Chapter 3 - Access to and usage of input factors by members of farmer cooperatives and non-members in Ethiopia

3.1 Introduction
Agriculture continues to be of vital importance for the world’s least developed countries in terms of gross domestic product (GDP), 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 input factors and markets.

In the field of development studies the potential of collective action to address development issues has been subject to a wide range of research topics (Adhikari and Lovett 2006; Bernard and Spielman 2009; Dasgupta and Beard 2007; Desai and Joshi 2014; Fischer and Qaim 2012; Naidu 2009; Poteete and Ostrom 2004; Ruttan 2008; Varughese and Ostrom 2001; Munshi and Parikh 1994). The theoretical potential of collective action is often acknowledged, yet in practice, for a variety of reasons, this potential often remains unrealized. Similarly the World Bank (2007) argues that farmer organizations have large potential to benefit their member farmers, yet often fail to do so in developing countries, particularly in Africa. Numerous studies have been published on how collective action would allow farmers to access input factors and markets which they cannot access individually (cf. Bernard and Spielman 2009; Barham and Chitemi 2009; Markelova, Meinzen-Dick, Hellin, and Dohrn 2009; Fischer and Qaim 2012; Desai and Joshi 2014). In the current chapter we study the potential of members of farmer cooperatives in Ethiopia to access farming input factors and utilize them efficiently to the end of creating profits for the farmers. We compare members of cooperatives to farmers who are not member and find that while members and non-members reach comparable profit levels, they do so in different ways. We find that members have better access to input factors yet utilize them
less efficiently than non-members with the exception of one input factor, namely speculating on price. Being able to benefit from speculating on price, however, is more the result of government policy favoring cooperatives rather than the result of cooperative management and deployment of input factors. In the current chapter we contribute to existing research in that we are one of the first to provide evidence based on quantitative data that members of cooperatives do not make as efficient use of input factors as do non-members. In addition we designed our research such that we do not only collect data on the three traditional input factors often used in agricultural economics research (land, labor, and capital), but include other input factors as well and measure them in a novel, reliable, and objective way.

We proceed as follows. We continue below with reviewing literature on collective action and the importance of collective action to farmers. We discuss the context specific to Ethiopia. Next we discuss our data and methods, provide results and finally a discussion and conclusion. In the conclusion we provide policy recommendations.

3.2 Literature
Economies of scale and scope motivate farmers to organize in cooperatives and bundle assets. 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 (Van Bekkum 2001; Beverland 2007; Olson 1965).

Cooperatives have not been unequivocally successful in Africa despite the continent’s continued reliance on agriculture for its GDP, export revenues, and employment (World Bank 2007). Nonetheless the World Bank (2007: 8) argues that modern agriculture in developing countries “is led by private entrepreneurs in extensive value chains linking producers to consumers and including many entrepreneurial smallholders supported by their organizations.” While in practice cooperatives fail to live up to their potential, their theoretical potential is still sufficient reason to pursue well-functioning cooperatives.

For farmers it is important to cooperate with others farmers in an effort to acquire, accumulate, develop, bundle, and deploy input factors. Such bundles of input factors can be developed by members contributing heterogeneous yet complementary input factors or homogeneous input factors resulting in economies of scale (Olson 1965; Wincent et al. 2010; Hitt, Dacin, Levitas, Arregle, and Borza 2000; Araujo Dubois, and Gadde 2003; Agarwal, Croson, and Mahoney 2010; Beverland 2007). 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 technologies and research and development, and finally they can increase their representativeness by means of lobbying (World Bank 2007; Berdegué 2001; Mesquita and Lazzarini 2008).

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 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, the more likely that such 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 group of firms that cooperates, the more input factors are accumulated, yet, at the same time, the larger the group, the more difficult it is to exploit the input factors.

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 (Olson 1965; Williamson 1975; Agarwal et al. 2010). 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 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 (Luo 2008; Kumar 1996). 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; Dolfsma 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).

