow, these farmers found ways to come around the government requirements for access. Perhaps social capital has played a role.

[7] See the Appendix, survey Module 6 on Farmer services, question 611
[8] See the Appendix, survey module 6, questions 603 and 604
[9] See the Appendix, survey Module 6, question 611
[10] Note that there is a small group of farmers that either did not respond to the question, or answered with "other reasons", which explains that the sum does not add up to 100%

Survey design and data collection

Our survey sample consists of 1,503 farmers from 22 communities of Fanteakwa Union cocoa cooperative in the Eastern Region of Ghana. Communities and farmers were randomly selected based on a full list of farmers made available by the cooperative management. The farmer survey was conducted between February and April 2016. The survey consists of a few modules, namely household composition, assets and standards of living, cocoa farming information, services from Cocobod, social capital, non-cocoa economic activities, and financial and savings data. For more details, see the supplementary material (SM 4) in the attachment. Surveys were conducted in person in Twi, the local oral language.

Besides the farmer survey, we also conducted at least one community-level survey per community with village chiefs or elders to get better insight into community-level characteristics, like the number of inhabitants in the community, availability of services in the community, like schools and hospitals and accessibility by road to the cooperative headquarter office. We also collected GPS coordinates of a central farmer gathering point in every community, to be able to determine distance to the cooperative headquarters.

Analytical model

In this paper, we use Linear Ordinary Least Squares (OLS) regression, and logit regressions to test for robustness. Our model looks as follows:

$$Y = \alpha + \beta \mathrm{N} + \gamma \mathrm{S} + \delta C + \zeta \mathrm{I} + \phi F + \varepsilon \qquad (1) \text{ for OLS and,}$$

$$P = F(Z) = \frac{1}{1+e^{-z}} = \frac{1}{1+e^{-(\alpha + \beta \mathrm{N} + \gamma \mathrm{S} + \delta C + \zeta \mathrm{I} + \phi F + \varepsilon)}} \qquad (2) \text{ for Logit.}$$

where Y is the dependent variable which refers to either access to hybrid seedlings or access to fertilizer. *P* stands for probability of getting access to seedlings and fertilizer in the Logit equation, and α is a constant. N refers to network social capital, obtained via factor analysis (see below), S is a set of binary variables denoting farmer status within community, C is a vector of community social capital, I represents a vector of farmer individual characteristics, and F denotes factor loading of farm variables (see explanation below).

Variables description

Seeddum and *Fertilizerdum* are dependent, binary variables defining whether farmers have access to seedlings and fertilizer respectively.

Network social capital is measured with a variety of variables: in terms of *frequency of interaction with 1) village chief and elders; 2) spiritual leader; 3) farmer group leader; 4) certification manager,* measured as interval variables with values 1 for "hardly ever"; 2 for "less than once a month"; 3 for "at least once a month"; 4 for "at least once a week"; 5 for "at least once a day"; and "." for "not applicable". These variables were then combined in one factor, using factor analysis.

Relationship variables are measured by community status binary variables and refer to *Farmer* (only), *Village chief, Community elder, Spiritual leader, Coop executive member* (member of the executive board of the cooperative)*, Immigrant* (binary variable with values 0 for indigenous, and 1 for 1st or 2nd generation migrant).

Community social capital variables used in this study are *distance* from cooperative main office (measured in kilometres via GPS coordinates), *accessibility* of these communities (dummy indicating how reachable they are by a motor vehicle), *size* of community (number of inhabitants) and total *community income*. We made a *Reachability* interaction variable from *Distance* and *Accessibility* variables. This data comes from the Opinion Leader Survey – a community-level survey conducted on one or two community elders in every community where farmers were surveyed (see end of SM 4, module 1 Community Level Survey for more detail). For more details on the community distances and differences in means of access to seeds and fertilizer per community, we refer to SM 1. The other community social capital variables are *community income* and *number of inhabitants.* Community income is a sum of the cocoa income of all cocoa farmers surveyed in the village. The number of inhabitants of each community is extracted from the Opinion Leader survey.

The control variables refer to individual characteristics, like *Gender* (0=male, 1=female), *Vehicle possession* (binary variables defining whether a farmer has a bicycle, car, pick-up or other transportation on wheels) and *Cocoa experience*, (years of experience with cocoa farming. Furthermore, we control for *cost of labour* and *cost of inputs* specifically for land preparation before planting seedlings. Finally, we control for farm characteristics, starting with government criteria for getting seedlings, namely *Mapped farm* (0-no, 1=yes, regardless of whether the government or the farmer has mapped the farms); *Uncleared land* is a binary variable (0 – land ready, 1 – land not cleared) referring to farmers who did not get seedlings because they have not cleared land from weeds, bushes etc. This was used as a proxy to asking farmers whether they have cleared their land for seedlings. Finally, *Farmfactor* variable groups a number of farm capital correlated variables into one factor using factor analysis: cocoa farm size (measured in hectares), number of cocoa farms, total income and proportion of income from cocoa into one component. These variables were then combined in two factor variables to avoid covariance issues. See methods below.

Descriptive statistics of farmer and community data

Table 1 summarizes descriptive statistics of variables key to this study. Our survey shows that 26% of farmers interviewed had received hybrid seedlings, and 56% fertilizer. These figures, however, are not referring to whether these were sufficient quantities from an agronomic point of view. The table compares means of a number of independent variables for those who take up each input (seedlings, fertilizer, or both), relative to those who do not (column 'none'). Using t-tests, we found a high number of variables with significantly different means that could potentially explain farmers' adoption of seedlings, fertilizer or both. We find that the mean of all of the network and social status variables are significantly higher for those who adopt both seedlings and fertilizer. So far this is in line with our first and second hypothesis. We also find that immigrant status is associated with higher adoption of seedlings, and a significantly lower adoption of fertilizer for immigrants. This can be explained by the fact that immigrant farmers are commonly not land owners, but rather farm labourers. According to the sharecropping system in Ghana, farm labourers can take anywhere between 1/3 and 2/3s of total crop output, but they are in charge of farm maintenance, which includes acquiring seedlings for planting or replanting[11]. As for community social capital variables, we find that higher community income is associated with higher adoption of seedlings, but not fertilizer. Surprisingly, communities with smaller income are associated with higher adoption of fertilizer. Another

[11] Information provided by cooperative management.

finding contrary to our expectations is that smaller communities adopt more seedlings, but the community size has no effect on fertilizer adoption. There might be some bias in our findings given that we only have 22 communities in our sample[12].

