

Social capital in sub-Saharan Africa

Exploring the value of bridging structural social capital for Farmer Groups
in Kenya and Ethiopia

Radboud Universiteit



Name: Jos den Ouden
Student Number: s4085388
Study: Business Administration – Strategic Management
Address: Banier 14, 5282 GD, Boxtel, the Netherlands
E-mail: jamdenouden@outlook.com
Phone number: +316 1282 1953

Supervisor: Dr. A. Saka-Helmhout
Second reader: Dr. P. Vaessen

University: Radboud University Nijmegen
Date: February 2018

“It’s not what you know, it’s who you know”

-

Michael Woolcock and Deepa Narayan (2000)

TABLE OF CONTENTS

Abstract.....	5
Acknowledgements.....	6
List of tables.....	7
List of figures.....	8
1. Introduction.....	9
2. Review of Literature.....	15
2.1. The classical social capital concept; a variety of perspectives.....	15
2.1.1. Concept controversies; collective versus individual.....	16
2.1.2. Concept controversies; closure versus openness.....	17
2.2. Conceptualization in this research.....	19
2.2.1. Structural social capital.....	20
2.2.1.1. Network size.....	20
2.2.1.2. Network diversity.....	21
2.2.2. Bridging versus bonding social capital.....	23
2.3. Summary of research expectations.....	25
3. Methodology.....	26
3.1. General research approach.....	26
3.2. Case selection.....	26
3.2.1. Identifying the population.....	27
3.2.2. Sampling.....	27
3.2.3. Determining the data sources and collection.....	29
3.3. Data processing.....	30
3.3.1. Control variable: Farmer Group size.....	32
3.3.2. Control variable: generation type.....	32
3.3.3. Operationalization of key constructs.....	33
3.4. Quality assurance.....	34
3.4.1. Credibility, transferability, dependability, and confirmability.....	35
3.4.2. Measurement equivalence.....	38
3.5. Research and data limitations.....	38
3.5.1. Positive selection bias.....	38
3.5.2. Data on Farmer Group age.....	39
4. Results.....	40
4.1. Comparison between countries.....	40
4.2. Comparison between regions in Ethiopia.....	42

4.3. Comparison between regions in Kenya.....	44
4.4. Comparison within regions.....	46
4.4.1. Ethiopia: SNNPR.....	46
4.4.2. Ethiopia: Amhara.....	48
4.4.3. Ethiopia: Oromia.....	50
4.4.4. Kenya: Nayandarua.....	52
4.4.5. Kenya: Bomet.....	55
4.5. Outliers.....	57
5. Discussion.....	60
5.1. Theoretical implications.....	60
5.2. Managerial implications.....	62
5.3. Strengths and limitations of the research.....	63
5.4. Future research directions.....	64
5.5. Reflection and consideration.....	65
6. Conclusion.....	66
References.....	69
Appendices.....	78
Appendix A: Scott’s types of data and analysis.....	78
Appendix B: Maps of the relevant regions in Ethiopia and Kenya.....	79
Appendix C: Guba’s conceptualization of trustworthiness.....	80
Appendix D: Ego-centric networks – Ethiopia.....	81
Appendix E: Ego-centric networks – Kenya.....	88
Appendix F: Climatologic differences between Ethiopian regions.....	95
Appendix G: Geographic differences between Ethiopian regions.....	99
Appendix H: Climatologic differences between Kenyan regions.....	101

Abstract

Kenya and Ethiopia are sub-Saharan countries struggling to get by. A big part of the population endures extreme poverty, including farmers, most of whom live on less than 2\$ a day. This group is known to economists and social scientists as the Base of the Pyramid (BoP). While agriculture – more specifically the (seed) potato sector – has a high potential in these countries, for both commercial investment as well as combating malnourishment, value chain initiatives have failed to achieve the improvements that were hoped for.

Previous research (Gildemacher et al., 2009b) consisting of stakeholder workshops unveiled that the interaction between actors in the seed potato value chain was inadequate and that actors faced dysfunctional information networks, thereby hindering potato production in both Kenya and Ethiopia. Evidence from other sub-Saharan countries (Minten & Fafchamps, 1999) indicated that agricultural traders use ‘social capital’ to overcome information issues in networks. Social capital is generally understood to be goodwill and resources that are embedded within social relations.

A literature review was carried out with a focus on bridging structural social capital: the raw social structure of out-group connections a specific actor possesses. Specifically, this study focused on network size and diversity. The focal actor in this research were members of a Farmer Group; a cooperation between farmers with the purpose of benefiting its members.

This study presents a comparison between the amounts of bridging structural social capital possessed by respondents and its influence on their performance in terms of annual yield per hectare. The applied qualitative social network analysis revealed the influence of network size and diversity on performance, whilst accounting for variables such as potato generation (i.e. input quality of seed potatoes) and Farmer Group size. The analysis did not provide enough evidence to draw unequivocal conclusions, mostly due to a small sample size. However, it did show the relevance of bridging structural social capital dynamics, resulting in the provision of recommendations for upcoming agricultural value chain research at the sub-Saharan BoP.

Keywords: Social capital, social network analysis, BoP network, Base of the Pyramid, Farmer Group, bridging structural social capital, seed potato, value chain, Kenya, Ethiopia, sub-Saharan Africa.

Acknowledgements

I would first like to thank my thesis supervisor Dr. Ayse Saka-Helmhout of the Radboud University Nijmegen. She has provided excellent feedback throughout this trajectory and her critical thoughts have motivated me to deliver a high-quality end product. Her cheerfulness and sincere kindness are admirable supervisory traits which definitely deserve an acknowledgement. The next person I would like to thank is Dr. Peter Vaessen of the Radboud University Nijmegen for his valuable comments on my thesis; his role as the second reader of my thesis is one of great importance. I would also like to thank Henk Hofstede, in his role as the main data collector in the underlying survey administered by the NSM research team under the auspices of the Food and Business Knowledge Platform of the Ministry of Foreign Affairs in the Netherlands. I appreciate your passionate input and wish you the best of luck in your academic career.

Special gratitude goes to my parents; they have provided me through moral, financial and emotional support in my academic career. My little brother has assisted their patronage and I am very grateful to all three of them. I am also very grateful to my friends who have supported me along the way; ‘potatoes in Africa’, right?!