In other words, though cooperatives have much potential in theory, in practice they are confronted with serious challenges. In the current chapter we are one of the first to quantify access to and usage of input factors by members and non-members of cooperatives and study efficiency in their usage.

**Ethiopia**

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 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 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. According to law no two (or more) cooperatives with a certain purpose may be established in a village. The government interferes in the establishment and management of cooperatives, because of which almost all cooperatives are 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 number of 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 input factors are discouraged to participate in the cooperative. Despite the potential of 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 importance of cooperating with other farmers with similar ambitions is illustrated by a cooperative called Humera 2 in the area where we collected data. We did not include its members in our sample, because of the 17 members only 3 are sesame seed farmers, which is a too small number to conduct statistical analyses. Nonetheless it is clear from studying this cooperative using case study methods 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 are still member. 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, et cetera. No new members were accepted and share prices increased from 3,000 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.

Nonetheless, in order to stimulate cooperative membership (of the one cooperative in a village), cooperatives are given a few privileges, of which tax exemptions and possibilities to sell produce via the Ethiopia Commodity Exchange and, or, to export produce directly, are the most important ones. In Ethiopia an auction hall called the Ethiopia Commodity Exchange (ECX) has been institutionalized for the trade of different crops, including the country’s two most important crops in terms of revenues, namely coffee and sesame seed. In order to deliver to the ECX the seller needs to provide at least 50 quintals. Individual small-scale coffee and sesame seed farmers normally do not reach such quantities. This implies that farmers can only sell via the ECX if they cooperate with other farmers. Given the high fees to become member of the ECX, a large group is needed in order to earn back these costs. Some cooperatives did become member of the ECX and hence can sell via the ECX at any time. In addition different cooperatives are organized jointly in a separate entity called the 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. This means that cooperatives and their members 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 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. This is highly different for the ECX. The auction floor at the ECX is open all year round. In addition payments always follow within two days after sellers sold 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. Sellers can thus rest assured that, given that there are buyers, they can sell anytime via the ECX if they like the price. 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 2,000 Ethiopian Birr per quintal (depending on quality; the local measuring standard of 1 quintal equals 100 kilogram) just after the harvest (i.e. late October) to around 3,500 Ethiopian Birr late April. In just half a year the price
increased by 75%. The Union even bypasses Ethiopian buyers (i.e. exporters) of sesame when they sell sesame directly to an importing firm. If this is arranged throughout the year, members of cooperatives can benefit from this as well.

Given the privileges of cooperatives together with restrictive institutions being imposed on them it remains ambiguous what the net benefits are to members. While the government creates disincentives for those pursuing effective deployment of input factors, membership may allow benefiting from direct export and access to the ECX.

3.3 Data and Methods
We collected data among sesame farmers in a county called Kafta-Humera in the Northwest of the region Tigray. The county borders Sudan and Eritrea. It is a drought-prone hot area where only two crops can grow well given the traditional rain-fed agricultural practices that are still employed: sorghum and sesame seed. A tractor used for plowing is the only non-traditional aspect of farming in this area. We collected data among 375 small-scale sesame seed farmers of whom approximately half is member of a cooperative and half is not. We chose to collect data in the Northwest of Ethiopia because many cooperatives in this region are established around the same time, namely some six to seven years after the DERG regime had been toppled by liberation fronts. The region Tigray, in the North of Ethiopia, formed the scenery where the worst fights against the military regime took place. Consequently, for a long time, soils were not exploited fully for agricultural purposes. It was not until after that war that more farmers started to come to the Northwest of Ethiopia to start farming sesame and sorghum. Later on they also established cooperatives. The setting provides a good place for collecting data on the use of input factors and profits generated since many farmers only produce sesame. Sesame is a cash crop solely produced for the generation of profits. Except for some sowing seed and some sesame for luxury hotels in the capital city of Ethiopia, Addis Ababa, all sesame is exported. Sesame is not a food crop used for home consumption. 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.

Variables
In the current study we employ a novel methodology in which we go beyond the three traditional input factors 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 input factors and how variances could
explain higher or lower profits. We conducted 131 interviews with stakeholders of
the sesame seed supply chain and held two focus group discussions with industry
experts in order to identify critical input factors. In total we identified eight input
factors that can explain variances in profits. We studied in what respects the
eight input factors vary and used these ways in which the input factors 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
input factors are listed below as well as with the ways in which each of these
input factors vary:

- 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

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 not
have the required input factors. 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 input factors 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 kilometers 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 easy 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 lowest just after harvest time and increases gradually throughout the following year.

For each of the input factors we determined with the industry experts during the focus group discussions how to rate their variances. Most of the input factors 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 is used as continuous variable and the actual average time of selling as well. 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.
The above list illustrates that each of the input factors 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 input factors are interrelated and affect the efficiency of the input factor. 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 score 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 R² 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 1-5. 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 who score 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.

In order to avoid lengthiness, we will describe only one of the six variables for which we calculated scores ranging from 1 to 5. The scores of other input factors are calculated in similar ways.

**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 to 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 the seed cause 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 4, 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.

In addition to the predictor variables we included four control variables in the analysis: 1) village, 2) age of the firm, 3) (il)literacy, and 4) cooperative membership (for the whole sample). The outcome variable was measured as the profit per hectare. Since the outcome variable measures profit per hectare, farm size is already accounted for in the outcome variable and therefore not included as control variable.

The survey was pilot tested from December 2012 to January 2013. From March to May 2013 survey data were collected using the final version of the survey.

### 3.4 Analysis and results

Our empirical analysis consists of two parts. First we compare member farmers to non-members in terms of their performance and access to input factors. 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. As we will document both 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 allows yielding more realistic estimates of the impact of cooperative-membership on profitability by finding comparable non-members.

In the second part, we continue to analyze how the two groups make use of the input factors. Using Ordinary Least Squares (OLS) regression we compare the relationships between input-factor endowment and profitability for member farmers and non-members. The coefficients inform us how an increase in input factors 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 input factors.

**Input factor endowment and profitability of members and non-members of farmer cooperatives**

In Table 1 we provide the results of the two-sample t-tests comparing profitability and input factor 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 input factors. Members score significantly higher than non-members for three input factors, namely Weeding, Storage, and the Number of
Animals. Concerning the other input factors there are no significant differences in the access to these input factors between members and non-members. These results suggest that non-members seem to be able to achieve similar levels of profits while having fewer input factors available to produce them.

Table 1. Simple comparison of profits and input factors of member and non-members

<table>
<thead>
<tr>
<th></th>
<th>Members Mean</th>
<th>St. Dev.</th>
<th>Non-Members Mean</th>
<th>St. Dev.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit per ha</td>
<td>3241</td>
<td>4798</td>
<td>3486</td>
<td>5152</td>
<td>.637</td>
</tr>
<tr>
<td>Plowing &amp; Sowing</td>
<td>2.6323</td>
<td>.6634</td>
<td>2.5234</td>
<td>.6685</td>
<td>.117</td>
</tr>
<tr>
<td>Weeding</td>
<td>3.5226</td>
<td>.6672</td>
<td>3.3830</td>
<td>.6285</td>
<td>.040</td>
</tr>
<tr>
<td>Harvesting</td>
<td>3.9698</td>
<td>.5938</td>
<td>3.9942</td>
<td>.5790</td>
<td>.692</td>
</tr>
<tr>
<td>Storage</td>
<td>2.8442</td>
<td>1.435</td>
<td>2.3382</td>
<td>1.3134</td>
<td>.000</td>
</tr>
<tr>
<td>Labor</td>
<td>1.8610</td>
<td>.3031</td>
<td>1.8377</td>
<td>.3033</td>
<td>.463</td>
</tr>
<tr>
<td>Location</td>
<td>3.2312</td>
<td>.5607</td>
<td>3.1988</td>
<td>.5959</td>
<td>.592</td>
</tr>
<tr>
<td>Animals</td>
<td>20.4646</td>
<td>31.0637</td>
<td>11.6667</td>
<td>35.9135</td>
<td>.012</td>
</tr>
<tr>
<td>Time Selling</td>
<td>4.4149</td>
<td>4.4950</td>
<td>4.4858</td>
<td>4.7898</td>
<td>.884</td>
</tr>
</tbody>
</table>

Note: Two-sided mean comparison test. The number of observations for members of cooperatives is 198 and the number of observations for non-members is 171.

Since it is likely that the decision to join farmer cooperatives is not independent of the available input factors we also calculated the average treatment effect (ATE) and the average treatment effect on the treated (ATET) using propensity-score matching. This allows us to compare profitability of members and non-members that have similar endowment of factor inputs. In addition to matching members to non-members based on factor endowment we also consider the farmers’ location (proxied by the village) to match both groups. In our case 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.
Table 2 reports the average treatment effect (ATE) and the average treatment effect on the treated (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 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 ten percent level. Our estimates indicate that if farmers that are members of cooperatives leave the cooperative and have to use the existing (and higher level) of inputs as efficient as the non-members do, their profitability would increase by 1.350. This translates to 1,350 Birr $\approx 53\,€$ $\approx 68\,$US-$ per 1 hectare – 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 seems to be quite realistic.
Table 2. ATE and ATET of membership in farmer cooperatives (Profit in 1,000 Ethiopian Birr (ETB))

| Treatment effect (ATE) | Std. error | P>|z| | Potential outcome for membership= Yes | Potential outcome for membership= No |
|------------------------|------------|--------|----------------|--------------------------------------|
| Average treatment effect | -1.239 | 0.589 | 0.036 | 2.844 | 4.083 |
| Average treatment effect on the treated (ATET) | -1.359 | 0.791 | 0.086 | 3.247 | 4.606 |

Our results regarding the differences in factor endowments and profitability indicate that members of a cooperative have similar profitability then non-members while employing more factor inputs. 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 how an increase in each of the relevant input factors relates to profits per hectare, both for farmers that are member and those that are not member of a cooperative.

Utilization of input factors of members and non-members of farmer cooperatives
In order to investigate how efficiently members and non-members of farmer cooperatives employ their resources we regress productivity on the set of production factors allowing for contingency between members and non-members by employing interaction terms between membership-status and each production factor. The results from this exercise are documented in Table 3. Next to the estimation results Table 3 also reports slope differences between members and non-members and whether these differences are significant.

We observe that plowing and sowing, harvesting, storage, labor, and animals exhibit a positive relationship to profits for the group of non-members at the five percent level. In addition, for non-members, the coefficients for location, literacy, and experience in sesame farming turn out to be positive and significant at the ten percent level. For farmers that are member of cooperatives storage, labor, animals, time-selling, and literacy are positive and significant at the five percent level while plowing and sowing are positive and significant at the ten percent level only. Interestingly, we find for members of cooperatives with more experience in sesame farming 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 input factors. 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 are better able to utilize harvesting, labor, and location resources (slope differences significant at the five percent level). In addition there is some evidence that farming experience benefits non-members but not the members of cooperatives. Next, we also find some weak indication that storage capacities are employed more efficiently as well (slope differences significant at the ten percent level). For plowing and sowing, weeding, animals and literacy we do not find significant differences in the slopes of the two groups. Members are better able to utilize the benefits resulting from speculating on price, or ‘time of selling’.

As a robustness check to the average treatment effect reported in the previous section we also calculated the predicted values assuming no farmer being member of a cooperative and contrast this predicted values assuming all farmers belong to a cooperative. The predicted values are reported in Table A3 in appendix (A) and are rather close to the potential outcome for membership and non-membership reported in Table 2.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Non-Members</th>
<th>Members</th>
<th>Δ Non-Members/Members</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regression results</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plowing and sowing</td>
<td>0.579**</td>
<td>0.547*</td>
<td>-0.0315</td>
</tr>
<tr>
<td></td>
<td>(0.0294)</td>
<td>(0.0491)</td>
<td>(0.0197)</td>
</tr>
<tr>
<td>Weeding</td>
<td>-0.265</td>
<td>0.118</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.124)</td>
<td>(0.0597)</td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td>1.094**</td>
<td>0.0320</td>
<td>-1.0616***</td>
</tr>
<tr>
<td></td>
<td>(0.0453)</td>
<td>(0.0392)</td>
<td>(0.0844)</td>
</tr>
<tr>
<td>Storage</td>
<td>0.946**</td>
<td>0.738***</td>
<td>-0.2074*</td>
</tr>
<tr>
<td></td>
<td>(0.0174)</td>
<td>(0.00652)</td>
<td>(0.0239)</td>
</tr>
<tr>
<td>Labor</td>
<td>5.385***</td>
<td>3.864***</td>
<td>-1.521**</td>
</tr>
<tr>
<td></td>
<td>(0.0450)</td>
<td>(0.0133)</td>
<td>(0.0583)</td>
</tr>
<tr>
<td>Location</td>
<td>1.434**</td>
<td>0.114</td>
<td>-1.3201**</td>
</tr>
<tr>
<td></td>
<td>(0.133)</td>
<td>(0.0708)</td>
<td>(0.0618)</td>
</tr>
<tr>
<td>Animals</td>
<td>0.0279**</td>
<td>0.0184**</td>
<td>-0.00953</td>
</tr>
<tr>
<td></td>
<td>(0.00141)</td>
<td>(0.000895)</td>
<td>(0.00231)</td>
</tr>
<tr>
<td>Time Selling</td>
<td>0.111</td>
<td>0.324**</td>
<td>0.213**</td>
</tr>
<tr>
<td></td>
<td>(0.0202)</td>
<td>(0.0134)</td>
<td>(0.00689)</td>
</tr>
<tr>
<td>Literacy</td>
<td>0.798*</td>
<td>0.889***</td>
<td>0.0909</td>
</tr>
<tr>
<td></td>
<td>(0.0676)</td>
<td>(0.00138)</td>
<td>(0.0662)</td>
</tr>
<tr>
<td>Farming experience (Firm age)</td>
<td>0.0653**</td>
<td>-0.0554*</td>
<td>-0.121**</td>
</tr>
<tr>
<td></td>
<td>(0.0103)</td>
<td>(0.00708)</td>
<td>(0.00321)</td>
</tr>
<tr>
<td>Cooperative membership</td>
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<tr>
<td>Constant</td>
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<tr>
<td>Village fixed effects</td>
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</tr>
<tr>
<td></td>
<td>(0.208)</td>
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<td></td>
</tr>
<tr>
<td>Observations</td>
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<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.311</td>
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</tr>
</tbody>
</table>

Note: 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.
3.5 Discussion

Members and non-members reach comparable profit-levels that do not differ significantly, yet do so in different ways. Assuming similar input factors 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 input factors to which they have better access than non-members. It is only because of the exploitation of one input factor, namely selling late in the season, that profit-levels between members and non-members do not differ significantly. If non-members were not constrained by the absence of spot-market traders or the minimum delivery quantity of 50 quintals by the ECX, non-members would perform much better than members. Reversing this statement we can argue that if members of cooperatives would be able to make as efficient use of the input factors plowing and sowing, harvesting, storage, labor, location, and number of animals as non-members their profit would be much larger.

Speculating on price fluctuations is a common tactic in the agribusiness industry. We can learn from the data that speculating on price can also be highly lucrative to farmers. More interesting, however, is that only members benefit from this tactic. This is not only the result of productive outcomes of collective action, but also the consequence of the subsidization by the Ethiopian State of the ECX. An important question is why farmers fail to exploit the theoretical potential of collective action. The explanation most likely has to be found in intra-group heterogeneity and relatedly selection mechanisms for cooperative membership, similar to previous discussions such as by the World Bank (2007). The costs and benefits of heterogeneity are highly debated in collective action literature. As mentioned before, heterogeneity with respect to complementary inputs is required in order to create synergy effects, but homogeneity is required with respect to the collective goal. The current institutional fabric in Ethiopia does not allow for 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. Farmers can choose to become member of a cooperative that is a melting pot of members heterogeneous with respect to goals or choose not to become a member. As a direct consequence of the problems of collective action the efficiency with which input factors are utilized may reduce, which explains why members make less efficient use of the input factors. Another complementary explanation is that the institutional fabric creates incentives for those farmers who do know how to make efficient use of input factors not to become member. After all they know that membership may results in reduced efficiency. For most
farmers the possibility to benefit from selling late in the season may not be sufficient reason to join the cooperative. Most farmers sell (part of) their produce right or shortly after the harvest in order to repay loans with excessive interest rates. Only richer farmers who do not borrow money and have excess capital to live without selling sesame short after the harvest for a while can benefit from selling later in the season. Indeed, when we consider the number of animals as a proxy for capital, we see from the t-test that member farmers are significantly richer than non-members. The number of animals often represents the savings accounts of poor rural families who do not have bank accounts. In times of successful harvests animals can reproduce, whereas in times of bad harvests animals can be sold in order to cover daily expenditures.

The cooperative does not seem to provide instruments to increase the efficiency of the utilization of input factors by members. This could be explained by the perspective on cooperatives in Ethiopia as organizations that provide public rather than club goods. Unless contributions result in rents that can be appropriated by the members, contributions (investments) are unlikely to be made and hence growth opportunities are constrained. It should therefore not come as a big surprise that the cooperatives fail to provide instruments for efficient utilization of input factors.

3.6 Conclusion and policy implications
Collective action provides small farmers in theory the potential to benefit from jointly created and utilized input factors. Nonetheless, as the World Bank (2007) and others argue, the theoretical potential often remains unrealized in developing countries. With a rigorous quantitative study we confirmed and added depth to what the World Bank (2007: 155) wrote in the 2008 World Development Report: “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.” Similarly in the current chapter we argue that the absent possibility for farmers to join other farmers with similar goals results in collective action problems that reduces the efficiency of farmers’ utilization of input factors and creates incentives for others not to join the cooperative. Farmers are often considered to be homogeneous and hence it is often thought that any group of farmers producing a certain crop can cooperate. However, we conclude that for collective action to succeed farmers need to work together with others who have similar ambitions. We already demonstrated that the access to and utilization of input factors varies among farmers despite their homogeneity. Similarly we can argue, albeit mostly on theoretical bases, that farmers vary with respect to their
goals, their aspirations as well. Small business management literature distinguishes entrepreneurial small business owners from managerial business owners. The former are more innovative, risk-taking, and pro-active than the latter and hence are often the ones realizing high growth of new firms (Wiklund, Patzelt, and Shepherd 2009; Busenitz and Barney 1997; Chen, Greene, and Crick 1998). Similarly aspirations between farmers, as small-business owners, will differ, particularly between those who are pre-dominantly driven by necessity and those who are pre-dominantly driven by opportunity to engage in farming (Naudé 2010; Carsrud and Brännback 2011).

Policy implications
Our findings do neither make us suggest members to quit the cooperative nor non-members to become member in case benefits arising from speculating on price outweigh efficiency losses of input factors. The most important reason is that such a recommendation would not tackle the problems where they originate, namely in the perception of policy makers that farmers are homogeneous. Their heterogeneity in terms of skills, entrepreneurial intent (goals), innovativeness, risk-taking propensity, trustworthiness, et cetera, is ignored. Currently there are no opportunities for farmers who know how to utilize input factors efficiently to benefit from collective action. Available options are not attractive to them and they are prevented from creating other options. A first policy recommendation therefore is to allow free organization by farmers and support them in working together with similarly ambitious others. Success factors of collective action need to be well understood and the ostensible homogeneity of commodity producers is not a criteria for grouping them. Criteria for grouping should be based on farmer goals. Secondly a policy recommendation is to allow all farmers to benefit from speculating on price. Speculating on price is a common tactic in agribusiness, but often not done by farmers. However, as the results show, farmers can benefit highly from speculating on price. A policy recommendation therefore is to aim for inclusion of all farmers, independent of cooperative membership, in the commodity exchange. Relatedly a policy recommendation is to provide low-interest loans to farmers. Low-interest loans would reduce the necessity for farmers to sell their sesame directly or shortly after the harvest. A third policy recommendation would be to consider cooperatives as organizations delivering club goods rather than public goods. We find from the data that the cooperative does not result in any output increasing the efficient utilization of members’ input factors. To reverse this inefficiency, benefits from investments should be accrued to members rather than the wider community. This policy recommendation does not only concern the Ethiopian governmental policy makers, but policy makers of non-governmental organizations (NGOs) as well. From primary and secondary data we learned that NGOs often considered cooperatives to be vehicles for pursuing the ‘millennium-development-goals’.
NGOs invest in gender equality in cooperatives, the provision of schools and education by cooperatives, and the inclusion of the poorest of the poor, among other things. While these are all highly noble and important objectives to pursue, cooperatives are not the vehicles to realize these objectives. When NGOs use a millennium-development-goal-agenda when supporting cooperatives women may lead cooperatives in a culture that does not accept female authority, investments by members may be demotivated because profits are spent on public goods, and the inclusion of weak members may dilute profits per existing member and hence motivation. Even among scholars inclusion of the poorest of the poorest farmers in cooperatives is considered important for poverty alleviation without understanding how this all-inclusiveness may constrain entrepreneurial behavior (Bernard and Spielman 2009; Fischer and Qaim 2012). While we do not advocate against supporting the poorest of the poor, we do argue that these farmers only should become member of a cooperative which’ goals align with their individual goals. Successful cooperatives may ultimately bring the outcomes that many NGOs target directly: improved income may lead to improved sanitation, access to healthcare and education, tax payments, et cetera (cf. Van Lieshout, Went, and Kremer 2010). Tobias, Mair, and Barbosa-Leiker (2013) refer to certain processes as “transformative entrepreneuring.” To improve competitiveness cooperatives and their supporting organizations need to search for the best fit between the cooperative’s input factors, market demands, and member and group aspirations.

Further research
We suggest further research to study in greater depth how collaborative agreements between firms succeed in bundling and creating input factors in order to gain insights from best practices. We also suggest further research on the effects of the institutional environment on the performance of firms in developing countries. An important question is how firms and entrepreneurs maneuver amidst restrictive official and officious institutions in an effort to gain and sustain a competitive advantage. We furthermore suggest further research on how aid organizations can contribute to the competitiveness of farmer organizations. Studies on the effects of what is called “aid for trade” are currently in a stage of infancy (cf. Brazys 2013; Calì and Te Velde 2011; Nowak-Lehmann, Martínez-Zarzoso, Klasen, and Herzer 2009; Schulpen 2002). To date these studies focused on bilateral and multilateral aid rather than non-governmental aid. In addition, the focus has been on the effects of aid on export, but export cannot be held synonymous to competitiveness. Which market is best to target for firms from developing countries depends on the fit between the market’s demands, and the firm’s input factors, capabilities, and aspirations. In development, political economy, and economic geography research there is often a ‘market myopia’ in the sense that high-value markets in the West are considered the best markets to target for developing country firms, without understanding
whether there is a fit between what a market demands and what a firm can offer. We therefore suggest further research on this topic.