As for demographic control variables, we see a significantly lower inputs adoption for women, than for men. This could be explained by general division of tasks between men and women in cocoa, where for instance, fertilizer application is generally considered men's duty on cocoa farms (Nkamleu et al, 2007). Looking at farm-level control variables, we find that higher mean of most farm capital variables (total farms size, number of farms, total income from cocoa) is associated with higher adoption of both seeds and fertilizer. This could imply high transportation costs of seedlings from seedlings centres to farms, or hidden fees in both seedlings and fertilizer adoption[13].

Table 1: Descriptive statistics of farm and network, relationships and community social capital variables

Independent variables	**No seedlings (n=1115)**	**Adopted seedlings[1] (n=386)**	**No fertilizer (n=746)**	**Adopted fertilizer[1] (n=755)**	**Adopted none[1] (n=1271)**	**Adopted both[1] (n=230)**
- Frequency of interaction with:						
Chief	1.49	1.85***	1.5	1.67**	1.52	1.95***
Spiritual leader	2.63	2.75**	2.63	2.70	2.64	2.76*
Coop leader	2.24	2.47***	2.23	2.36**	2.26	2.52***
Certific.mngr	.92	1.04*	.85	1.06***	0.92	1.13***
- Farmer status[1]:						
Chief	1%	2%**	8%	12%***	1%	3%***
Elder	7%	12%***	7%	10**	1%	1%***
Spiritual leader	7%	10%*	6%	9%**	8%	9%
Coop leader	1%	4%***	1%	3%***	1%	6%***
Immigrant	48%	53%**	51%	47%*	49%	49%
- Community Social Capital:						
Distance (km) (min 0, max 24.82)	8.98	12.85***	9.62	10.33***	9.59	12.09***
Accessibility[1]	52%	53%	61%	44%***	47%	54%**
Community income	548,656	749,214***	732,767	663,004**	588,604	797,207***
Nr inhabitants in community	4827	3626***	4617	4422	3834	4960***
- Individual characteristics:						
Gender[1] (1-female)	36%	25%***	40%	26%***	35%	22%***
Cocoa farming experience	15.92	15.65	14.91	16.77***	15.59	17.28**
Vehicle (bike, car, pickup)	12%	16%**	12%	14%***	12%	17%**
- Farm attributes:						
Tot. farm size (ha)	7.30	8.72***	6.97	8.34***	9.38	6.77***
Nr farms	2.11	2.24**	2.03	2.25***	2.44	2.06**
Cocoa income	5245	6483***	4241	6870***	8009	4242***
Proportion cocoa income from total income	0.71	0.65***	0.67	0.73***	0.69	.68
Labour cost landprep	186.3	326.5***	172.6	272.0***	354.1	142.2***

[12] There are a total of 25 communities within the cooperative.

[13] An alternative way to explain this phenomenon is that they have higher income because they have adopted inputs in the past years and are now enjoying the benefits of higher productivity and thus, income. However, we do not have time-series data from previous years to control for this potential causality problem.

Inputs cost landprep	118.8	170.0**	97.0	166.9***	192.7	86.56***
Mapped farm[1]	31%	41%***	25%	3%***	32%	47%***
Land not cleared	15%	10%***	13%	15%*	14%	13%

*** p<0.01, ** p<0.05, * p<0.1

1 - Binary variables

2 - Farmer Business School training on good agricultural practices: Binary variable

3 – Likert scale variables: 1- hardly ever, 2- less than once a month, 3- at least once monthly, 4- at least once weekly, 5- at least once daily

4 - Civil servant: teacher, nurse, policeman

5 - Lead farmer introducing farm innovations in a community

Our findings show that farmers who have a smaller proportion of income from cocoa relative to alternative sources of income adopt fewer seedlings and more fertilizer. This might show that farmers who have alternative sources of income might rent out their land through share-cropping agreements and let farm labourers (typically immigrants) ensure they get take up seedlings. This can also be seen from Table 1 where we see that immigrants have a significantly higher access to seedlings relative to indigenous farmers.

Another important variable from a logistical perspective is possession of a vehicle, indicating that those with a vehicle are more likely to adopt seedlings. Finally, the only official criteria for getting seeds and fertilizer from the government (Cocobod) are having farms mapped and land cleared for seedlings. Indeed, our findings confirm that adoption of seedlings is significantly higher for farmers who have their farms mapped. Cleared land seems to be more relevant for getting access to seedlings than to fertilizer.

We have five groups of explanatory variables: summarized in Table 2.

Table 2:

Access to fertilizer and hybrid seedlings

Social capital variables			**Control variables**	
Network variables: Frequency of interaction with: • community chief • spiritual leader • farmer group leaders • certification manager	*Relationship variables:* • community status defined by 12 binary variables	*Community variables:* • Distance to main coop office, • Accessibility by road	*Farmer individual attributes:* • gender, • years of experience in cocoa farming, • possession of a vehicle)	*Farm attributes*: • farm capital (factor variable for farm size, nr of farms, income from cocoa farming, proportion of cocoa income relative to total income) • farm expenditure • farm map

Factor analysis and Principal Component Analysis (PCA) for network social capital and farm variables

As shown above, we use a variety of proxies for network social capital, who are (highly) correlated. We therefore use factor analysis to derive an index of Network social capital. As a robustness test, we also use Principal Component Analysis (PCA). We proceeded as follows. First, we conducted Bartlett's test of sphericity and Kaiser-Meyer-Olkin (KMO) test to see how suited the network variables are for factor analyses. Bartlett's test of sphericity tests the hypothesis that the correlation matrix between variables for factor analysis is an identity matrix, meaning

that variables are unrelated and unsuitable for structure detection (Snedecor & Cochran, 1989). This hypothesis is rejected (X^2= 375.334, p-value = 0.000), implying that the data is indeed suitable for factor analysis. Second, we conduct a KMO test. The KMO test measures the sampling adequacy for each variable in the factor model as well as the complete model, as it measures the proportion of common variance among variables within a group. Our KMO test returns value 0.64 (>0.6), which confirms that the sampling is adequate. Third, after conducting factor analysis, we look at Eigenvalues, namely the amount of variance accounted for by each factor, which is equal to the sum of the squared loadings for a given factor. Using factor analysis, we observe only one factor with eigenvalue close to 1 (0.78), meaning that only one factor explains the covariance of our network variables. We use the standard orthogonal rotation to rotate the factor to get the best explanation on factor loadings with as few factors as possible. Finally, we use the factor loadings of the factor *'network1'* as a single variable used to describe the network effect on adoption of inputs in our regression model.[14]

Following the same method of factor and PCA analysis, we grouped *farmfactor* variables using factor analysis (with eigenvalue of 1.29). KMO value of 0.625 and Bartlett's test of sphericity (X^2= 911.663, p-value = 0.000) confirm that the farm variables were suitable for factor analysis.

Results

The results of the OLS regression using factor analysis are summarized in Table 3 below [15]. We present OLS results in the main text, for ease of interpretation, and Logit results in the Appendix the Appendix. Qualitatively they provide similar results. When looking at social capital variables alone (columns 1-3 in Table 3), we find that indeed all three types of social capital are associated with higher adoption of both seedlings and fertilizer. However, when we add farmer individual characteristics and especially farm characteristics, our findings change as elaborated below.

Adoption of seedlings: significance of social capital and other factors influencing adoption

The network variable, measured as frequency of interaction with different community members, significantly increases farmers' adoption seedlings. We find that among relationship variables, only being a cooperative leader is significant. Finally, from community variables, community reachability has a slightly significant influence on adoption of seedlings, implying that easier and shorter road access to a community enhances adoption of seedlings. Our findings confirm our hypothesis. Indeed, farmers adoption of subsidized seedlings is higher for those farmers who are more exposed to their network. Furthermore, we find that farmers with higher adoption of seedlings have significantly higher labour costs and lower inputs costs for land preparation. Clearing land and planting new seedlings does require significant labour, but does not require any additional inputs such as fertilizer.

[14] We also considered an alternative method to factor analysis, that is, PCA. PCA transforms our network variables into two linearly uncorrelated principle components with eigenvalues of 1.66 and 0.92 respectively. These 2 components are newly defined variables named 'pcanetwork1' and 'pcanetwork2' in our dataset.

[15] Analysis using PCA components is summarized in Table 3a in the Appendix; Logit analysis in 3b in the Appendix.

Adoption of fertilizer: social capital not significant

Looking at our fertilizer analysis, we find that none of the three defined social capital variable categories has a significant influence on adoption of fertilizer. Contrary to our hypothesis, neither social status nor accessibility enhance adoption of subsidized good despite potentially facilitated access to it. Unlike with adoption of seedlings, social network is less relevant when farm investments are not risky. We also find that farmers with mapped farms and higher farm capital (factor variable comprised of cocoa farm income, farm size, number of farms and proportion of cocoa income from total income) have higher access to fertilizer. The implications of these findings suggest that the government criteria for getting access to fertilizer are still more important than social capital in getting access to subsidized fertilizer. The importance of farm capital is somewhat surprising, given that the fertilizer is distributed for free. There are two ways of explaining this. On the one hand, farmers with higher farm capital own more land and therefore have greater demand for fertilizer. On the other hand, there could be hidden costs to fertilizer access, including fees and gifts to extension officers for both mapping farms and distributing fertilizer which wealthier farmers are more likely to be able to pay. Once these two variables, 'farm capital' and 'mapped farm' are added to the model, all social capital variables become insignificant. Finally, looking at other control variables, we find that women are less likely to adopt fertilizer, probably because fertilizer application is traditionally a man's job (Bymolt et al., 2018).

Table 3: OLS regression results with one factor network variable

VARIABLES	(1) seeds no control vars	(2) fertilizer no control vars	(3) both no control vars	(4) seeds demograp. controls	(5) fertilizer : demogr. controls	(6) both: demog. Control	(7) seeds: incl. farm controls	(8) fertilizer : incl. farm controls	(9) both: incl. farm controls
network[1]	0.04**	0.06***	0.03**	0.04**	0.05**	0.03**	0.04**	0.03	0.02
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Chief	0.12	0.12	0.24	0.11	0.08	0.22	0.10	0.17	0.20
	(0.18)	(0.17)	(0.19)	(0.19)	(0.15)	(0.19)	(0.23)	(0.22)	(0.23)
Elder	0.08**	0.09*	0.12***	0.06	0.04	.09***	0.04	0.02	0.07*
	(0.04)	(0.05)	(0.03)	(0.04)	(0.05)	(0.03)	(0.05)	(0.05)	(0.04)
Spirituallead	0.05	0.08	0.02	0.03	0.05	-0.01	0.03	0.05	0.00
	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
Cooplead	0.44***	0.21**	0.38***	0.42***	0.17*	.35***	0.42***	0.11	0.29***
	(0.09)	(0.09)	(0.10)	(0.09)	(0.09)	(0.10)	(0.09)	(0.12)	(0.10)
Immigrant	-0.01	-0.00	-0.02	-0.01	0.01	-0.02	-0.02	0.02	-0.02
	(0.03)	(0.05)	(0.03)	(0.02)	(0.05)	(0.03)	(0.03)	(0.05)	(0.03)
Reachability	0.01**	-0.01*	0.00	0.01*	-0.01	0.00	0.01*	-0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
community income	-0.00**	-0.00	-0.00	-0.00**	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
nr. Inhabitants	0.00	0.00	-0.00	-0.00	0.00	-0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Gender				-0.05*	-0.12***	-.04**	-0.03	-0.08**	-0.03
				(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
cocoa exper.				0.00	0.00**	0.00*	-0.00	0.00	0.00
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
vehicle[2]				0.07*	0.03	0.07*	0.01	-0.01	0.03
				(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.03)
cost_labor							$3*10^{-4}$***	0.00	$2*10^{-4}$***
							(0.00)	(0.00)	(0.00)
cost_inputs							$-1*10^{-4}$***	0.00	$-8*10^{-5}$***
							(0.00)	(0.00)	(0.00)
farmcapital[3]							-0.01	0.11***	0.02
							(0.02)	(0.02)	(0.02)
mapped_farm							0.08**	0.16***	0.09***
							(0.03)	(0.03)	(0.02)
Unclearland							-0.11***	0.04	-0.02
							(0.03)	(0.05)	(0.03)
Constant	0.24***	0.56***	0.16***	0.26***	0.54***	.15***	0.18***	0.45***	0.09**
	(0.05)	(0.06)	(0.03)	(0.05)	(0.07)	(0.03)	(0.05)	(0.06)	(0.03)
Observations	1,312	1,312	1,312	1,297	1,297	1,297	1,066	1,066	1,066
R-squared	0.09	0.03	0.04	0.09	0.05	0.05	0.11	0.10	0.07

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

1.The number of observations of social status variable in question

2. Binary variable for whether farmer owns a car, bike or other means of transportation on wheels

3. Factor variable comprised of cocoa farm size (+), number of cocoa farms (+), total income (+) and proportion of income from cocoa (+)

Conclusions and policy recommendations

The aim of this paper was to evaluate the effect of social capital on farmers' adoption of subsidised input supplies, namely hybrid seedlings and fertilizer. Government subsidies are an equivalent to lifting part of the credit constraints related to inputs adoption. We measure the effect of three types of social capital on adoption: network social capital, referring to the frequency of interaction that enhances information flow between farmers within a community; relationship social capital, which looks at the role of social status in distribution of government-subsidized input supplies; and finally the community social capital, evaluated through community income, size and reachability from the cooperative headquarter office.

This study has three major conclusions and policy recommendations. First, we find an important role for social capital in enhancing the adoption of inputs. However, the effect of social capital plays a more important role for seedlings than for fertilizer. We argue that this result is intuitive as seedlings involve higher risks than fertilizer. Fertiliser adoption does not pose a high level of risk as farmers can always switch back from using fertilizer at no risk, and they sacrifice no short-term income. On the other hand, whereas farmers can get free seedlings from the government for planting or replanting trees, even the hybrid seedlings take at least 1.5 years to start bearing fruits, during which farmers have no income from that particular seedling, or square meter of productive land. As mentioned earlier, one of the main seedlings adoption impediments is high risk aversion (Chetty & Looney, 2006, Dercon & Christiaenson, 2011), which makes farmers less willing to undertake activities and investments even when they have high expected returns (Lipton 1968; Rosenzweig & Binswanger 1993). The uncertainty about the yields of hybrid seedlings and its reaction to weather conditions, maintenance requirements etc. present an objective source of uncertainty, which can be overcome if farmers have more information. Given the riskiness of the investment and the opportunity costs associated with it, farmers are bound to rely on their social networks for information before they make a decision to (re)plant a tree. The existence of network social capital which improves information diffusion and social learning about the benefits of planting hybrid seedlings is bound to improve farmers willingness to adopt them. In this case, information from other farmers from the network plays a role of de-risking the investment and getting a more objective picture about its benefits before making a final decision. This clearly suggests the importance of an enhancement of extension efforts at promoting seeds through highly connected social figures in communities – individuals who will promote and "de-risk" adoption of seedlings by showing how productive these hybrid seedlings are. Network learning is a powerful way of enhancing seedlings adoption. The government could also consider alternative options to de-risking seedlings adoption – like for example introduction of subsidized insurance for farmers who plant seedlings. So far there is mixed evidence on whether subsidized insurance is beneficial adoption (Karlan, 2014, Perez-Viana, 2019), but such intervention calls for further research for cocoa farmers specifically.

Second, we see that social status does not facilitate adoption of either seedlings or fertilizer, and neither does location of the farmer. This implies that there is little selective distribution of inputs due to distribution inefficiencies of extension officers for instance. This further illustrates that despite subsidies, reasons for low adoption remain demand driven. On the contrary, the government criteria for inputs' adoption add another hurdle to inputs adoption, and that is compliance to farm mapping and land clearing criteria. Several farmers don't have

access to inputs simply because they did not comply to the government requirements. Land clearing is the responsibility of a farmer himself. However, farm mapping is a service commonly provided by extension officers. Probably, the process of farm mapping lags behind. Therefore, the government should actively stimulate the process of mapping cocoa farms by enhancing investments in mapping farms.

Third, our regression results show that adoption of subsidized fertilizer is positively correlated with farm capital. This suggests that farmers with higher farm capital (wealthier farmers) tend to have better access to subsidized fertilizer. Partly, this may be due to demand-side effects: bigger farms need more fertilizer. However, it also signals that fertilizer subsidies may end up with the richer farmers, and indirectly may have a negative effect on income equality in cocoa communities. We also find that some farmers get access to both inputs even though their farms are not mapped. Finally, being a cooperative leader appears to be important for getting access to inputs. All these results suggest that a stricter and more reliable accounting system of subsidies distribution is needed to avoid that input subsidies primarily end up with cooperative leaders and/or the wealthier farmers. In our view, the government should play an important role in improving the accountability of the distribution of input subsidies.

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Appendix

1. Community variables means tests

Distance variable is based on distance of every community to the central community (Osino). Distances are calculated based on GPS coordinates collected at a central community gathering point in every community. Distances is measured by air, not kilometres of road.

Table 1: Community means tests table

	Mean adoption of inputs per community			**Accessibility[3]**		**Adoption of seeds**		**Adoption of fertiliser**		**Adoption of both**	
	Community	Distance (km) to Osino[1]	Nr inhabitants	0[4]	1	0[4]	1	0[4]	1	0[4]	1
1	Abakoase	17.87	3092	136	0	.26	.26	.49	.63***	.15	.2*
2	Abompe	3.45	2405	0	31	.26	.23	.51	.39*	.15	.1
3	Addokrom	24.82	917	0	32	.25	.56***	.51	.25***	.15	.19
4	Adjeikrom	10.99	1340	.	.	.26	.24	.49	.70***	.15	.18
5	Ahomahomasu	21.44	1944	0	31	.26	.35	.5	.55	.15	.1
6	Akwansrem	11.95	722	0	26	.25	.54***	.5	.42	.15	.23
7	Apaa	9.26	1028	0	37	.25	.35*	.51	.38*	.14	.19
8	Asarekwao	20.16	1250	0	45	.25	.62***	.5	.73***	.16	.53***
9	Asiakwa	10.29	9172	38	0	.26	.21	.5	.55	.15	.08*
10	Bosuso	9.48	4878	159	0	.26	.27	.48	.73***	.16	.2**
11	Dome	4.62	683	0	50	.26	.18	.5	.52	.15	.1
12	Ehiamankyene	18.01	1480	91	0	.25	.34**	.51	.46	.16	.22**
13	Gyampomani	3.70	592	0	26	.26	.08**	.50	.54	.18	.04**
14	Heman	3.88	~9250[2]	0	332	.30	.12***	.54	.37***	.15	.08***
15	Juaso	4.31	1139	0	41	.26	.17*	.51	.39*	.15	.15
16	Koradaso	12.90	22421	26	0	.26	.31	.5	.65*	.15	.19
17	Miaso No. 1	22.80	796	0	30	.26	.07***	.50	.47	.16	.03**
18	Nsuapemso	2.66	633	40	0	.26	.13**	.51	.38*	.16	.05**
19	Nsutam	4.93	4722	80	0	.26	.16**	.49	.68***	.15	.14
20	Osino	__	7490	41	0	.25	.37*	.51	.41	.15	.22
21	Owusukrom	22.97	736	0	63	.24	.68***	.51	.27***	.15	.19
22	Saamang	3.19	2944	62	0	.26	.19	.51	.40*	.15	.11

1- Osino is the location of the coop main office, located on the main highway connecting Accra to Kumasi, biggest cities in Ghana

2- Estimation based on the relative number of cocoa farmers in every community to the total community population

3- Chi-sq. tabulation of number of farmers per community

4- 0 for poor access, 1 for decent access.

2. OLS using Principle Component Analysis

Table 2a. OLS with network capital reflected by two PCA components

VARIABLES	(1) seeds no control vars	(2) fertilizer no control vars	(3) both no control vars	(4) seeds demograph. controls	(5) fertilizer: demogr. controls	(6) both: demogr. controls	(7) seeds: incl. farm controls	(8) fertilizer: incl. farm controls	(9) both: incl. farm controls
pcanetwork1	0.02***	0.03***	0.02***	0.02***	0.03**	0.02**	0.02**	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
pcanetwork2	0.01	0.04*	0.02**	0.01	0.03	0.01*	0.02	0.01	0.01
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)
chief	0.13	0.13	0.24	0.12	0.08	0.22	0.11	0.17	0.21
	(0.18)	(0.17)	(0.19)	(0.19)	(0.16)	(0.19)	(0.23)	(0.22)	(0.24)
elder	0.08**	0.09*	0.12***	0.06	0.04	0.09***	0.04	0.02	0.07*
	(0.04)	(0.05)	(0.03)	(0.04)	(0.05)	(0.03)	(0.05)	(0.05)	(0.04)
spirituallead	0.05	0.09	0.02	0.03	0.05	-0.00	0.03	0.05	0.01
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
cooplead	0.44***	0.19**	0.37***	0.42***	0.16*	0.34***	0.42***	0.10	0.28***
	(0.09)	(0.08)	(0.10)	(0.09)	(0.09)	(0.10)	(0.09)	(0.12)	(0.10)
immigrant	-0.01	-0.00	-0.02	-0.02	0.00	-0.02	-0.02	0.02	-0.02
	(0.03)	(0.04)	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)	(0.05)	(0.03)
reachability	0.01**	-0.01*	0.00	0.01*	-0.01*	0.00	0.01*	-0.01	0.00
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
comm_income	-0.00**	-0.00	-0.00	-0.00**	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
nr_inhabitants	0.00	0.00	-0.00	0.00	0.00	-0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
gender				-0.04	-0.11***	-0.04*	-0.03	-0.07**	-0.02
				(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)
cocoa_exper				0.00	0.00**	0.00	-0.00	0.00	0.00
				(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
vehicle				0.07*	0.03	0.07*	0.01	-0.01	0.03
				(0.04)	(0.04)	(0.04)	(0.03)	(0.05)	(0.03)
cost_labor_landprep							0.00***	0.00	0.00***
							(0.00)	(0.00)	(0.00)
cost_inputs_landprep							-0.00***	0.00	-0.00***
							(0.00)	(0.00)	(0.00)
farmcapital							-0.01	0.11***	0.02
							(0.02)	(0.02)	(0.02)
mapped_farm							0.08**	0.16***	0.09***
							(0.03)	(0.03)	(0.02)
unclearland							-0.11***	0.04	-0.02
							(0.03)	(0.05)	(0.03)
Constant	0.24***	0.56***	0.16***	0.25***	0.53***	0.15***	0.18***	0.45***	0.09**
	(0.05)	(0.06)	(0.03)	(0.05)	(0.07)	(0.03)	(0.05)	(0.06)	(0.03)
Observations	1,312	1,312	1,312	1,297	1,297	1,297	1,066	1,066	1,066
R-squared	0.09	0.04	0.05	0.09	0.05	0.05	0.11	0.10	0.07