A special mention goes to Paul, who has provided me with (highly) valued/appreciated comments (i.e. feedback) on my writing, thesis in general, Oxford commas, and (unnecessary) brackets. This has greatly improved the readability of my thesis. I am confident that your PhD is just a matter of time.

And most importantly, my significant other, who has helped me in too many ways to name. I am forever grateful that I could rely on you while writing my thesis: *hvala za sve*.

LIST OF TABLES

Table 1: Operationalization of key constructs.....	33
Table 2: Country-wise comparison.....	40
Table 3: Region-wise comparison in Ethiopia.....	42
Table 4: Region-wise comparison in Kenya.....	44
Table 5: Comparison in Ethiopia – The SNNPR.....	47
Table 6: Comparison in Ethiopia – Amhara.....	48
Table 7: Comparison in Ethiopia – Oromia.....	50
Table 8: Comparison in Kenya – Nayandarua.....	52
Table 9: Comparison in Kenya – Bomet.....	55

LIST OF FIGURES

Figure 1: Research expectations.....	25
Figure 2: Guba’s naturalistic treatment of trustworthiness.....	36
Figure 3: Ego-centric network of respondent E60.....	43
Figure 4: Ego-centric network of respondent K38.....	46
Figure 5: Ego-centric networks of respondents E30 and E31.....	51
Figure 6: Ego-centric networks of respondents K37 and K44.....	54

1. Introduction

Despite innumerable efforts by a variety of authorities all over the world, poverty still holds sway in most of Africa. Around seventy percent of the world's poorest countries are located in the continent; the absolute poorest living mostly in sub-Saharan Africa. Both Kenya and Ethiopia are sub-Saharan countries struggling to get by, as indicated by the list of countries ranked on gross domestic product at purchasing power parity (GDP, PPP per capita). Out of a total of 175 countries, Kenya is found at place 141. Ethiopia ranks even lower at place 159 (World Bank, 2017). More specifically, the rural population of these countries endure extreme poverty, such as farmers, most of whom are living on less than \$2 per day – commonly known as the Base of the Pyramid (BoP, as defined first by Prahalad & Hammond and Prahalad & Hart, both in 2002). Agriculture is an extremely important sector in these countries. As of 2016, the value added as a percentage of GDP by the agricultural sector is 36% in Kenya and 37% in Ethiopia (World Bank, 2016).

In sub-Saharan Africa, potatoes are the fastest expanding food crop. The potato is the second most important food crop in Kenya nowadays, just behind maize.¹ Ethiopia has possibly the highest potential for potato production of all countries in Africa due to its high percentage of arable land in the highlands.² The above facts suggest that the (seed) potato value chain has substantial prospects for both commercial investment as well as combating the poverty and malnourishment in sub-Saharan Africa.

Despite its bright prospect, numerous seed potato value chain initiatives and donor assistance in both Ethiopia and Kenya over the past decade have failed to achieve the desired improvements, which subsequently has led to a research interest in evaluating the seed potato value chain.³

¹ As indicated by The National Potato Council of Kenya (NPCK) at <https://npck.org/>. The Centre for Development Innovation at the Wageningen University endorses this statement in their Introductory Note of Phase II of the public-private support project with regard to Seed Potato Development in Kenya (Wageningen UR, 2013).

² As indicated by the CIP (International Potato Center; CIP 2009). An estimated 70% of the country's arable land is potentially suitable to potato cultivation (Yilma, 1989). At the same time, the highland areas of Ethiopia suit the potato general well, which is 44% of the nation's area.

³ E.g. Hoeffler, 2006; Janssens et al., 2013; Ketema et al., 2015.

Previous research on the seed potato value chain in sub-Saharan Africa exists: Gildemacher et al. (2009c) identified via participatory analysis that numerous constraints exist between value chain stakeholders in both Kenya and Ethiopia with regard to potato production and marketing. They have ranked these constraints in terms of their gravity. The results suggest that the lack of contacts and the limited interaction between parties in the value chain are among the most important constraints experienced by stakeholders. These constraints revolve mostly around market and product information and knowledge. Stakeholders indicate that mutual linkages between many of them are weak which hampers the flow of information and development of knowledge.

Knowledge development and information exchange are vital preconditions for these countries to get ahead instead of getting by. Stakeholder workshops in Kenya and Ethiopia unveiled that the interaction between actors with regard to potato information is inadequate and deemed a key area for improvement (Gildemacher et al., 2009b). Their research suggests that currently the most important sources of information are personal experience and the farmer communities (Gildemacher et al., 2009b, pp. 193 and 194, tables 9 and 11). This suggests that the current so-called information network – with the above-mentioned stakeholders as its members – in the sub-Saharan seed potato value chain is not functioning optimally. As mentioned, this information issue appears to hinder the potato production in both Kenya and Ethiopia. This has resulted in research interest in identifying the extent to which these information networks are effective in enabling access to an affordable yield. Until now, this has been unclear.

Evidence collected by Minten & Fafchamps (1999) from Madagascar – another sub-Saharan African country – proves that agricultural traders use ‘social capital’ to overcome transaction costs through a reduction in information costs. In fact, social capital is so important in these countries, that it is often named the ‘capital of the poor’. The concept is rarely used as an input factor in modeling economic processes, even though it has clear benefits that are economically relevant: one can imagine that information and knowledge development, which are resources (or benefits) in the definition of social capital, aid in overcoming transactions costs.

As the before mentioned workshops indicated that information is valued highly in these countries, it is interesting to investigate to what extent social capital results in higher yields.

Over the past decades, numerous definitions and conceptualizations of social capital have emerged. It is roughly understood as the goodwill that is embedded in social relations and that can be mobilized by a person or group (Adler & Kwon, 2002). More specifically, the concept is associated with resources embedded within, available through and derived from a social structure (network); including information and knowledge development (e.g. Nahapiet & Ghoshal, 1998; Coleman, 1998; Burt, 1997, 2000; Bourdieu, 1980; Adler & Kwon, 2002; Portes, 1998).

The focal target of this research is the Farmer Group/Cooperative.⁴ In general, all agricultural cooperatives – like Farmer Groups and Cooperatives – can be defined as cooperations with the purpose of benefiting its members via one way or another, for example by increasing their production, improving their network connections, and increasing their bargaining power. This research focuses on ‘official’ Farmer Groups with a legal name and a year of establishment.

Existing literature suggests that the amount of social capital a group possesses is directly related to the amount of information (resources) one has access to (Woolcock & Narayan, 2000). This research focuses on ‘structural’ social capital; one of three different components of social capital that have been distinguished in previous literature that this research builds upon. It revolves around the raw social structure of connections an actor possesses. The other two components of social capital are relational social capital and cognitive social capital (Nahapiet & Ghoshal, 1998; Ansari, Munir & Gregg, 2012; Inkpen & Tsang, 2005). Relational social capital focuses on the quality of ties within a social structure, while cognitive social capital focuses on shared meaning systems and culture. These three components are interrelated and should all be present (to some degree) in order to enable the exchange of knowledge and information.

As mentioned, this research will focus solely on structural social capital. Nahapiet and Ghoshal distinguish between three subcategories within structural social capital: network ties, network configuration, and appropriable organization.

⁴ Farmer Group was the most used term in Kenya, whilst Farmer Cooperative was the most used term in Ethiopia. From this point on, the term Farmer Group or its abbreviation FG will be used. This is done to improve readability and avoid confusion by using the two interchangeable terms.

Only the first two subcategories will be discussed since they contain the factors that are empirically tested in this research: network size and network diversity.

Furthermore, the above differences in 'getting by' and 'getting ahead' relate to the distinction between an in-group form of 'bonding' social capital and an out-group form of 'bridging' social capital. This distinction was recognized by Woolcock & Narayan (2000) and is sometimes referred to as horizontal versus vertical social capital; this was later applied to BoP networks (Ansari, Munir & Gregg, 2012). These two forms of social capital are not mutually exclusive and different combinations of both are responsible for different outcomes that can be attributed to social capital (Woolcock & Narayan, 2000).

In spite of the theoretic advances made with regard to networks and social capital in BoP countries, there is a lack of empiric evidence. Both Rivera-Santos and Rufín (2010) as well as Ansari, Munir and Gregg (2012) propose several theoretical hypotheses with regard to the structure of networks and social capital, but these have not yet been tested. The latter address in their research agenda that much remains to be examined at the BoP. More specifically, they address the need for network analysis and large-scale questionnaires in order to provide insights into the breadth and density of structural social capital at the BoP. They claim that "*structural social capital facilitates conditions of accessibility to various parties for exchanging and transferring knowledge*" (Ansari, Munir & Gregg, 2012, p. 823). As pointed out above, there is a poignant shortcoming of information and a disturbed flow of knowledge, which hampers the BoP farmer community in their quest to affordable quality yields. Therefore, this research aims to gain empirical insights into the impact of bridging structural social capital. In order to achieve this research objective, the following central research question is composed:

'Does bridging structural social capital of Farmer Group members active in the seed potato value chain have a positive effect on access to affordable quality yields in sub-Saharan Africa, specifically in Kenya and Ethiopia?'

To answer this research question, multiple subjects need further examination and clarification.

First of all, a thorough understanding of the social capital concept is essential, including its components and its evolution over time. This will be achieved by conducting an exhaustive literature review. Out of the theoretical components, a selection was made which will be focused on in this research. At the same time the literature review provides control variables which will be assessed and accounted for.

With this theoretical substantiation, a social network analysis will be applied to map ego-centric networks of Farmer Group members active in the seed potato value chain. This qualitative research builds upon archival data, coming from a secondary database, which has been collected via surveys and interviews conducted in both Kenya and Ethiopia. The surveys were conducted among various authorities. Most of them were conducted among the focal target of this research, the Farmer Groups. Nevertheless, county governments, sub-county governments, seed potato multipliers, small-scale producers, Ministries, non-governmental organizations (NGOs), and other institutions were interviewed as well. This was done to assure a complete image of all the actors in the seed potato value chain. In both Kenya and Ethiopia surveys have been conducted in four counties/regions. In Kenya, these were conducted in the Meru, Nyandarua, Bomet and Nairobi county. In Ethiopia, surveys were conducted in the Amhara, Oromia, SNNPR and Addis Ababa region.⁵

The above results in an opportunity to provide new insights by bringing social capital theory and practice together. This is done by empirically testing the existing theory on social capital – specified to the BoP – in a sub-Saharan agricultural value chain. This research aims to explore the current theoretic framework in practice, while gaining knowledge that is needed prior to conducting quantitative research at a larger scale in these regions.

This research starts off with an in-depth literature review of the classical conceptualization in chapter two. This leads to theoretical research expectations that will be empirically tested. This will be done by means of qualitative ego-centric social network analysis; the method itself and the choice for this design will be explained and justified in the third chapter. The fourth chapter will highlight the results of this research; the analysis and its findings will be systematically reported.

⁵ SNNPR stands for Southern Nations, Nationalities, and Peoples' Region, one of the largest regions in Ethiopia.

The first four chapters add to the discussion section in chapter five, where theoretical implications and recommendations for managerial use will be discussed. This chapter will also contain research limitations and suggestions for future research. The sixth chapter will contain the final conclusion.

2. Review of Literature

In this literature review the key concept (social capital) and its conceptual elements will be further introduced and explicated to provide an adequate scientific framework in order to substantiate the findings in this research.

Considering social capital to be associated with resources embedded within, available through and derived from a social structure, successful and affordable quality yields in Kenya and Ethiopia might be positively influenced by the extent to which members of Farmer Groups are involved in agricultural networks and possess said social capital. This influence will be measured by comparing the amount of bridging structural social capital that members from different Farmer Groups have to their performance (i.e. their average annual yield per hectare). Therefore, a thorough understanding of the various conceptualizations is needed, as well as breaking apart the various components social capital consists of. This understanding is needed in order to establish a sense-making explanation of the relation between the value of bridging structural social capital and the performance of Farmer Group members.

The fact that social capital has been somewhat divergently conceptualized over the past three decades is a challenge that will be dealt with in this chapter. The 'classical' perspective and its controversies will be discussed first. Accompanying this classic perspective is the view on social capital and its components that are used in this research. The perspective used in this research will be based on Nahapiet and Ghoshal's (1998) threefold division. The focus will be on the structural dimension of social capital. Finally, research expectations that will be empirically tested are introduced in this chapter.

2.1. The classical social capital concept; a variety of perspectives

Since Bourdieu's works, dating back to the late 1970s, the social capital concept has bloomed. The concept emerged in social science as one of the hardest to grasp and therefore difficult to accurately describe. Bourdieu defined social capital as "*the sum of the resources, actual or virtual, that accrue to an individual or group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintance and recognition*" (Bourdieu & Wacquant 1992, p. 119, which is expanded from Bourdieu, 1980).

Following Bourdieu, numerous other authors have established definitions and conceptual variables regarding social capital: James Coleman, Ronald Burt, Alejandro Portes, Paul Adler and Seok-Woo Kwon are some exemplary authors that have introduced influential and interesting insights on how social capital should (or can) be defined (Coleman, 1988; Burt, 2001; Portes, 1998; Adler & Kwon, 2002). These insights sometimes appear inconsistent or contradicting. One should question themselves which theory or variables suit(s) best when looking to conceptualize social capital in their research.

Instead of immediately turning to the final conceptual variables that were used in this research to define and measure social capital, the most important controversies and confusions between the different underlying theories are discussed. Lin (1999, 2002) identified two major controversies, which will be assessed below.

2.1.1. Concept controversies; collective versus individual

The first controversy that is often put forward is about ‘ownership’ of social capital. To be specific, whether the accumulated capital is an asset for an individual by itself, or if it has a collective benefit for the entire group. This is merely a theoretic discussion with regard to the unit of analysis rather than the two being opposing views. In this research Farmer Groups are the focal target; the benefits they accrue from social capital (e.g. being better connected to input and market information) are a collective asset. Nevertheless, the different perspectives are clarified below to provide a complete understanding of this contraposition.

Some of the previously mentioned authors view social capital as capital beneficial (mostly) to the individual; individuals use their ‘sum of accrued resources by means of relationships and networks’ (paraphrased after Bourdieu) for their own benefit and gain.

To name a few: Flap (2002) proposes to treat social networks as a sort of capital ‘that is instrumental in reaching general goals’. Burt (2002) stresses the individual advantage of being a ‘broker’ in a specific network, by possessing ‘control’ over opportunities and information. Lin (1999) refers to individuals engaging in interactions in order to produce profits for themselves.

On the other hand, there are authors that have acknowledged the benefits for the individual and the 'ego centered' approach, but these authors have also discussed a more central form of social capital. This collective form of capital is shared by and contributed to by all group members. Its functioning is closely related to the 'closure' of a network, which is the controversy that will be dealt with in the next paragraph.

For example, Putnam's work (2001) does not 'include' altruism as a part of the definition of social capital, but stresses the power of social connectedness as an important predictor of "doing good for other people" (altruism: a collective thought). Coleman (1988) speaks of elements that resemble Bourdieu's earlier line of reasoning with regard to recognizing the collective fraction of social capital. He talks about relations within a certain social structure; these relations are subjected to obligations and expectations to said 'group' structure. These obligations and expectations can be seen as norms, which can be effectuated by means of sanctions. According to Coleman: *"A prescriptive norm within a collectivity that constitutes an especially important form of social capital is the norm that one should forgo self-interest and act in the interests of the collectivity. A norm of this sort, reinforced by social support, status, honor and other rewards, is the social capital that [...] in general leads persons to work for the public good"* (Coleman 1988, pp. 103-104).

Despite the difference in unit of analysis, most authors agree upon the fact that social capital is about interaction between members in a certain social structure which results in resources beneficial to the collective and to individuals within that collective (e.g. Adler & Kwon, 2002; Nahapiet & Ghoshal, 1998; Portes, 1998).

2.1.2. Concept controversies; closure versus openness

The second controversy is about the degree of 'closure' of a certain group, and about the 'density' within this group (Coleman, 1988; Lin, 1999). How a network is configured relates to the amount and quality of the accrued social capital.

Some of the authors mentioned earlier in this chapter advocate a closed network structure because they view network closure as a distinctive advantage for social capital. They propose that a closed network improves trustworthiness and promotes group solidarity; therefore, it aids in maintaining and preserving group resources.

Others prefer an open (or sparse) network; they emphasize the importance of individual mobility and see possibilities in 'weak ties' (e.g. Burt, 2001; Granovetter, 1993). They suggest that closed networks lead to tunnel vision and impede the access to non-redundant information.

Starting with the authors that speak of closure and its advantages. As defined by Portes: *"Closure means the existence of sufficient ties between a certain number of people to guarantee the observance of norms"* (Portes, 1998, p. 6). Portes mentions that both Bourdieu and Coleman follow a similar line; closure enhances trust, density and group solidarity (according to Coleman because of norms, sanctions and authority; Coleman 1988. Additionally, Bourdieu, 1980; Portes, 1998). Putnam (1995) acknowledges that density among members increases trust. When a network has a high degree of closure and density, its members are closely intertwined and proponents of a closed network configuration deem these aspects important in order to preserve and 'protect' group resources.

On the contrary, Burt's work is exemplary in stressing the importance of the total opposite of these 'sufficient ties'. His structural hole theory discusses the weaker connections which create a competitive advantage for an individual who can 'bridge' these gaps (Burt, 2001). According to Burt (2001), closed networks contain more redundant information than their open counterpart, and network constraint (which measures the extent to which a person's contacts are redundant, therefore relating to network density and closure) is negatively related to certain performance indicators. His theory builds upon the strength of weak ties as proposed by Granovetter (1973, revisited in 1983). Burt's firm conclusion leaves little room for misinterpretation: *"Closed networks – more specifically, networks of densely interconnected contacts – are systematically associated with substandard performance. For individuals and groups, networks that span structural holes are associated with creativity and innovation, positive evaluations, early promotion, high compensation and profits"* (Burt 2001, p. 45).

Lin summarizes these perspectives and concludes that he does not believe that network density or closure is required for the utility of social capital; this would *"deny the significance of bridges, structural holes, or weaker ties"* (Lin 1999, p. 34).

He proposes an expedient point of view: when the goal is preserving or maintaining resources, a closed network is the better option. When searching for and obtaining resources not currently possessed, an open network suits better than its closed counterpart (Lin, 1999). Adler and Kwon (2002) endorse this statement: both closed and sparse networks can yield benefits; it depends on the task and goal of the actor.

Instead of choosing one over another, one should assert which network properties might generate better returns in a given situation.

2.2. Conceptualization in this research

In this research social capital will be conceptualized along the line of Nahapiet and Ghoshal (1998), among other authors that have followed their conceptualization. They define social capital as *“the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit”* (Nahapiet & Ghoshal 1998, p. 243). Said definition is in line with definitions other authors have established and it contains all ‘mandatory’ aspects agreed upon. It includes both the social structure and the resources that can be derived from it.

They have introduced three dimensions (or clusters) of social capital: a *structural*, *relational* and *cognitive* aspect. These dimensions are highly interrelated yet simultaneously clearly distinguishable. Relational social capital focuses on the quality and type of bonds one has. This has to do with trust, norms and social motives; aspects that motivate other people to help. For example, the mere ability to exchange information does not directly mean one has the willingness to exchange information. Cognitive social capital focuses on resources that provide a shared system of meaning. This cognitive dimension of social capital contains shared culture, goals, or even shared understandings which evolve over time.

The structural dimension includes the network configuration mentioned earlier; it contains the ‘hard infrastructure’ of one’s network. It is less about motivation or ability and more about opportunity. The structural aspect of social capital is determined by the pattern of linkages (or ties) one has: measured, for example, by amount, density, diversity and connectivity. Although all three of the above dimensions need to be present to a certain degree in order to promote the exchange of knowledge and information, this research will focus on the structural aspect of social capital.

On a side note: Adler and Kwon (2002) have also distinguished three dimensions of social capital in their article about a new social capital concept. Their dimensions are named opportunity, motivation and ability. Despite the differences in names (they deem it a 'folk' schema), the content of these three dimensions is similar to the categories of Nahapiet and Ghoshal. The theoretical content and indicators of motivation and ability introduced by them are in line with the content of the relational and cognitive dimension discussed earlier. Furthermore, Adler and Kwon's opportunity dimension contains components similar to Nahapiet and Ghoshal's structural social capital dimension. Therefore, the work of Adler and Kwon will be incorporated in the theoretical framework of this research.

2.2.1. Structural social capital

The structural aspect of social capital facilitates the opportunity to exchange knowledge or information with various parties. It can be considered as the raw social structure an actor has at his disposal with regard to information and knowledge. 'Who' you know precedes the relational and cognitive aspects of social capital; the structural dimension therefore functions as a foundation of social capital. Ansari, Munir and Gregg (2012) argue that merely structural social capital is not enough to develop bridging social capital in order to get ahead. All three aspects have to be nurtured and developed in order to get ahead. However, having structural social capital is considered a good starting point.

Nahapiet and Ghoshal (1998) have made a subdivision between three categories of structural social capital: network ties, network configuration and appropriable organization. These categories are all interrelated. As mentioned in the introduction, only the first two categories are relevant with regard to this research. The network ties category contains the 'network size' variable, an indicator of the number of ties one possesses. The network configuration category contains the 'network diversity' variable. These two variables will be discussed below, as they are the ones that are focused on in this research.

2.2.1.2. Network size

A social structure is built upon network ties, which in turn enable access to resources: "*An actor's network of social ties creates opportunities for social capital transactions*" (Adler & Kwon 2002, p. 24). Thus, it is valuable to possess a network of social relations.

In general, the larger a social network of which one is a part of, the more network ties one has. Being connected to and maintaining a relationship with more people increases the odds that one of them has the resource you need (Burt, 1983). Flap (2002) endorses this statement by stressing the importance of size with regard to the opportunity to meet and entertain ties. Burt (1992) has introduced 'effective' network size: the number of alters that an ego is directly connected to, weighted by strength of tie, minus a 'redundancy' factor (Borgatti, Jones & Everett, 1998). The fact that all of these authors stress the importance of network size with regard to structural social capital leads to the first research expectation: *"Members of a seed potato Farmer Group in sub-Saharan Africa, more specifically Ethiopia and Kenya, benefit from having a large network since it leads to more yield per hectare"*. The above expectation implicitly assumes that social relations serve as information channels which reduce the amount of time and investment needed to gather information. According to Coleman (1988), information provides a basis for action but is rather costly to gather. Structural social capital – in this case, a large(r) network – facilitates broad access to relevant (diverse and non-redundant), timely (the earlier the better) and trustworthy (reliable) information, which is an important benefit for networks and their members. Therefore, despite not being included in the research expectations, access to information is implicitly assumed to link social capital and performance. This implicit assumption applies to the expectation below, with regard to network diversity, too.

2.2.1.2. Network diversity

Complementing tie quantity is a network's diversity: an important aspect of structural social capital which is associated with network flexibility and the ease of information exchange.

Network diversity is one of the facets of structural social capital – along with network closure, density, connectivity and hierarchy – which influence the range of information that one has access to (Nahapiet & Ghoshal, 1998).

Network density is closely related to closure: density is the degree of closeness between members within a network, while the degree of closure describes the accessibility of a certain network. Earlier in this chapter, the differences between these network characteristics were touched upon. Also, the contraposition between proponents of a closed (Coleman) and open (Burt) network has been assessed above and will only be briefly discussed after the second research expectation.

Density is related to connectivity: information within a dense and closed group is most likely to be redundant information. This implies that being connected to everybody is unnecessarily time-consuming and costly. Therefore, *diversity* of contacts is an important facet. Burt addresses cohesion and equivalence (which are related to diversity): cohesive contacts within said group probably possess the same information. Contacts that link the individual to the same third parties are structurally equivalent which results in redundant information as well.⁶ The benefits of a sparse network configuration (being loosely connected to multiple networks via weak ties; i.e. diversity) are found in the variety of information it holds and the lower cost of accessing it. These so-called structural holes tend to separate groups, therefore separating information flows, resulting in non-redundant sources of information for the broker between those groups. As mentioned, the research expectation is based on the assumption that access to (non-redundant) information is one of the factors that links social capital to performance.

Bridging structural holes in a sparse network can result in a cost-efficient way to access relevant, non-redundant information in a timely fashion (Burt, inter alia, 1997, 2000). This is the result of a wider and more diverse network of relationships, which leads to the second research expectation: *“Members of a seed potato Farmer Group in sub-Saharan Africa, more specifically Ethiopia and Kenya, benefit from having a more diverse network since it leads to more yield per hectare”*.

As mentioned, this expectation is based on the assumption that network diversity grants (better) access to more diverse sources of information, which links social capital to performance. However, according to Ahuja (2000), structural holes between partners serve contradictory roles: while they expand the range and diversity of information, they also increase exposure to potential malfeasance. Others, like Nahapiet and Ghoshal, endorse Burt’s statement by arguing that (structural) social capital increases efficiency through non-redundancy. Furthermore, they suggest that high levels of trust diminish the probability of opportunism and reduces the need for costly monitoring processes.

Adler and Kwon (2002) refer to this apparent contradiction as a task contingency, *“clarifying the tension between Coleman’s thesis that the closure of a social network is the key source of social capital and Burt’s theory that favors sparse networks with many structural holes*.

⁶ I refer to Burt’s 2001 work for a detailed explanation on control and brokerage advantages, pp. 35-36.

Coleman's analysis highlights solidarity benefits, whereas Burt's focuses on information and power benefits, and depending on which benefit is more important in a given situation, one or the other network configuration will be more desirable" (Adler & Kwon 2002, p. 33).

Nevertheless, as this research implicitly assumes information to be one of the links from social capital to performance, network diversity is expected to be beneficial for said members of seed potato Farmer Groups.

2.2.2. Bridging versus bonding social capital

As mentioned earlier, not everybody has access to the same ties. Therefore, not everybody has an equal amount and quality of structural social capital. Different communities possess access to more or less (dimensions of) social capital. This results in another theoretical division between two forms: bridging and bonding social capital.⁷ This distinction between bridging and bonding social capital is associated with the works of Burt and Granovetter with regard to the strength of ties and the closeness (and density) of a network. Woolcock and Narayan (2000) indicate that different combinations of bonding and bridging social capital result in different outcomes, with the optimal combination changing over time.

Bonding social capital refers to the in-group: there is a focus on internal ties within communities. It stems from strong core ties: high in trust, closure and shared norms (Ansari, Munir & Gregg, 2012). On the other hand, bridging social capital refers to external relations: relations that 'bridge' between the in-group and the out-group. Related to Burt's structural hole theory, this is the social capital found in weaker peripheral ties that are often high in non-redundant information. In the networks view, as described by Woolcock and Narayan (2000), the importance of both associations is stressed. That both are needed is demonstrated by a commonly used example, namely the poor: *"they often lack the more diffuse and extensive intergroup relations – bridging social capital – deployed to 'get ahead' "* (Ansari, Munir & Gregg 2012, p. 821). The poor often only possess bonding social capital: a close-knit community network with a high degree of cohesion. The non-poor 'get ahead' by combining their strong intracommunity and their weak intercommunity ties. Cross-cutting ties (bridging social capital) open up economic opportunities to the people that do not belong to powerful or precluded groups (Narayan, 1999).

⁷ Sometimes called vertical and horizontal, or internal and external social capital.

As opposed to the strong core ties that bonding social capital embodies, these intercommunity ties do not have to be strong; they have to be somewhat dense and simply present in order to access them.

The above leads to a challenge for poor communities: to identify the conditions under which the positive characteristics of bonding social capital can be retained, while at the same time aiding the poor to get access to a more diverse array in terms of bridging social capital.

Combining bridging and bonding social capital in poor communities is a frail balancing act which entails multiple dilemmas – especially for external NGOs, development agencies and others – since it might entail modifying social systems that have existed for generations in longstanding cultures (Woolcock & Narayan, 2000).

This research focuses on the bridging form of structural social capital only, since cross-cutting ties are the ones that potentially enable the poor to get ahead. Ties to in-group members will not be investigated nor analyzed.

2.3. Summary of research expectations

This paragraph reiterates what has been laid out above. The consideration of structural social capital in recent literature has led to some theoretical conclusions. The investigated literature suggests that bridging structural social capital results in a better performance, as indicated by the yield per hectare. As mentioned, this research focuses on two aspects of structural social capital: network size and network diversity. As stakeholder workshops in Kenya and Ethiopia indicated that information plays a major role in their quest to get ahead instead of getting by, one can expect that individuals who have better access to information than others to have an advantage. Thus, this research will implicitly assume that information plays an important role in the link between social capital and performance. This culminates in the two mentioned research expectations, which are depicted in the following visualization:

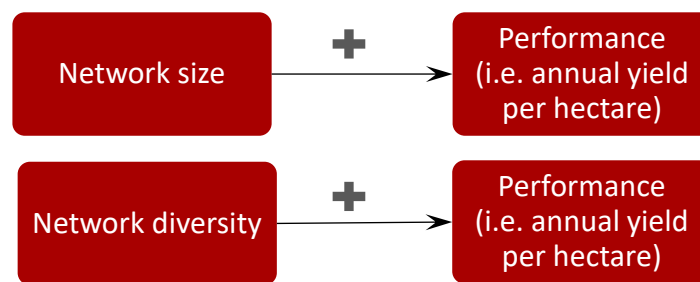


Figure 1. Research expectations.

The operationalization of the constructs in the above figure will be assessed in chapter three.

3. Methodology

The method applied in this research will be explicated and justified in this chapter. The research approach will be assessed in detail, discussing case selection, population identification and sampling, as well as data sources and data collection. This research will be critically judging the trustworthiness of the underlying data, as well as reviewing attempts that were made to increase the value of methodological cornerstones as credibility and transferability. This chapter concludes by stating encountered research and data limitations.

3.1. General research approach

By nature, the BoP field is hard to reach when aiming to conduct empirical research. Despite its increasing popularity among researchers over the past decade, the environment is still characterized by ‘digital remoteness’ – and many other institutional voids – which makes it both difficult and expensive to conduct survey research.⁸ Nevertheless, previous survey research has been conducted in sub-Saharan Africa. Gildemacher et al. (2009a, 2009b) have successfully conducted surveys in Ethiopia, Kenya and Uganda while Fafchamps and Minten (1999) have successfully conducted surveys in Madagascar, thereby demonstrating the possibility of successful research at the BoP.

The literature review in chapter two has laid the foundation for an explorative research approach. The stated research expectations will be empirically tested. This empirical data will come from a secondary database, used as primary data in this research: a survey conducted among members from Farmer Groups in multiple regions across Ethiopia and Kenya. This research aims to gain the necessary knowledge prior to conducting quantitative research at a larger scale in these regions.

3.2. Case selection

In any empirical network research, decisions have to be made with regard to what is considered the relevant population, and which decisions lead to a specific sample of that population being surveyed. These decisions will be assessed below.

⁸ Only a small and select percentage of people has access to the Internet in both Kenya (26%) and Ethiopia (15%), based on 2016 World Bank Data. In all probability, the rural poor probably do not belong to this select group.

3.2.1. Identifying the population

According to Scott (2000), Wasserman and Faust (1994), one of the few distinct problems that arises when working with relational data is the selection of cases. These selection problems are related to boundedness; one has to identify the boundary of the population one wants to investigate. Marsden (2005) endorses this difficulty, although mentioning that it depends on the set of objects. A theoretically informed decision has to be made with regard to what is significant for the research project, instead of identifying the ‘natural’ boundaries of a social network.

“Where does a researcher set the limits when collecting data on social relations that, in reality, may have no obvious limits?” (Knoke & Yang, 2008, p. 15).

When ego-centric network research is conducted – assuming it to be part of a representative sample survey, as discussed below – boundary specification goes hand in hand with the definition of the target population for the surveys. A research population can be defined as a large collection of individuals/objects that are the main focus for a scientific research; this population consists of individuals or subjects that all have similar characteristics and common traits. This research focuses on Farmer Groups in Ethiopia and Kenya: therefore, the population is all Farmer Groups in both countries.

3.2.2. Sampling

Sampling poses a distinct problem as well when analyzing networks. Simply put, a sample is a subset of the population, demanded by the practical inability to survey all existing Farmer Groups in both countries. Scott (2000) recognizes that the general rules of sampling, based on probability and well-established mathematical rules, do not apply when investigating relational data.

This research focuses on ego-centric networks. Furthermore, these networks are limited to a one-step neighborhood. Every ego from the sample has a network with the same demarcation. This leads to measuring the ‘Total Personal Network’ of an ego; defined as all the (relevant) alters known to ego (Knoke & Yang, 2008, p. 27). Sampling different Farmer Groups and mapping every FGs ‘personal network’ enables comparison between the measured amounts of social capital (based on the social capital indicators used in this research) that each Farmer Group possesses and their respective yields.

As mentioned in the earlier chapters, only out-group nodes are considered relevant in this research when mapping ego-centric networks.

Purposive sampling has been used; participants in the surveys were deliberately chosen due to certain qualities they possessed. These participants have worked with local partners in the past and they were located in regions that were known for relatively high seed potato production. More specifically, homogeneous sampling was used: the selected individuals were egos that had similar traits and characteristics. Only seed potato farmers that worked with quality seed and belonged to a small seed potato Farmer Group were selected. The underlying survey was conducted at 28 Farmer Groups, evenly divided between the two countries. These surveys were conducted in three different regions in both countries. In Ethiopia, four participants were active in the SNNPR region and five participants were active in each of the Amhara and Oromia regions. In Kenya, two participants were active in the Meru region, seven participants in the Nayandarua region and five in the Bomet region.

According to Etikan, Musa and Alkassim (2015) purposive sampling is a nonrandom technique that does not require a set number of participants. The underlying research surveyed a ‘hard-to-find population’ – a term mentioned by Bernard (2011) – which almost creates reliance on purposive sampling, with no minimum requirement of participants. Therefore, sampling size will not be discussed in this research.

Purposive sampling holds some dangers: the most relevant potential sampling and non-sampling errors in this research include selection bias and measurement error. Selection bias is obviously accepted when sampling purposively; it is implied in the method that the researcher picks certain respondents. However, the underlying research suffered from positive selection bias, which will be discussed at the data limitations paragraph.

Measurement error is related to measurement equivalence; it will be discussed in the quality assurance paragraph.

3.2.3. Determining the data sources and collection

The primary data for this research came from a secondary database, namely the survey administered by the NSM research team under the auspices of the Food and Business Knowledge Platform of the Ministry of Foreign Affairs in the Netherlands.

This survey was used to acquire relevant data on size and diversity of the ego networks of farmers belonging to Farmer Groups in Kenya and Ethiopia, as well as data on the relevant control and yield variables.⁹ With regard to the independent variables in this research: one item asked the respondents if, and if so, with whom they had engaged (or maintain relations), with the aim of receiving/providing information and/or services about seed potatoes during the three years from 2014 to 2016. This could include (but was not limited to) training of farming practices, financial credits or the promotion of seed potatoes. This was a pre-coded question: they were presented with a list, based on prior desk research, containing government organizations, seed potato and trade companies, processors, credit organizations, research and education organizations, input suppliers, and NGOs. In case the pre-coded question was not exhaustive, blank space was included, which enabled them to list other organizations with whom they maintained relations. The above instrument is called a name generator (Marsden, 2011), as it generates a roster of alters (names) within a respondent's ego-centric network.

Furthermore, with regard to the dependent variable in this research, the survey asked respondents to provide their annual seed potato yield – while controlling for the amount of land they used for the production of said seed potatoes – during the three years from 2014 to 2016. Lastly, with regard to control variables, respondents were asked about the generation type of the seed potatoes they used and the size of the Farmer Group they were a member of.

The used method to acquire this data in the underlying research was a hardcopy pen and paper survey. According to Rudestam and Newton (2014) two aspects need to be considered when determining the method of data collection: fidelity and structure. Open interviews, for example, have little structure and a mediocre amount of fidelity; the latter is hugely increased by recording the interview properly. The hardcopy paper and pen survey has a high amount of structure and a high amount of fidelity. Hollstein (2011) refers to the focus of the research: when the research is concerned with actual existing relations – as this research is – accurate knowledge is arguably important. The high fidelity and structure generated by a hardcopy paper and pen survey provided this accurate knowledge.

⁹ Data from this survey will be treated confidentially and subject anonymity is guaranteed. Informed consent was established prior to conducting the survey.

Also, pragmatic considerations, usually revolving around funding and time, obviously impact the data collection. The underlying sample is preferably as high as possible, but at the same time, conducting more surveys increased research costs. Even more so since this research surveyed a hard-to-find population. Considerations with regard to sample size and cost efficiency were therefore made.

3.3. Data processing

By using data from the underlying survey on Farmer Groups in Kenya and Ethiopia this research intends to investigate whether the possession of more bridging structural social capital by a focal unit influences their yield. A frequently used method for analyzing networks is the social network analysis (SNA). Scott (2000) linked styles of research and the source of evidence to types of data and types of analysis. When a survey research is conducted, using questionnaires or interviews – the type of data being relational – one should conduct a network analysis.¹⁰

One central objective of network analysis that Knoke and Yang (2008) distinguish is to measure and represent structural relations accurately and to assess what their consequences are. Social network analysis is important as relations are often more important in understanding behavior than attributes like gender or age. The analysis reveals how contacts and interactions give access to, for example, better information, greater awareness of their surroundings and higher susceptibility to external factors. Moreover, structural relations are a dynamic process, rather than a rigid statistic, which is why one ideally analyzes these continuously transforming networks more often over a certain period of time.

In some cases, it is not desirable to analyze the whole structure of a network. When one has the intention to examine social networks from the perspective of a single focal actor, as this research intends to, the ego-centric network analysis (ENA) is the better choice. It helps in understanding complicated networks by visualizing how they arise from the local connections of individual actors (Hanneman & Riddle, 2005). Ego-centric networks are an example of a set of actors that is relatively bounded as mentioned by Wasserman and Faust (Wasserman & Faust, 1994, p. 31).

¹⁰ Referring to figure 1.1 of Scott's Social Network Analysis handbook, p. 3. The figure is enclosed in Appendix A.

A 'one-step neighborhood' selection is applied: the network consists of ego (the focal actor) and all nodes to whom ego has a direct connection (Scott & Carrington, 2011, p. 357). Therefore, one still has a semi-holistic approach, despite an idiographic inside-out way of investigating. More specifically, only out-group nodes are taken into account, since this research focuses on bridging social capital. Visualization of individual ego-centric networks are often very helpful. Therefore, visual displays of all ego-centric networks have been created.¹¹

These ego networks are analyzed based solely on size and diversity, therefore no 'hard boundary' with regard to tie quality or strength has to be established. This research includes all actors who have reciprocal ties with ego – the so-called reciprocal neighborhood according to Hanneman and Riddle (2011). This decision is based on the use of the term 'engagement' with other organizations in the underlying survey, which implies that parties are mutually involved with each other. Also, for information to be transferred, a two-way interaction is needed.

In this research, a qualitative network analysis is conducted, instead of the 'usual' quantitative version. Schepis (2011) endorses Easton (1995) in his statement that a qualitative network analysis has the ability to handle the complex and dynamic nature of networks. It allows for a richer analysis and a greater understanding as network information is not typically explicit. A top-down analysis of the results will be conducted, narrowing down to comparisons between and within regions. This is done to facilitate a clean drawing of inferences. Qualitative ego-centric network analysis enables the researcher to do so when working with a limited sample size. The mentioned control variables can be properly taken into account. Moderating variables cannot be tested as this research deploys a qualitative approach. However, explanatory conditions can be taken into account when assessing the results; for example, the climatological and geographical context. The underlying survey has (incomplete) data on the amount of fertilizer used as well; whenever available it can be used as explanatory variable.

¹¹ All visualizations can be found in Appendices D and E.

All of these explanatory conditions are potentially relevant as surveys were conducted in different regions across Kenya and Ethiopia and these will most likely not be constant factors. Although these explanatory conditions are acknowledged, their exact impact is unknown as this is beyond the scope of this research.

3.3.1. Control variable: Farmer Group size

When a scientific analysis is conducted one should pay attention not to fall into causal fallacies. For example, variables that might moderate the causal line of reasoning should be assessed and accounted for in order to draw meaningful conclusions later on. Relevant control variables should be recognized and monitored. In the following section the monitored variables will be named and discussed.

The first variable that was monitored in this research is group size. Firm or group size is commonly included as a control variable in literature on social capital and performance (Wu, 2008; Walker, Kogut & Shan, 1997; McEvily & Zaheer, 1999). It is often included together with firm/group age which, due to accessibility issues with regard to the relevant data, is not included in this research. This is briefly discussed in the research limitations.

Group size is considered to be a proxy for possession of specific resources that may affect the group's performance. Boyle (1968) and Powell and Brantley (1992) discovered that the frequency of cooperative relationships increases with group size. Although frequency of interaction is not included in this research, it is an aspect of social capital positively related to the sharing of information (Wu, 2008). Since group size is proven to affect the sharing of information, it should be monitored in this research.

3.3.2. Control variable: generation type

The second variable that was monitored in this research is generation type. The more often a seed potato is multiplied, the fewer kilograms per hectare it yields. According to Rahman et al. (2010) this gradual decomposition of genetic potential is referred to as degeneration, either due to physiological causes or due to viruses. Therefore, seed potatoes are classified in 'generations'; the higher the generation, the worse the yield.

Farmers were asked after how many harvests they replaced their initial seed potato which gives an indication as to which generation their potato belongs. The generation type obviously affects the yield per hectare and therefore should be controlled for.

3.3.3. Operationalization of key constructs

Constructs differ in their ease of measurement: this paragraph will briefly describe the key constructs of this research – which are mostly direct – and their operationalization. The following constructs are assessed in this paragraph: network size, network diversity, performance, potato generation and Farmer Group size. These key constructs are visualized in the table below for the sake of clarification:

Table 1

Operationalization of key constructs

Construct:	Scale:	Calculation:	Value:
Network size	Direct and ratio scaled	Adding up all different organizations/groups a respondent identified to have had contact with between 2014-2016	If existent then at least 1. If nonexistent then a value of 0 is noted. Theoretically no maximum value
Network diversity:	Direct and ratio scaled	The above organizations have been categorized into 9 categories. Calculated by checking how many categories a respondent had contact with ