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Deploying strategic resources: comparing members of farmer cooperatives to non-members in sub-Saharan Africa

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ABSTRACT

Primary producers in global value chains, like any other firm, aim for entrepreneurial success through deploying strategic resources, collective action, strategic intent, and a supportive institutional environment. In the current article, we analyze the extent to which members of farmer cooperatives in Ethiopia succeed in deploying strategic resources. We find that non-members utilize resources more efficiently and that the potential for collective action is not realized. The potential for collective action remains unrealized due to the institutional environment. We suggest pathways for further research.

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JEL CLASSIFICATION Q12; Q13; M13; L70

1. Introduction

Entrepreneurial success depends – in addition to individual strategic intent – on several factors, including (1) access to and deployment of strategic resources,¹ (2) cooperative networks, and (3) a market's and, or society's institutional environment (Barney 1991; Busenitz and Barney 1997; Mesquita and Lazzarini 2008; Hitt *et al.* 2000). This is no less true for African farmers as it is for high-tech entrepreneurs in industrialized countries. We study to what extent *collective* deployment of strategic resources by Ethiopian sesame seed farmers helps them perform better: themes 1 and 2 above. We do so by introducing a novel method for measuring the deployment of strategic resources and compare the

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¹Resources and intent become *strategic* when they contribute to a firm's competitive advantage (cf. Barney 1991). Priem and Butler refer to Schoemaker's (1990: 1179 as cited in Priem and Butler 2001: 29) definition who defines competitive advantage as a firm 'systematically creating above average returns.'

deployment of strategic resources by farmers who are member of a cooperative to the deployment of strategic resources by farmers who are not member of a cooperative. We not only observe differences in the deployment of strategic resources between members and non-members, but also shed light on how the institutional environment – theme 3 – affects deployment differences between members and non-members. The institutional environment creates incentives for entrepreneurial farmers with a high strategic intent *not* to join a cooperative, despite some of the potential benefits of being a member. We conclude that the potential for collective action remains unrealized due to an unsupportive institutional environment, and suggest pathways for future research.

2. Literature

Agriculture continues to be of vital importance for the world's least developed countries in terms of gross domestic product, employment, and export revenues (World Bank 2007; Gollin and Rogerson 2014). Approximately one-fifth of the world population are estimated to derive their incomes at least partly from farming, while another two-fifth are estimated to depend on agriculture for their livelihoods, though they do not directly engage in farming. The majority of these people reside in developing countries (Alston and Pardey 2014). An increase in income in farming would benefit hundreds of millions of smallholders. Yet resource constraints that poor smallholders are confronted with prevent them from appropriating created value in supply chains (Kaplinsky 2006). To benefit more from their farming activities, farmers need to act entrepreneurially. The World Bank (2007) therefore speaks of farmers as entrepreneurs and their cooperatives as businesses. Collectively, it is argued, farmers are capable of creating business-like organizations that have better access to resources and markets.

In development studies, the potential for collective action to address development issues was researched quite extensively (Adhikari and Lovett 2006; Bernard and Spielman 2009; Dasgupta and Beard 2007; Desai and Joshi 2014; Fischer and Qaim 2012; Munshi and Parikh 1994; Naidu 2009; Poteete and Ostrom 2004; Ruttan 2008; Varughese and Ostrom 2001). The theoretical potential for collective action is acknowledged, yet in practice, for a variety of reasons, this potential often remains unrealized. The World Bank (2007), for instance, argues that farmer organizations have large potential to benefit their member farmers, yet often fail to do so in developing countries, particularly in Africa.

Economies of scale and scope motivate farmers to organize in cooperatives and bundle resources. Cooperatives are powerful forms of organization for farmers but due to their nature of an organization owned by a collective of individual firms, are subject to challenges of collective action (Beverland 2007; Olson 1965; Van Bekkum 2001).

For farmers it is important to cooperate with others farmers in an effort to acquire, accumulate, develop, bundle, and deploy resources. Such bundles

of resources can be developed by members contributing heterogeneous yet complementary resources or homogeneous resources resulting in economies of scale (Agarwal, Croson, and Mahoney 2010; Araujo *et al.* 2003; Beverland 2007; Hitt *et al.* 2000; Olson 1965; Wincent *et al.* 2010). As a collective farmers can reduce transaction costs by supplying bulk to the market and collectively buying inputs, they can access different markets due to bulk, quality improvements or processing, they can collectively invest in capital-intensive means of production, possibly in research and development, and, finally, they can improve the extent to which their interests are considered by means of lobbying (Mesquita and Lazzarini 2008; World Bank 2007).

While collective action offers opportunities to benefit from cooperation, it is subject to a variety of challenges resulting from individuals with individual interests pursuing a common interest in a collective. Unless cooperatives meet conditions for success, collectives are unlikely to succeed. For a collective to succeed complementary heterogeneous contributions are required as well as homogeneous contributions that result in economies of scale. Such contributions will result when members expect that individual gains exceed individual contributions. A problem with members aiming for individual gains larger than individual contributions is that the distribution of relational rents among members proportionate to contributions may be neglected. As long as individual gains are larger than individual contributions, there is an incentive to participate in a collective even if other members are free-riding. As such Olson (1965) argues that members contributing nothing or little to a collective may benefit disproportionately as compared to members contributing a lot. He refers to this phenomenon as 'the exploitation of the large by the small.' The larger the group, however, the more likely free-riding results. Wincent *et al.* (2010: 45), hereby, refer to the 'paradox of group size.' The paradox, or trade-off, is that the larger the number of firms that cooperate, the more resources are accumulated; yet, at the same time, the larger the group, the more difficult it is to exploit the resources.

Problems associated with opportunistic behavior in groups can, at least partially, be overcome through governance of the group. First and foremost, it is important that members, though heterogeneous with respect to contributions, are homogeneous with respect to the common goal (Agarwal *et al.* 2010; Olson 1965; Williamson 1975). Governance should ensure that once some members made contributions, others will not simply freely benefit from it but instead follow suit (Araujo *et al.* 2003). In addition, only new members that maintain or increase current members' gains should be allowed. It is important that gains resulting from cooperation are distributed in a way that is perceived as procedurally just (Kumar 1996; Luo 2008). However, formal institutions are weakly developed in the world's least developed countries. Even if formal institutions are ratified, enforcement often is still a problem. While this can be partially overcome by informal institutions, the larger the group gets, the more difficult it becomes to rely on informal institutions (Beverland 2007; Dolfisma and Van der

Eijk 2010; Hoskisson *et al.* 2000; Luo 2008; Mesquita and Lazzarini 2008; Olson 1965; Wincent *et al.* 2010).

The World Bank (2007) lists different challenges that collectives in developing countries face. Some of these challenges violate the conditions for success of collective action. A first is the conflict between efficiency and equity: 'Producer organizations typically operate in the context of rural communities where they are subject to norms and values of social inclusion and solidarity. This may clash with the requirements of professional, business-oriented organizations that must help members compete to survive in the market place. In the name of inclusion, organizations have difficulty excluding members who do not comply with obligations. In the name of solidarity, they are pressed to cross-subsidize poorer-performing members at the expense of better performers, thereby weakening rewards for efficiency and innovation. They are also frequently pressed to deliver public goods to the community, putting a drain on their resources.' (World Bank 2007: 155). Another problem is the heterogeneity in terms of members and their goals and positions within collectives, serving the interests of some over the interests of others. Collectives are furthermore constrained by limited managerial capacity, and weak institutional environments (World Bank 2007).

The current article is the first to quantify access to and usage of strategic resources by members and non-members of cooperatives and study efficiency in their usage. We find that, though cooperatives have much potential in theory, in practice they are confronted with serious institutional challenges. It is commonly known that institutions make some behaviors more likely to be adopted, prevent other behaviors from occurring, and affect economic outcomes (Alesina and Giuliano 2015; Dolfsma and Verburg 2008). Within the scope of allowed for behaviors that institutions, formal and informal ones, prescribe, incentives to suggest some kind of behaviors over others are provided (North 1990). In any given practice of human (economic) activity, such as farming, institutions that are directly relevant for that practice regulate behavior will have influence, but institutions from a different (but related) practice might also have an effect. This effect can be unintended and unanticipated (Alesina and Giuliano 2015). The literature on cooperatives is insufficiently cognizant of this, and in particular of the interplay between institutions originating from different domains in society.

3. Methodology

We collected data among sesame seed farmers in the county Kafta Humera in the northwest of Ethiopia. These farmers proved a useful sample for collecting data on the use of resources and profits since sesame seed farmers do not produce sesame for household consumption but solely for commercial purposes instead. Sesame farming furthermore involves the outsourcing of certain

activities such as plowing by someone with a tractor and weeding by migrant laborers. Since not all activities are carried out by the farmer himself, high costs are incurred prior to selling the produce. Overall farmers have strong incentives to obtain the highest agronomical yields and price as possible.

3.1. Data collection

Our article offers a mixed-methods type of analysis, showing and closely combining qualitative and quantitative kinds of analyses, resulting in increased rigor, reliability, and validity of results (Hoskisson *et al.* 2000).

The data we collected concern access to and deployment of strategic resources by both members of cooperatives and non-members. We also collected data about the governance structures of cooperatives and the institutional environment surrounding cooperatives, using both quantitative and qualitative methods to collect data. We collected qualitative data on the governance structures of cooperatives, the institutional environment, and to determine what exactly the strategic resources are for sesame seed farmers. In addition, we collected quantitative data in order to test which resources, and to what extent these resources, contribute to the performance of sesame seed farmers. We compared members of cooperatives to non-members. We conducted 131 interviews during 6 visits to Ethiopia and collected quantitative survey data among 375 farmers. Approximately half of these farmers are member of a cooperative. In addition, we collected secondary data about the institutional environment that farmers face. This includes secondary data about laws, proclamations and principles of cooperatives, and regulations concerning the trade in agricultural produce.

3.1.1. Qualitative data collection

We made use of theoretical rather than random sampling for the case study data (the cooperatives) (Eisenhardt 1989, 1991; Yin 2003). We selected polar cases in line with Eisenhardt and Graebner's (2007) arguments for finding convincing case study data. Theoretical sampling is important to increase external validity, which can be a weakness of case study research (Eisenhardt 1989). We conducted the following number of interviews, by cooperative: Humera #1 (3 interviews), Humera #2 (2), Maikadra (3), Adebay (3), Central (1), Aydola (1), Bereket (2), Baekar (2), Tirkan (1). Additional interviews with farmer organizations: Large-scale farmers' cooperative (1), Sesame farmers' union Humera (3), Sesame farmers' union Sanja (2), Oromiya Coffee Union (2), Federation (3). We had interviews with 9 small-scale farmers who are a member of a cooperative, with 7 small-scale farmers who are not a member, and with 11 large-scale farmers. We interviewed 16 government staff, 32 industry experts, 20 representatives of exporting and processing firms, 4 ECX staff, as well as 3 spot market traders.

We developed semi-structured interviews intended to compare the governance structures of the cooperatives based on considerations that the theory suggests. The theory on cooperatives does not tend to conceptualize the effect of the institutional context. The extent to which success factors are abided is partially dependent on the institutional environment. We therefore studied the institutional environment with a focus on aspects of the institutional environment that affect cooperative governance.

3.1.2. Quantitative data collection

Once we selected cooperatives in Kafta Humera based on theoretical sampling we relied on random sampling among the sesame farmers in the cooperatives' villages to collect survey data.

3.2. Variables and data analysis

3.2.1. Explanatory variables

In the current study, we employ a novel methodology in which we go beyond the three traditional resources in agricultural economics studies (land, labor, and capital) to add more detail to variances existent in farmer inputs and hence explain with greater specificity variance in farmers' profits. We collected qualitative data to study variances in resources and how variances could explain higher or lower profits. We conducted the interviews with stakeholders of the sesame seed supply chain and held two focus group discussions with industry experts in order to identify critical resources. During two focus group discussions in total 24 experts participated. Experts included local researchers, *large-scale* farmers, traders, consultants, and NGO staff. All of them had been working with sesame in the county Kafta Humera for at least three years. After the focus group discussions, we presented our observations about the nature of resources farmers might possess to a range of industry experts and researchers who each complemented, corrected, and, or, reaffirmed the insights we were developing. We analyzed data three times: after our first visit, halfway, and after our last visit (Eisenhardt and Graebner 2007; Yin 2003).

In total we identified eight resources that can explain variances in profits. We studied in what respects the eight resources vary and used these ways in which the resources vary to ask objective data to farmers in the questionnaires. As such we obtained highly specific data for each of the respondents concerning their farming practices. The resources are listed in table 1 below as well as with the ways in which each of these resources vary:

Plowing and sowing is important for both the agronomical yield and quality. Plowing is done preferably three times (although many farmers plow only once), and sowing is done preferably in the first week of the second period (of two periods) of rainfall, using improved rather than traditional seeds. Farmers do often not follow these rules because they are not aware or because they do

Table 1. Resources and variances in resource deployment.

Resources	Variances in resource deployment
Plowing and sowing	Number of times of plowing Time of sowing Type of seeds used
Weeding	Weeding after flowering in the previous year Number of times of weeding Time of weeding
Harvesting	Time of harvesting
Storage	Floor materials Wall materials Roof materials House or not Plastic shelter on the field or not
Labor	Provisions to hired laborers (food, water, shelter, et cetera) Repeated contracts with hired laborers Number of household members working on the farm
Location	One of the 'favored' locations Soil quality Distance between the respondent's home and field Distance from the respondent to a large-scale farmer
Time of selling	Generally speaking the later the better
Number of animals (as proxy for capital)	Generally speaking the more the better

not have the required resources. When farmers, for example, knew what the best time of sowing is, but did not sow at that time we asked why they did not do that. Often they replied that there was a lack of machinery (i.e. tractors and plowing machines for rent) or lack of capital (renting a tractor is most expensive during peak demand).

Similarly, there is a variety in the way farmers weed and harvest, which are also important resources to improve agronomical yield and quality and to manage rainfall. Storage is important to prevent theft, damage on the crop resulting from humidity, and lost harvest because of strong winds. Capital can help farmers attract the right machinery and labor at the right time in order to plow, sow, weed, and harvest as desired. Since the small-scale farmers in Kafta Humera have no bank account and are typically unwilling to share information on the amount of capital they have, we use the number of animals as a proxy for capital. Animals such as goats, sheep, oxen, donkeys, and camels often function as the savings accounts of farmers who do not have bank accounts. In bad sesame production years, animals can be sold, while in good sesame production years animals will reproduce. Animals can function as collateral when obtaining loans and allow farmers to take more risks (in the hope of higher returns) when farming. Labor is important in order to obtain good quality and agronomical yields and to avoid theft. Careful weeding is important in order not to damage the crop, yet as many weeds have to be removed as possible in order to give the crop the space to grow well. Location is important because of soil fertility, capacity of land to avoid water-logging, proximity to asphalt roads and proximity to large-scale farmers and the farmers' homes.

Farmers can live up to 80 km from their fields. Proximity to *large-scale* farmers is important because large-scale farmers own tractors and plowing machines. Given their ownership of these machines they will plow sufficiently and at the right times. Bordering fields of small-scale farmers can, if paid for, relatively easily be included in the plowing and sowing process of large-scale farmers. Finally, the time of selling is important in order to obtain a high price. Generally speaking, the price is the lowest just after harvest time and increases gradually throughout the following year.

For each of the resources, we determined with the industry experts during the focus group discussions how to rate their variances. Most of the resources were given a score ranging from 1 to 5, except for the number of animals and time of selling, for which the actual number of animals and the actual average time of selling are used, respectively, as continuous variables. Farmers sometimes sell their produce in different batches at different periods of time and therefore the average is taken. It is argued that, in general, the more animals the better and the later one sells the sesame, the better. A score of 1–5 does not indicate that farmers have ‘more’ of a certain resource. For example, a score of 5 for storage does not mean that a farmer has more storage than a farmer with a score of 2. The score, instead, indicates *better* resources. A farmer with a score of 5 for storage, for example, has storage facilities that protect its produce from things like theft, humidity, and sunlight in order to maintain the produce’s quality as much as possible. This is also how the results should be interpreted: the question is not one of marginal returns, but rather one of whether access to better (and not more) resources, on average, results in higher profits.

The above list illustrates that each of the resources consists of 1–5 different items which can each vary again. Though each of the items is given a score of 1–5 we decided not to measure the items independently but make composite measures instead. The main reason lies in the argumentation of the focus group discussants who argued that the composited items cannot be seen independently. The items of each of the resources are interrelated and affect the efficiency of the resource. Consider, for example, plowing and sowing. The timing of sowing is important, but the extent to which farmers benefit from the time of sowing depends on what seeds are sown and in what soil (i.e. how many times is it plowed?). Plowing and sowing go inseparably together. Sowing is done simultaneously with plowing. The interesting feature of composite measures is that with greater specificity distinctions are made between those farmers who perform well on all items versus those who perform well on only one or two. In other words, the group that scores 5 for time of sowing is larger than the group of farmers that scores 5 for each of the three items. Hence, we distinguish those farmers who exploit the best time for sowing by making use of sowing the right seeds in well-plowed soils from those who do not and expect this to improve the linear relationship. We also ran regression analyses without the composite measures and indeed the R^2 and the number of significant coefficients was much

lower. The composite measures add specificity because all of the composite measures except storage (for which there is a clear continuum from score 1 to score 5) consist of one or two items that can have only two or three values (1 and 5 or 1, 3, and 5). As such these items give a positive (score 5) or negative (score 1) weight to the other item(s) which can have all integer values from 1 to 5. Since those items for which there are only two or three values are typically significantly positively skewed, those respondents who score well on each of the items is clearly a smaller group than those who score well on only 1 of them. There are, for example, two types of seeds that can be used for sowing: the traditional and the improved variety. The vast majority of farmers uses the traditional seed and are given a score 1, while the others receive a score 5. Because of these two options the group of respondents that scores a 5 for the time of sowing is divided into two groups: one that additionally scores a 5 for the type of seeds used and one that does not.

Appendix B describes how we calculated the score for the resource ‘plowing and sowing’. In order to avoid lengthiness, we described only one of the six variables. The scores of other resources are calculated in similar ways. These calculations are available upon request. Appendix A provides the questionnaire used to collect the data among the sesame seed farmers.

3.2.2. Dependent variable and control variables

In addition to the resources we included a few control variables. The first one is farm size in terms of the number of hectares of land. In farm production literature it is common to include farm size as a control variable. According to one stream in literature small-scale farmers use their land more efficiently than large-scale farmers. High costs for hiring labor and failing insurance markets explain these effects. Others come to conclusions opposite of this ‘inverse productivity’ relationship, explained by lumpy investment or working capital needs. Both relationships have been shown in literature. Controlling for this effect is required, particularly because in our sample there is a relatively large variance in farm size (Collier and Dercon 2014). Furthermore, we included farming experience in terms of the number of years a respondent has been farming sesame since Kafta Humera still attracts many new farmers from other regions to whom sesame farming is new, literacy (yes or no), and village (data were collected in six neighboring villages). The dependent variable is profit per hectare. Profits are calculated as all revenues generated from producing and selling sesame subtracted by all sesame-related costs made during the season. This in line with the argument by Collier and Dercon (2014: 94) that ‘yield is not the relevant variable to assess efficiency of agriculture [...]. A more relevant indicator would be value added –returns to land and labor, after immediate inputs- per unit of land.’ In order to make the results between respondents comparable the profits per hectare are used.

4. Results: cooperative membership and farmer resources

Our empirical analysis consists of two parts. First, we compare member farmers to non-members in terms of their performance and access to resources. Using simple mean comparison tests, we analyze whether there are significant differences in the resource endowments of farmers across these two groups and if average profitability differs. However, because membership in cooperatives is not random, profitability differences are likely to be biased: groups do not have similar access and endowments of resources. Therefore, we continue to test profitability differences based on propensity score matching. Propensity score matching provides more realistic estimates of the differences between cooperative-members and non-members in terms of their profitability. We do not aim to make causal claims with this exercise but rather show that the difference in profitability continues to exist once we correct for the differences in the resource scores.

In the second part, we continue to analyze how the two groups make use of the resources. Using ordinary least squares regression, we compare the relationships between resource endowment and profitability for member farmers and non-members. The coefficients inform us how an increase in resources increases profits per hectare for members and non-members. In order to test for the effect of membership on slope differences, we also report linear hypothesis tests for the differences in slopes for each of the resources.

In Table 2, we provide the results of the two-sample *t*-tests comparing profitability and resource differences for members and non-members. Interestingly, the profits that members and non-members make do not differ significantly from one another. However, there are some significant differences regarding the resources. Members score significantly higher than non-members for three resources, namely weeding, storage, and the number of animals. As explained in the methods section except for the number of animals, this does not mean that members have 'more' of these resources. Instead, they score 'better' on these resources because their weeding practices and storage facilities are better. Concerning the other resources there are no significant differences in the access to these resources between members and non-members. These results suggest that non-members seem to be able to achieve similar levels of profits while having lower quality resources available to produce them.

Since it is likely that the decision to join farmer cooperatives is not independent of the resource scores we also calculated the average treatment effect (ATE) and the average treatment effect on the treated (ATET) using propensity score matching. One can then compare or match profitability of members and non-members that have similar endowment of factor resources² and farmers'

²We use the following variables for the matching procedure: storage, plowing and sowing, weeding, harvesting, storage, labor, location, animals, time of selling, farm size.

Table 2. Cooperative member vs. non-member farmer resources and profitability: a simple comparison.

	Members		Non-members		Sig.
	Mean	SD	Mean	SD	
Profit per ha	3241	4798	3486	5152	0.637
Plowing & Sowing	2.6323	0.6634	2.5234	0.6685	0.117
Weeding	3.5226	0.6672	3.3830	0.6285	0.040
Harvesting	3.9698	0.5938	3.9942	0.5790	0.692
Storage	2.8442	1.435	2.3382	1.3134	0.000
Labor	1.8610	0.3031	1.8377	0.3033	0.463
Location	3.2312	0.5607	3.1988	0.5959	0.592
Animals	20.4646	31.0637	11.6667	35.9135	0.012
Time of Selling	4.4149	4.4950	4.4858	4.7898	0.884
Farm size (in ha)	6.5553	5.6673	4.6491	4.8096	0.001

Note: Two-sided mean comparison test; Cooperative members ($n = 198$) vs. non-members ($n = 171$).

Figure 1. Overlap graph.

location (proxied by the village). The propensity score matching estimator matches on the estimated treatment probabilities using a logit model. One of the central assumptions required to estimate the effect of membership on profits using propensity score matching is that each individual farmer has a positive probability of becoming member of a cooperative. To assure that this assumption is not violated Figure 1 plots the estimated densities of the probability of being member. This figure displays the estimated density of the predicted probabilities that a non-member farmer is a non-member and the estimated density of the predicted probabilities that a non-member farmer is a member. Since both plots do not indicate too much probability mass near 0 or 1 and the

estimated densities have most of the masses in areas in which they overlap we do not have evidence that the overlap assumption is violated. As a robustness check, we also calculated the ATE and ATET without 20 outliers such that a graph would result without the lack of overlap as can be seen in Figure 1 below on the right side. The part on the right side where there is no overlap concerns only a few observations and the robustness check indeed revealed similar outcomes. The graph does not display a complete overlap. This implies that in the analysis there are not always two equally sized groups to match, but this is entirely accepted as long as there is sufficient overlap.

Table 3 reports ATE and ATET. The ATE is the average effect of the treatment in the population, i.e. $ATE = E(y_1 - y_0)$, while the ATET is the average treatment effect among those that receive the treatment ($ATET = E(y_1 - y_0 | t = 1)$, with $t = 1$ denoting the treatment group of members). In both cases we observe, unexpectedly, that membership in a farmer cooperative is negatively related to profits per hectare and that this negative effect turns out to be rather similar in effect size. However, the ATET turns out to be only significant at the 10% level. Our estimates indicate that if farmers that are member of cooperatives leave the cooperative and have to use the existing (and higher levels) of resource scores as efficient as the non-members do, their profitability would increase by 1.370. This translates to $1370 \text{ Birr} \approx 54\text{€} \approx 69 \text{ US-}\$$ per 1 ha – based on the average prices in the period under investigation this implies an additional 75–100 kg of sesame per hectare. After cross-checking with industry experts our estimates seem to be quite realistic.

4.1. Utilization of resources of members and non-members of farmer cooperatives

Our results thus indicate that members of a cooperative have similar profitability as non-members, but employ higher quality resources. Once we compare farmers with similar levels of factor inputs, substantial differences in profitability between members and non-members are observed. This calls for a more fine-grained analysis to determine how an increase in each of the relevant resources relates to profits per hectare, comparing cooperative members to non-members. To do so, we regress productivity on the set of production factors, allowing

Table 3. ATE and ATET of membership in farmer cooperatives (profit in 1000 Ethiopian Birr (ETB)).

	Treatment effect	Std. error	$P > z $	Potential outcome for membership = Yes	Potential outcome for membership = No
Average Treatment Effect (ATE)	-1.21	0.58	0.031	2.862	4.072
Average Treatment Effect on the Treated (ATET)	-1.37	0.78	0.083	3.253	4.623

for contingency between members and non-members by employing interaction terms between membership status and each production factor (Table 4). Table 4 also reports slope differences between members and non-members, and whether these differences are significant.

We observe that plowing and sowing, harvesting, storage, labor, location, animals, and the time of selling exhibit a positive relationship to profits for non-members (at 1% or 5% level). Literacy and experience in sesame farming turn out to be positive and significant (at 10%). Farm size is negatively related to profit (at 1%). For members of cooperatives, plowing and sowing, storage, labor, animals, time of selling, and literacy are positive and significant at 1% or 5%, while location is positive and significant at 10%. Members of cooperatives with more experience in sesame farming and larger farm size have lower profitability levels.

The more informative insights of this exercise are the differences in the slopes between non-members and members. Such differences display dissimilarities in farmer's utilization of resources. A negative and significant difference in the slope indicates that non-members are better able to utilize the inputs they possess to produce and market sesame, while a significant positive difference indicates that members have an advantage in employing a resource compared to non-members.

We find that non-members better utilize harvesting, storage, labor, location, and animals resources (slope differences significant at the 5 or 10% level). In addition, there is some evidence that farming experience benefits non-members but not members of cooperatives. For plowing and sowing, weeding, and literacy, we do not find significant differences. Members are better able to utilize benefits resulting from speculating on price ('time of selling') and experience a less negative effect from increasing farm size (Table 4).

5. The institutional setting affecting collective entrepreneurship in Ethiopia

The results of our analysis about the performance effect of cooperative membership for farmers are different from what we anticipated based on the relevant literature because cooperative membership (collective action) hardly benefits the farmers under study. We suggest that the particular institutional environment in Ethiopia can be alluded to, to explain the difference. Except for a report by the World Bank (2007), this is not previously considered in the literature on cooperatives.

Ethiopia is one of the world's least developed countries, ranking place 173 on the human development index. In pursuit of economic growth, the country's strategy is to invest in the development of the agricultural sector by means of, among other things, stimulating membership of farmer cooperatives by small-scale farmers. The proven relevance of farmer cooperatives in different

Table 4. How resources determine Farmer Profit/Ha (in 1000 ETB): regression results.

		Regression results	Δ Non-members/ members
Plowing & sowing	Non-Members	0.535** (0.0336)	0.112
	Members	0.647*** (0.0018)	
Weeding	Non-Members	0.0463 (0.0617)	−0.116
	Members	−0.0692 (0.0362)	
Harvesting	Non-Members	1.305** (0.0346)	−1.402**
	Members	−0.0967 (0.0637)	
Storage	Non-Members	0.991*** (0.0037)	−0.172*
	Members	0.819*** (0.0187)	
Labor	Non-Members	4.577** (0.119)	−1.419*
	Members	3.158*** (0.0423)	
Location	Non-Members	1.476** (0.0779)	−1.150**
	Members	0.327* (0.0448)	
Animals	Non-Members	0.0344*** (0.0005)	−0.0127*
	Members	0.0217** (0.0006)	
Time of Selling	Non-Members	0.135** (0.0031)	0.195**
	Members	0.330*** (0.0008)	
Literacy	Non-Members	0.752* (0.0658)	0.449
	Members	1.201** (0.0363)	
Farming experience (Firm age)	Non-Members	0.0737* (0.0088)	−0.115**
	Members	−0.0414** (0.0020)	
Farm size (in Ha)	Non-Members	−0.204*** (0.0022)	0.032***
	Members	−0.173*** (0.0024)	
Cooperative membership		12.04*** (0.108)	
Constant		−20.25*** (0.180)	
Village fixed effects		Yes	
Observations		367	
R^2		0.339	

Notes: Standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Standard errors are clustered across membership status. Δ Non-Members/Members reports contrasts of marginal linear predictions in the slope between members and non-members.

parts of the world forms the basis on which the country's strategic direction in what is called the 'growth and transformation plan' is based. Nonetheless, the country suffers from an institutional environment that falls short in creating incentives for collective action. The government currently pursues a strategy to organize all farmers in one cooperative per village. Ethiopian law dictates that only one cooperative with a certain purpose is allowed per village. This still implies that, according to law, multiple cooperatives in one village can coexist as long as they have a different purpose. The government, however, prefers to have only one cooperative per village. The government aims to realize this by letting its staff interfere in the establishment and management of cooperatives. Government staff puts farmers under pressure to make their cooperatives so-called 'multi-purpose cooperatives.' Since these cooperatives cover basically every thinkable purpose, there is no more space for other cooperatives, and even if there were such space, the government would not provide permission for its establishment. Cooperatives are furthermore expected to bring benefits not only to members, but to the wider community as well. In other words, on the spectrum of private goods, club goods, and public goods, services provided by the cooperative are seen more as public goods than as club goods. This, for example, means that a cooperative with a tractor does not give priority to members over non-members when renting out the tractor but instead rents out the tractor on a first-come-first-served basis, even though the tractor is (indirectly) paid by the members. Similarly, in informal meetings, leaders of cooperatives are persuaded to buy fertilizer from the state-owned monopolist and sell it to farmers in the village. In practice this meant that in the years in which we were collecting data cooperatives used profits made from trading in members' produce not to distribute it to members in forms of cash (dividend) but to trade in fertilizer. The risky nature of this business became apparent when a cooperative only succeeded in selling the fertilizer to farmers when it reduced the selling price to 10% of the price it had paid to the state-owned monopolist. While the cooperative engages in risky investments farmers can become member (and hence co-owner of the cooperative's assets) for less than US\$ 3.00.

The implications that the regulations have on entrepreneurial behavior are numerous and the list is much longer than the few examples mentioned above. However, what it illustrates is that farmers who are ambitious and make efficient use of their resources are discouraged to participate in the cooperative. Despite the potential for collective action, if the goals of the cooperative do not align with the goals of the ambitious farmer, then the ambitious farmer most likely does not benefit from membership. Forming a cooperative with similarly ambitious other farmers, on the other hand, is not allowed in Ethiopia. The institutional environment as such functions as a selection mechanism that prevents ambitious farmers making efficient use of their resources from becoming a cooperative member. This selection mechanism explains why non-members make more efficient use of their resources than members.

The importance of cooperating with other farmers with similar ambitions is illustrated by a cooperative called Humera #2 in the area where we collected data.³ It is clear from studying this cooperative that they meet all requirements for success of collective action. The cooperative was formed shortly after the Ethiopia–Eritrea border war over a decade ago. They started with a group of 18 farmers of whom 17 still remain. They made clear regulations about (heterogeneous) contributions everyone had to make in kind and in cash, the development of the share price, sharing of revenues, investment plans, etc. No new members were accepted and share prices increased from 3000 Ethiopian Birr at inception to 50,000 Ethiopian Birr during the last interview (as compared to 50 Ethiopian Birr for regular cooperatives). Sanctions on free-riding behavior were formulated and revenues were supposed to benefit group members in the first place rather than the wider community. They did not abide by the Ethiopian regulations and were able to circumvent these regulations because of their status as former fighters of the liberation front that toppled the former military regime in 1991 and forms the country's government since then. Currently, the cooperative engages in a wide range of diverse activities, makes profits, invests, and its members consume. This example illustrates that if farmers want to be more profitable, they need to cooperate with like-minded others.

Different from the situation for Humera #2, other cooperatives must abide by Ethiopian law and practice enforced by government staff. Cooperative membership (of the single cooperative in a village) must be stimulated, and so cooperatives are given a few privileges, of which tax exemptions and possibilities to sell produce via the Ethiopia Commodity Exchange (ECX) and, or, to export produce directly, are the most important ones. In Ethiopia, the auction ECX was institutionalized for the trade of different crops, including the country's two most important crops in terms of revenues (coffee and sesame). In order to deliver to the ECX a seller needs to provide at least 50 quintals. Individual small-scale coffee and sesame seed farmers normally do not reach such quantities. Farmers can only sell via the ECX if they cooperate. Given the high fees to become member of the ECX, cooperation in a large group is needed to spread costs sufficiently. Some cooperatives became member of the ECX. Cooperatives can jointly organize as a so-called Union. The Union has organizational assets in the form of management, language and accounting skills, network, and the like, to be able to engage in export, where individual cooperatives lack such capacity. Cooperatives have two additional sales outlets as compared to non-members: the ECX and the (exporting) Union. The two additional sales outlets can benefit members of cooperatives because non-members can only sell sesame to spot market traders (who in turn sell

³We did not include its members in our sample (above), because it is very different from the other cooperatives. Of the 17 members, only 3 are sesame seed farmers.

via the ECX). Selling via the ECX or to the Union by cooperatives brings major benefits as compared to selling to spot market traders. Firstly, spot market traders are abundantly present short after the harvesting season in all villages (i.e. late October). Yet, as time goes by, the number of spot market traders reduces quickly, particularly after December. Lack of spot market traders reduces the bargaining power and increases the transaction costs of farmers who sell to these traders. The auction floor of the ECX is open all year round. In addition, payments always follow within two days after selling sesame via the ECX. Quick payment is realized because buyers of sesame (Ethiopian exporters located in Addis Ababa) first need to deposit an amount of money before they can buy sesame. The amount of sesame they are allowed to buy depends on the amount of money that they deposited. The ECX records the daily prices of sesame and from these data we learn that in the year in which we collected data the price of sesame increased gradually from around 2000 Ethiopian Birr per quintal (depending on quality; the local measuring standard of 1 quintal equals 100 kg) just after the harvest (i.e. late October) to around 3500 Ethiopian Birr late April. In just six months, the price for sesame increased by 75%. The Union can bypass Ethiopian buyers (i.e. exporters) of sesame by selling sesame directly to a foreign firm. Institutions that farmers and their cooperatives face define privileges for cooperative members and restrict non-member behavior in important ways. While the government creates disincentives for those pursuing effective deployment of resources, membership seems to create benefits from the possibility of access to the ECX and possibly of directly exporting if a cooperative belongs to a union.

6. Conclusion and policy implications

Cooperative members and non-members reach comparable profit levels that do not differ significantly, yet do so in different ways. Assuming similar resources non-members are expected to outperform members significantly. This is an important and interesting finding based on rigorous data that can shed light on why so many cooperatives in Africa fail to utilize their potential (see World Bank 2007). Our data suggest that farmers as collectives have difficulties in exploiting the resources to which they have better access than non-members because of the institutional environment they face. It is only because of the exploitation of one resource, namely selling late in the season, speculating on price increases after the harvest season has passed, that members still manage to perform on a par with non-members. If non-members were not constrained by institutions, non-members would perform much better than members. Alternatively, if members of cooperatives would be able to make as efficient use of resources as non-members their profit would be much larger.

The current institutional fabric in Ethiopia does not allow more than one cooperative per village (except for a handful of privileged farmers, such as

former fighters). The cooperative is also considered to be more a provider of public goods rather than club goods. This may result in free-riding and other forms of opportunistic behavior as well as little incentives to invest and take risks. As a direct consequence of the problems of collective action, the efficiency with which resources are utilized may reduce, which explains why members make less efficient use of the resources. At the same time, this institutional fabric creates incentives for those farmers who do know how to make efficient use of resources not to become member. For farmers the possibility to benefit from selling late in the season may not be sufficient reason to join the cooperative. Farmers may sell (part of) their produce shortly after the harvest to repay loans (carrying excessive interest rates). Members indeed are significantly richer (have more animals such as cows or goats) than non-members, as a *t*-test indicates: they can wait.

The findings contribute to our understanding of failure and success of farmer cooperatives in developing countries. Though a large body of literature exists that studies farmer cooperatives in developing countries, the relationship between the institutional environment and performance of cooperatives has hardly been studied before. The World Bank (2007) reports about a conflict between efficiency and equity:

Producer organizations typically operate in the context of rural communities where they are subject to norms and values of social inclusion and solidarity. This may clash with the requirements of professional, business-oriented organizations that must help members compete to survive in the market place. (World Bank 2007: 155)

The report, however, adds little detail and explanation as to how this works. Though literature discusses intended and unintended consequences of societies' institutions on entrepreneurship and markets, the relationship of these consequences on cooperative performance has hardly been studied. Olthaar *et al.* (forthcoming) are one of the few linking the institutional environment directly to cooperative performance. The authors introduce the concept of 'tensions' between potentially incompatible institutions, in line with the framework by Helmke and Levitsky (2006). Conflicting, competing, or inconsistent institutions may prescribe different behaviors that may cause cooperatives to drown in what Olthaar *et al.* (forthcoming) call an 'institutional swamp.' At the same time, however, the existence of tensions may also cause cooperatives to engage in institutional entrepreneurship, thereby actively working on the evolution of institutions in line with their interests. Important implications, according to the authors, are (1) to recognize and understand complex institutional fabrics including formal and informal institutions, and institutions directly impinging on a practice and institutions doing so indirectly, (2) alignment of institutions favoring cooperative performance with institutions based on societal values, (3) find a balance between top-down and bottom-up institutional evolution, and (4) accept that there is no single institutional blueprint for cooperatives

success. In line with this Lutz and Tadesse (this volume) argue that policies stimulating open membership of cooperatives in developing countries may constrain entrepreneurial activities.

Based on our research a first policy recommendation is to allow free organization by farmers and support them to cooperate with others who have similar ambitions. Secondly, farmers should be allowed to benefit from speculating on price changes. Speculating on price is a common tactic in agribusiness, but often not done by farmers. However, farmers can benefit substantially from speculating on price changes. Loans carrying a low interest available to farmers would reduce the necessity for farmers to sell their sesame shortly after the harvest. A third policy recommendation would be to consider cooperatives as organizations delivering club goods to members rather than public goods for an entire community. The latter results in cooperatives using resources inefficiently. Benefits from investments should accrue to members rather than the wider community. This policy recommendation is relevant for non-governmental organizations (NGOs) and governments who see a major role for them in development as well. NGOs often consider cooperatives to be vehicles for pursuing 'millennium-development-goals' (Bernard and Spielman 2009; Fischer and Qaim 2012; Tobias, Mair, and Barbosa-Leiker 2013; Van Lieshout, Went, and Kremer 2010).

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No potential conflict of interest was reported by the authors.

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Appendix A

The survey can be found below

A questionnaire for the PhD research of Matthias Olthaar of the University of Groningen (The Netherlands) in cooperation with the Ethiopian Institute of Agricultural Research on farming resources and capabilities of sesame seed farmers in Ethiopia

Location: Kafta Humera (Kebeles: Humera, Maikadra, Bereket, Adebay, Baekar, Rawiyan)
Respondents: Sesame seed farmers
Data collectors: Humera: Muez
Maikadra: Hawlit
Bereket: Goshu
Adebay: Kiday
Baekar: Tuum
Rawiyan: Gezu

Name Data Collector: _____
Signature: _____
Signature supervisor: _____
Date (international): _____
Ethiopian time: Start of interview (hh:mm) _____ End of interview (hh:mm) _____
Kebele: _____
Ketena: _____
Respondent is: Member of a cooperative / Not member of a cooperative

Does the respondent meet the following criteria (if no, stop the interview)

- Sesame is the major crop: yes / no
- Respondent owns 1 -30 ha: yes / no

PLEASE READ THE INSTRUCTIONS FROM THE INSTRUCTIONS MANUAL**CAREFULLY BEFORE DATA COLLECTION**

Phone number Matthias Olthaar in Ethiopia: 0924116278

GENERAL INSTRUCTION FOR THE INTERVIEWER

- *Please, make sure that the interviewee has fully understood the objectives of the interview and the information she/he gives will be confidential,*
- *It is absolutely necessary to win the confidence of the interviewee by creating climate of friendship and trust, and asking his/her convenient time and place to get reliable information.*
- *Don't make any promises of help.*
- *Write any additional information you get from interviewees on your note book and/or the bottom of the pages of the questionnaire in the language you are comfortable with. Supervisors please enter these notes in the special note box at the end of the online survey.*

INTRODUCTION AND INFORMED CONSENT

Hello. My name is _____ and I am working with the Ethiopian Institute of Agricultural Research and the University of Groningen from the Netherlands. We are conducting a study on sesame production and marketing. We would very much appreciate your participation in this survey.

I would like to ask you about some important information related to sesame production, marketing, as well as your household composition. This information will help us learn how sesame production and marketing can be improved. It will take us about **60 minutes** to complete the interview. Whatever information you provide will be kept strictly confidential and will not be shown to other persons. Participation in this survey is voluntary and you can choose not to answer any individual question or all of the questions. However, we hope that you will participate in this survey since your views are important. At this time, do you want to ask me anything about the survey?

May I begin the interview now? 1. Agree 2. Disagree

RESPONDENT AGREES TO BE INTERVIEWED 1 GO TO A01

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED 2 END

Questionnaire Number: _____

A. Demographic characteristics of the respondent

A01	What is your name?	
A02	What is your phone number? <i>In case the respondent has no phone, ask for phone number of friend or relative and write down the name belonging to the phone number and relation to respondent.</i>	
A03	For how many years have you been farming sesame?	

	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
Member code	Name of household member (start with respondent and make a complete list before moving to A05)	Sex (Code A)	Age (years)	Relation to respondent (Codes B)	Marital status (Codes C)	Education level (Code D)	Completed years of formal education	Main Occupation (Code E)	Secondary Occupation (Code E)	Estimated net annual income (in ETB)
01										
02										
03										
04										
05										
06										
07										
08										
09										
10										
11										
12										
Sex (Codes A) 0. Female 1. Male		Relation to respondent (Code B) 1. Household head 2. Husband / Wife 3. Son / daughter 4. Parent 5. Son/daughter in-law 6. Grand child 7. Other relative 8. Hired worker 9. Other, specify: _____		Marital Status (Code C) 1. Married living with spouse/s 2. Married but spouse away 3. Divorced/separated 4. Widow/widower 5. Never married 6. Other, specify.....		Education (Code D) 0. None/Illiterate 1. Elementary (some) 2. Elementary (finished) 3. Secondary (some) 4. Secondary (finished) 5. Tertiary (some) 6. Tertiary (finished) 7. Others, specify: _____ (e.g. religious or adult education)		Occupation (Code E) 1= farming 2=salaried 3=casual labor 4=housekeeping 5=student 6= Business 7= N/A (e.g. baby, old age, or no secondary occupation) 8= Other, specify: _____		

B. Household assets

HOUSING		Code	Answers
B01	Do you own or rent the house where you live?	1= Own 2= Rent	
B02	How much rent or mortgage interest do you pay <u>per month</u> ?	Write down the answer in ETB	
B03	Major material wall is made of	1=Wood and Mud 2=Wood and Grass 3=Reed and Bamboo 4=Mud and Stones 5=Corrugated iron sheets 6=Cement and Stones 7=Hollow Bricks 8=Bricks 9=Other (specify)	
B04	Major material floor is made of	1=Earth/Mud 2=Wood 3=Cement 4=Ceramics/Tiles 5=Other (specify)	
B05	Major material roof is made of	1=Wood and Mud 2=Thatch and Grass 3= Reed and bamboo 4= Clay 5=Corrugated iron sheet 6= Cement 7=Other (specify)	
B06	Total number of rooms in the house	N/A	
B07	Does the house have access to electricity?	1=Yes 2=No	
B08	Does the house have access to piped water?	1=Yes 2=No	
B09	How much does it cost if you want to sell it	Write down the answer in ETB	

Assets owned by the household			
	Type	B10 Number	B11 Estimated <u>total</u> value in ETB
1	Mobile phone		
2	Hand watch		
3	Bed		
4	Radio/ CD Player		
5	Television		
6	Chicken / cocks		
7	Goats		
8	Sheep		
9	Donkey		
10	Cows		
11	Oxen		
12	Camels		
13	Caro (donkey cart)		
14	Bicycle		
15	Motor cycle		
16	Tractor		
17	Gun		
18	Jewelry		
19	Car		
20	Water pump		
21	Other.....		

Loans this farming season (2004-2005 E.C.)						
B19	B20	B21	B22	B23	B24	B25

C. Production and Marketing

Crop production: List all plots and identify crops planted in the year 2004 E.C. and harvested in 2005 E.C. (the current year)															
Plot	Name of plot location	C01 Type of crop planted (Code A)	C02 Distance from home in km	C03 Distance from investor in km	C04 Size of plot in ha	C05 Organic certification (Code B)	C06 Fertility status (Code C)	C07 Ownership (Code D)	C08 Costs of renting in ETB	C09 UREA used in quintals	C10 DAP used in quintals	C11 Did you use improved seeds (Code E)	C12 Total harvested per plot in quintals	C13 Number of quintals sold to date	C14 Total revenue in ETB
1															
2															
3															
4															
5															
Crop (Code A)		3 = Cotton		Certification (Code B)		Fertility (Code C)		Ownership (Code D)		Seeds (Code E)					
1 = Sesame		4 = Other, specify:		0 = No		1 = fertile		1 = owned		0 = No (traditional / local seeds were used)					
2 = Sorghum				1 = Yes		2 = medium		2 = rented-in		1 = Yes					
						3 = degraded		3 = rented-out							

Sesame plots: Copy the plot locations of the sesame plots from the table above in the table below and answer the questions												
		Plowing			Sowing			Weeding				
Plot	Name of plot location	C15 How many times did you plow?	C16 What is the right number of times of plowing?	C17 If gap between C15 and C16, why? (Code A)	C18 When did you sow? (Code C)	C19 What is the best time of sowing (Code C)	C20 If gap between C18 and C19, why? (Code A)	C21 Did you receive training on plowing / sowing? (Code B)	C22 How many times did you weed?	C23 What is the right number of times of weeding?	C24 If gap between C22 and C23, why? (Code A)	C25 Did you receive training on weeding? (Code B)
Code A		4 = shortage of labor		Code B		3 = yes, from cooperative		Code C		4 = Between the first and second rainfall		
1 = shortage of time		5 = excess rainfall		0 = No		4 = yes, from a company		1 = Before the first rainfall		5 = In the first week of the second rainfall		
2 = shortage of machinery		6 = other, specify:		1 = yes, from development agents		5 = yes, from research institute		2 = In the first week of the first rainfall		6 = In the second week of the second rainfall		
3 = shortage of capital				2 = yes, from NGO		6 = yes, from other (specify):		3 = In the second week of the first rainfall		7 = After the second week of the second rainfall		

Sesame plots: Continue with the plot locations of the sesame plots from the table above in the table below and answer the questions									
Weeding					Harvesting				
C26	C27	C28	C29	C30	C31	C32	C33	C34	C35

Sales of sesame. First ask in how many times the respondent sold the sesame										
C36	C37	C38	C39	C40	C41	C42	C43	C44	C45	C46

C47	Is a plot on which you grew sesame on any of the following locations: Bowal, Redem, Shelela, Lugudi, Mechach, Bahre-selam?	0 = No 1 = Yes	If yes, which plot(s):
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Labor for *sesame* only per activity

Activity	C48		C49	C50	C51		C52	C53
	Num ber	Days (total)	Were these paid laborers the same as last year? (Code A)	Total costs of paid laborer in ETB	Household members (unpaid labor)		Working days of respondent	Days of supervision respondent
Plowing and Sowing of sesame								
Weeding of sesame								
Harvesting of sesame								
Threshing of sesame								

Code A: 0 = No; 1 = Yes, some; 2 = Yes, all**Camping conditions laborers for *sesame* only (this is additional to salary)**

		Code	Answer
C54	Did you provide water to laborers?	0 = No; 1 = Yes	
C55	Did you provide food to laborers?	0 = No; 1 = Yes	
C56	Did you provide wood for cooking to laborers?	0 = No; 1 = Yes	
C57	Did you provide cooking utensils to laborers?	0 = No; 1 = Yes	
C58	Did you provide shelter to the laborers?	0 = No; 1 = Yes, from plastic; 2 = Yes, from grass, 3 = Yes, from corrugated iron	

Storage of *sesame* after *last* harvest

		Code	Answer
C59	How many quintals of sesame did you store in your house?	N/A	
C60	How many quintals of sesame did you store in a shelter (DAS in Tigrigna)	N/A	
C61	How many quintals of sesame did you store in a warehouse? (If >0 continue with C62-C65)	N/A	
C62	Major material the wall of the warehouse I used is made from	1=Wood and Mud 2=Wood and Grass 3=Reed and Bamboo 4=Mud and Stones 5=Corrugated iron sheets 6=Cement and Stones 7=Hollow Bricks 8=Bricks 9=Other (specify)	
C63	Major material the floor of the warehouse I used is made from	1=Earth/Mud 2=Wood 3=Cement 4=Ceramics/Tiles 5=Other (specify)	
C64	Major material the roof of the warehouse I used is made from	1=Wood and Mud 2=Thatch and Grass 3= Reed and bamboo 4= Clay 5=Corrugated iron sheet 6= Cement 7=Other (specify)	
C65	Who owns the warehouse?	1=Cooperative 2=Spot market trader 3=Investor farmer 4=Business owner 5 = Me 6=Other, specify	

D. Costs of sesame production

Costs of <u>sesame</u> production this year		
		ETB
D1	What were your total costs for <u>sesame</u> this farming season?	
D2	What were your costs for <u>sesame</u> transport from plot to warehouse?	
D3	What were your costs for bags for <u>sesame</u> ?	
D4	What were your total costs for storage of <u>sesame</u> ?	
D5	What were your total costs for herbicides, pesticides, and insecticides for <u>sesame</u> ?	
D6	What were your other costs for <u>sesame</u> ?	

E. Cooperative

Membership						
		Code	Answer			
E01	Do you know any cooperative in your kebele?	0 = No 1 = Yes				
E02	If yes, what is the name of the cooperative?	N/A				
E03	Are you member of the cooperative?	0 = No 1 = Yes				
E04	a. If yes, why?	1=The cooperative is an important organization for the kebele 2=The cooperative is an alternative selling outlet 3=The cooperative strengthens the market position of farmers 4=The cooperative provides important information 5=Other, specify:				
	b. If no, why not?	1 = I am not eligible 2 = There are no benefits of being a member 3 = The cooperative is far 4 = Other, specify:				
E05	A major problem within the cooperative in my kebele is:	Totally disagree	Somehow disagree	Neither agree nor disagree	Somehow agree	Totally agree
	a. Bad management of the cooperative					
	b. A too large number of members					
	c. A too small number of members					
	d. Opportunistic behavior					
	e. The value of shares is incorrect					
	f. No investments are made for the long term					
	g. The cooperative takes little risks with respect to investment					
	h. Members need to provide more capital					
	i. The cooperative does not disseminate relevant market information					
	j. The cooperative does not disseminate farming systems knowledge					
	k. Other problem, namely:

Questions on this page are for members of cooperatives only

E06	For how many years have you been a member?	N/A	
E07	What is your role in the cooperative?	1 = Ordinary member 2 = Committee member 3 = Chair	
E08	Do you participate in meetings (regarding activities of the cooperative)?	0 = Never 1 = yes, rarely 2 = yes, regularly 3 = yes, always	
E09	How much did you pay for registration? (in ETB)	N/A	
E10	How many shares do you own?	N/A	
E11	How much did you pay for each share? (in ETB)	N/A	
E12	Did you receive dividend this year?	0 = No; 1 = Yes	
E13	If yes, how much dividend did you receive? (in ETB)	N/A	
E14	Did you receive dividend last year?	0 = No; 1 = Yes	
E15	If yes, how much dividend did you receive? (in ETB)	N/A	

Perceptions on the services of the cooperative (only for members)

Do you agree on the following statement? Please tick one box

[illegible]

F. Aspirations

F1	Suppose you would win 50,000 ETB with a lottery ticket. How would you spend the money?	
F2	Suppose you would win 50,000 ETB with a lottery ticket and you have to spend the money on farming activities. How would you spend the money? (Note, this question is on farming in general and can also be about investments in cattle, sorghum, et cetera).	
F3	Suppose a bank offered you a 100,000 ETB loan for an annual interest rate of 9%. Please indicate how you would allocate the money	Allocation
		ETB
		Immediate repayment
		Spend on house
		Spend on household assets
		Spend on animals (donkey)
		Spend on occasional activity such as wedding
		Invest in a non-farm business
		Covering costs of next sesame farming season
		Invest in the sesame farm
		Invest in the cooperative
		Other, namely:

G. Final notes data collector

G1	Did the respondent find some of the questions difficult, embarrassing or confusing?	
G2	If yes, which questions? Elaborate	
G3	What is your evaluation of the accuracy of the respondent's answers?	

Appendix B

Example: Plowing and Sowing

We already identified that for plowing and sowing the number of times of plowing is important, the timing of sowing, and the type of seed used. All this affects both quality and quantity (agronomical yield). From the focus group discussions, we know that of these three aspects of plowing and sowing, the time of sowing is most important, followed by the number of times of plowing, and finally the type of seed used.

We also know from the focus group discussions and the interviews with industry experts that generally speaking there are seven moments on which farmers can sow (time of sowing). The right time depends on the rainfall. After a dry period of around 7–8 months, it starts raining in Kafta Humera. The first rainfall usually takes about two weeks. After these two weeks it is dry for a short period of time and then it starts raining again for about 3–4 months. The best time to sow is in the first week of the second period of rainfall because the moist soil together with sufficient new rainfall allows the seed to germinate and grow well. The risk of sowing earlier is that the period between the first and second rainfall takes long which may cause the seed to germinate and then die. However, the seed should not be sowed too late either since this would prevent the crop to mature before the dry season starts and too much humidity can make the seed 'drown.' We asked farmers objectively when they sowed the seeds. The answer was coded using seven options:

- (1) Before the first rainfall.
- (2) In the first week of the first rainfall.
- (3) In the second week of the first rainfall.
- (4) Between the first and second rainfall.
- (5) In the first week of the second rainfall.
- (6) In the second week of the second rainfall.
- (7) After the second week of the second rainfall.

For this part of plowing and sowing respondents would get a score 5 if the answer was code 5, a score 4 if the answer was code 3, a score 3 if the answer was code 2, a score 2 if the answer was code 4, 6, or 7, and a score 1 if the answer was code 1.

Plowing is preferably done three times. The minimum is one time, since sowing is done simultaneously with plowing. So for this part of plowing and sowing farmers scored a 5 if they plowed 3 times, a 3 if they plowed 2 times, and a 1 if they plowed only once. Finally, there are two types of seeds: the traditional seed and the improved seed. The improved seed is said to result in better yields and better resistance to drought. If farmers used the improved seed they would get a score 5, otherwise a score 1.

Next, we had to come to one score for plowing and sowing. Given the varying importance of the three different parts we did not just add the three scores and divided them by 3. Instead, we multiplied the score for the timing of sowing by 3, the score for the number of times of plowing by 2, and the score for the type of seed used was not multiplied. We added the multiplied scores and the score for the type of seed used and divided by 6.

In this way, we asked questions about farmer's variances in farming inputs in an objective way while interpreting the results using the qualitative data.