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

3. Logit output table with Factor Analysis

Table 2b: Logit output table using factor analysis for the network variable

VARIABLES	(1) seeds no control vars	(2) fertilizer no control vars	(3) both no control vars	(4) seeds demograph. controls	(5) fertilizer: demogr. controls	(6) both: demogr. controls	(7) seeds: incl. farm controls	(8) fertilizer: incl. farm controls	(9) both: incl. farm controls
network1	0.21**	0.23***	0.27**	0.21**	0.20***	0.26**	0.27**	0.12	0.28*
	(0.09)	(0.08)	(0.11)	(0.09)	(0.08)	(0.11)	(0.12)	(0.09)	(0.16)
Chief	0.62	0.49	1.35	0.55	0.32	1.20	0.57	0.76	1.31
	(0.82)	(0.71)	(0.85)	(0.84)	(0.66)	(0.85)	(1.15)	(1.00)	(1.23)
Elder	0.40**	0.38**	0.78***	0.28	0.17	0.57***	0.19	0.10	0.54**
	(0.17)	(0.19)	(0.17)	(0.17)	(0.19)	(0.15)	(0.25)	(0.22)	(0.26)
spirituallead	0.27	0.33	0.18	0.16	0.19	-0.04	0.17	0.22	0.04
	(0.24)	(0.23)	(0.39)	(0.24)	(0.21)	(0.35)	(0.27)	(0.21)	(0.38)
Cooplead	2.00***	0.90**	1.89***	1.89***	0.76	1.69***	2.04***	0.48	1.61***
	(0.45)	(0.45)	(0.39)	(0.45)	(0.47)	(0.40)	(0.43)	(0.54)	(0.47)
Immigrant	-0.07	-0.00	-0.16	-0.09	0.02	-0.16	-0.12	0.08	-0.24
	(0.16)	(0.19)	(0.26)	(0.15)	(0.19)	(0.23)	(0.18)	(0.21)	(0.29)
reachability	0.05**	-0.04*	0.01	0.05**	-0.04*	0.01	0.05**	-0.03	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
communityincome	-0.00**	-0.00	-0.00	-0.00*	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
nr_inhabitants	0.00	0.00	-0.00	-0.00	0.00	-0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
sex_Respondent				-0.28**	-0.49***	-0.41***	-0.19	-0.34***	-0.27
				(0.14)	(0.09)	(0.15)	(0.18)	(0.12)	(0.22)
cocoa_Exper				0.00	0.01**	0.01*	-0.00	0.00	0.00
				(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Vehicle				0.36**	0.12	0.53**	0.04	-0.05	0.24
				(0.17)	(0.17)	(0.21)	(0.22)	(0.22)	(0.24)
cost_labor_landprep							0.00***	0.00	0.00***
							(0.00)	(0.00)	(0.00)
cost_inputs_landprep							-0.00**	0.00	-0.00***
							(0.00)	(0.00)	(0.00)
farmcapital							-0.05	0.49***	0.24
							(0.12)	(0.10)	(0.15)
mapped_farm							0.46***	0.69***	0.76***
							(0.16)	(0.11)	(0.18)
unclearland							-0.77***	0.16	-0.27
							(0.23)	(0.20)	(0.32)
Constant	-1.12***	0.24	-1.67***	-1.06***	0.15	-1.73***	-1.54***	-0.24	-2.27***
	(0.26)	(0.24)	(0.26)	(0.30)	(0.30)	(0.28)	(0.33)	(0.27)	(0.33)
Observations	1,312	1,312	1,312	1,297	1,297	1,297	1,066	1,066	1,066

standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

4. Survey

FILL OUT THE LINES WITH !!! IN FRONT OF THEM BEFORE TALKING TO THE RESPONDENT

		Name			ID	Date		
	Enumerator code					D D	M M	Y Y Y Y
	Community number							
	Household code							
	Respondent's full official name							
	Cellphone number (exclude 1st zero)							
	Circle ID type and write the ID number	1) Voter ID 2) NHIS	3) Identity Card 4) Passport	5) Driving license 6) No ID available				
	Data clerk 1					D D	M M	Y Y Y Y
	Data clerk 2					D D	M M	Y Y Y Y

Hello. My name is _____ and I am working with CRIG.

We are conducting a survey of the economic activities and financial situation of cocoa farmers in this area. The survey will take about one hour. Participation in this survey is voluntary, and if we should come to any question you don't want to answer, just let me know and I will go to the next question; or you can stop the interview at any time. However, we hope that you will participate in this survey since your views are important.

To show you how important your answers are to us we would like to give you a small gift for your cooperation throughout the questionnaire.

At this time, do you want to ask me anything about the survey?
May I begin the interview now?

IF YES HAND OUT THE INFORMED CONSENT FORM AND BEGIN THE INTERVIEW

Module 2 Household composition

NO	**201**	**202**	**203**	**204**	**205**	**206**	**207**	**208**
	What are the names of the people who usually live and share the meal in your household? START WITH HOUSEHOLD HEAD, FOLLOWED BY RESPONDENT'S NAME IF DIFFERENT	Is [NAME] male or female?	How old is [NAME] now?	What is the relationship of [NAME] to the head of the household? EXAMPLE: IF [NAME] IS THE MOTHER OF THE HOUSEHOLD HEAD, ENTER 6	What is the highest education level [NAME] ever completed?	How many total years of schooling did [NAME] complete in total? EXCLUDE REPEATED YEARS	Can you read easily in English? EXAMPLE: NEWSPAPER	Can you write easily in English? EXAMPLE: LETTER
1	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋
2	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
3	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
4	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
5	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
6	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
7	_____	⌊__⌋	⌊__⌋⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋⌊__⌋		
	RECORD ALL NAMES FIRST	0. Male 1. Female	RECORD AGE IN YEARS AND VERIFY COHERENCE	1. Head 2. Wife or husband 3. Son or daughter 4. Son- / daughter-in-law 5. Grandchild 6. Parent / Parent-in-law 7. Brother / sister / -in-law 8. Cousin/niece/nephew 9. Other:_____	0. None 1. Primary 2. Middle 3. JHS / JSS 4. SHS / SSS 5. Vocational 6. Tertiary	COMPLETED YEARS IN EDUCATION	0. No 1. Yes	0. No 1. Yes

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES		
209	How many years of experience do you have in farming cocoa?	⌊_⌋⌊_⌋	RECORD NUMBER OF YEARS		
210	What is your status within the community? SELECT MORE IF APPLICABLE	a. ⌊_⌋ b. ⌊_⌋ c. ⌊_⌋	0. Farmer only 1. Chief 2. Village elder / opinion leader 3. Women's leader	4. Spiritual leader 5. Savings group leader 6. Purchasing clerk 7. Fanteakwa executive member 8. Farmer's trainer	9. Certification manager 10. Assembly man 11. Formal sector employee 12. Community Chief Farmer 13. Other: _____
211	What is the main religion practiced in your household?	⌊_⌋	1. Christianity 2. Islam	3. Traditional 4. Other, specify _____	
212	What languages are normally spoken in your household?	a. Primary ⌊_⌋ b. Secondary ⌊_⌋	1. Twi 2. Fanti 3. Ga	4. Dagbani 5. Ewe 6. Krobo	7. English 8. French 9. Other, specify_____
213	Are you indigene of this community or a migrant?	⌊_⌋	1. Indigenous	2. First generation migrant	3. Second generation migrant

Module 3 Assets & standard of living

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
301	How many rooms in your home are used by your household?	⌊_⌋	RECORD TOTAL NUMBER OF ROOMS, INCLUDING LIVINGROOM BUT EXCLUDING BATHROOMS	
302	Does your house have access to electricity?	⌊_⌋	0. No. 1. Yes, Solar 2. Yes, generator 3. Yes, grid	
303	Do you or anyone in your household own any of the following? a. cellphone? b. radio? c. bicycle? d. motorbike/tricycle? e. car f. truck g. knapsack sprayer? h. mist blower?	a. ⌊_⌋ b. ⌊_⌋ c. ⌊_⌋ d. ⌊_⌋ e. ⌊_⌋ f. ⌊_⌋ g. ⌊_⌋ h. ⌊_⌋ i. ⌊_⌋	0. No 1. Yes	

	i. television? j. fridge?	j. ⌊__⌋		
304	What proportion of your household income was spent on food in the last month?	⌊__⌋	1. Up to 1/4 2. Up to 1/2 3. Close to all income	

Module 4 Cocoa farming information

NO	**401**. What is the ownership situation of every **COCOA** farms you individually work on? START WITH THE MAIN FARM FIRST	**402.** How much do you pay for land lease per year?	**403.** What is the travelling time from home to your main farm (on foot)?	**404.1** What is the size of this farm?	**404.2** Unit of measure of farm size	**405**. Do you have a map of your farm?	**406**. How old is the oldest cocoa tree on this farm?	**407**. Which cocoa certification standards do you have?
1	⌊__⌋	⌊__⌋ ⌊__⌋__⌋__⌋	⌊__⌋, ⌊__⌋	⌊__⌋__⌋, ⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋	a. ⌊__⌋ b. ⌊__⌋ c. ⌊__⌋
2	⌊__⌋	⌊__⌋ ⌊__⌋__⌋__⌋		⌊__⌋__⌋, ⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋	a. ⌊__⌋ b. ⌊__⌋ c. ⌊__⌋
3	⌊__⌋	⌊__⌋ ⌊__⌋__⌋__⌋		⌊__⌋__⌋, ⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋	a. ⌊__⌋ b. ⌊__⌋ c. ⌊__⌋
4	⌊__⌋	⌊__⌋ ⌊__⌋__⌋__⌋		⌊__⌋__⌋, ⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋	a. ⌊__⌋ b. ⌊__⌋ c. ⌊__⌋
5	⌊__⌋	⌊__⌋ ⌊__⌋__⌋__⌋		⌊__⌋__⌋, ⌊__⌋	⌊__⌋	⌊__⌋	⌊__⌋	a. ⌊__⌋ b. ⌊__⌋ c. ⌊__⌋
	0. Landowner → 403 1. Abunu (50-50) → 403 2. Abusa (1/3 – 2/3) → 403 3. Abunan (1/4 – 3/4) →403 4. Land lease → 402 5. Other: _____	ENTER GHANA CEDIS *PER YEAR*	IN HOURS AND MINUTES (E.G. 2, 35 = 2H AND 35 MINUTES)	RECORD THE NUMBER OF LAND UNITS	0. Hectares 1. Acres 2. Poles	0. No 1. No, but COCOBOD mapped my farm 1. Yes, compass 2. Yes, GPS	HELP FARMER RECALL OLDEST TREE. USE -99 IF UNKNOWN	0. None / none yet 1. Fair Trade 2. UTZ 3. Rain Forest Alliance 4. Organic 5. Armajaro traceable 6. Cocoa Abrabopa

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES
408	How many bags of cocoa did you produce during the... CHECK FARMER'S PASSBOOK AND ASK FARMER ABOUT COCOA SALES NOT REGISTERED IN THE PASSBOOK	last main-crop season a. ⌊__⌋ ⌊__⌋__⌋__⌋, ⌊__⌋ last light-crop season b. ⌊__⌋ ⌊__⌋__⌋__⌋, ⌊__⌋	INSERT TOTAL NUMBER OF BAGS PRODUCED FOR ALL FARMS. ENTER -99 IF THE FARMER DOESN'T KNOW WHAT HE PRODUCED
409	How many of bags did you sell at certified *price*?	last main-crop season a. ⌊__⌋ ⌊__⌋__⌋__⌋, ⌊__⌋ last light-crop season b. ⌊__⌋ ⌊__⌋__⌋__⌋, ⌊__⌋	CHECK FARMER'S PASSBOOK AND ALSO ASK FARMER ABOUT COCOA SALES NOT REGISTERED IN THE PASSBOOK.

410	How do you get paid for the sale of your cocoa?	⌊_⌋	1. Cash immediately 2. Cash later 3. On a group account immediately 4. On a group account later 5. On a personal bank account immediately 6. On a personal bank account later 7.Via mobile money immediately 8 Via mobile money later 9. Cheque 10. Not applicable
411	How many cocoa trees do you have on your main farm?	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	INSERT NUMBER TREES; ENTER -99 IF THE FARMER DOESN'T KNOW WHAT HE PRODUCED
412	How many cocoa trees older than 25 years do you have on your main farm? HELP ESTIMATE OLD TREES ON MAIN FARM	Older than 25 years ⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	INSERT NUMBER TREES; ENTER -99 IF THE FARMER DOESN'T KNOW WHAT HE PRODUCED
413	How many shade trees do you have on your main cocoa farm?	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	INSERT NUMBER OF SHADE TREES; ENTER -99 IF THE FARMER DOESN'T KNOW

Module 5 Cocoa-related expenditures

NO		**501**	**502**
	Activity	How much did you invest in buying input supplies for [ACTIVITY] in the last year, for all cocoa farms?	How much did you spend on hired labour on [ACTIVITY] in the last year for all cocoa farms?
1	Land preparation and planting new seedlings	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋
2	Weeding, weedicide and pruning	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋
3	Pest, insect, disease and black pod control	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋
4	Harvesting	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋
5	Post-harvesting (pod breaking, fermentation, drying and transport to PC)	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋	⌊_⌋ ⌊_⌋⌊_⌋⌊_⌋

Module 6 Farmer services

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
601	In the last main season did the PC 'discount" the kilograms shown on the weighting scale?	⌊_⌋	0. no 1. yes	→ 603 → 602
602	What was the main reason for getting this discount'? (select multiple answers if applicable)	⌊_⌋ ⌊_⌋	1. The water content/moisture content of beans was too high (too wet) 2. There was foreign matter (waste/soil/stones) in the bag 3. Other, specify _____	

		⌊__⌋		
603	How many bags of fertilizer did you receive from Cocobod in the last main season for all cocoa farms?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT NUMBER OF BAGS	
604	How many bottles of fertilizer did you receive from Cocobod in the last main season for all cocoa farms?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT NUMBER OF LITERS	
605	How much did you pay in total for fertilizer in the last main season, for all cocoa farms?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT VALUE IN GHANA CEDIS, INSERT 0 IF FARMER BOUGHT NO FERTILIZER	
606	How many seedlings did you receive in the last year for all your cocoa farms?	⌊__⌋__⌋__⌋	INSERT NUMBER OF POTS	If 0, skip to 609
607	How much did you pay for seedlings in the last year?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT GHANA CEDIS, INSERT 0 IF FARMER BOUGHT NO SEEDLINGS	
608	How many of these cocoa seedlings are still alive?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT NUMBER STILL ALIVE; ENTER -99 IF THE FARMER DOESN'T KNOW	
609	Would you want to get (more) seedlings?	⌊__⌋	0. No 1. Yes	If 0, skip to 612
610	How many (more) seedlings do you want to get?	⌊__⌋__⌋__⌋	INSERT NUMBER OF SEEDLINGS; ENTER -99 IF THE FARMER DOESN'T KNOW	
611	Is there something that prevents you from getting (more) seedlings?	⌊__⌋	0. No. 1. Yes, they are not available 2. Yes, my farm was not ready for seedlings yet (land not cleared) 3. Yes, my farm has not been measured yet by extension officer. 4. Other, specify _____	
612	How many seedlings did you raise and plant on your own farms last year, for all cocoa farms?	⌊__⌋ ⌊__⌋__⌋__⌋	INSERT NUMBER OF SEEDLINGS, INSERT 0 IF FARMER PRODUCED NO SEEDLINGS	
613	Did you keep written records of your farm inputs and expenditures in the last year? INCLUDE RECORDS WRITTEN OR RECORDED BY OTHERS	⌊__⌋	0. No 1. Yes	
614	Besides the passbook, did you keep written records of your farm output and sales in the last year? INCLUDE RECORDS WRITTEN OR RECORDED BY OTHERS	⌊__⌋	0. No 1. Yes	
615	Would you be willing to give a small contribution to receive information on prices of inputs and cocoa? FOR EXAMPLE 50 PESOAS OR SOME FOOD	⌊__⌋	0. No 1. Yes	

616	Would you be willing to give a small contribution to receive feedback on your inputs use, farming practices and productivity compared to other cocoa farmers in your area? FOR EXAMPLE 50 PESOAS OR SOME FOOD	⌊__⌋	0. No 1. Yes	
617	Have you ever attended the Farmer Business School training?	⌊__⌋	0. No 1. Yes	→ 701 → 614
618	Did you ever make use of the Farmer Business School workbook to record your farm activities?	⌊__⌋	0. No 1. Yes	
619	Did you receive the Farmer Business School training certificate?	⌊__⌋	0. No 1. Yes	

Module 12: Social Capital

Group / Institution	**1201**	**1202**	**12**	**1204**	
	How frequently do you interact with [PERSON]	In the past 3 months did you **give** money or goods to [PERSON]?	How much did you give / what was the value of goods that you gave?	In the past 3 months did you **receive** money or goods from [PERSON]?	How much did you receive / what was the value of goods that you received?
Village chief and elders	⌊__⌋	⌊__⌋	_____	⌊__⌋	_____
Spiritual leader	⌊__⌋	⌊__⌋	_____	⌊__⌋	_____
Farmer group leaders	⌊__⌋	⌊__⌋	_____	⌊__⌋	_____
Certification managers	⌊__⌋	⌊__⌋	_____	⌊__⌋	_____
People in your community		⌊__⌋	_____	⌊__⌋	_____
	0. Hardly ever 1. Less than once monthly 2. At least once monthly 3. At least once weekly 4. At least once daily	0. No → 1204 1. Yes → 1203	HELP FARMER ESTIMATE THE AMOUNT OF MONEY OR THE VALUE OF GOODS GIVEN	0. No → End of survey 1. Yes → 1205	HELP FARMER ESTIMATE THE AMOUNT OF MONEY OR THE VALUE OF GOODS GIVEN

Module 1 Community level survey

NO	QUESTIONS AND FILTERS	ANSWER	CODING CATEGORIES	SKIP
101	What is your position with the community?	⌊__⌋	1. Chief 3. Opinion Leader 2. Sub-chief 4. Assembly man	→ END → 102
102	How many people live in this village?	⌊__⌋ ⌊__⌋__⌋	APPROXIMATE NUMBER OF PEOPLE	
103	Is the bus/taxi coming to the village every day?	⌊__⌋	0. No 1. Yes	
104	Which of these amenities is available in your village?	a. primary school ⌊__⌋ b. secondary school ⌊__⌋ c. hospital/health center ⌊__⌋ d. post office ⌊__⌋ e. bank ⌊__⌋ f. borehole ⌊__⌋ g. river ⌊__⌋ h. input supplier ⌊__⌋ i. produce storage facility (warehouse) ⌊__⌋ j. mobile networks (e.g. MTN, Tigo, Vodafone etc.) ⌊__⌋	0. No 1. Yes	
105	How far walking is the village to the nearest town?	Hours: ⌊__⌋ Minutes: ⌊__⌋	ENTER ESTIMATED TIME	
106	What is the road mostly made of in the village?	⌊__⌋	1. concrete/asphalt 2. pebble stones 3. mud/sand	→ 108 → 107 → 107
107	How far walking is the village from the main paved road?	Hours: ⌊__⌋ Minutes: ⌊__⌋	ENTER ESTIMATED TIME	
108	How many LBCs operate in the village	⌊__⌋	ENTER NUMBER	
109	Which LBCs operate in the village?	A.TransRoyal B. PBC C. Olam D. Armajaro E. Cocoa Merchants F. Other, specify: _____	CIRCLE ALL THAT APPLY	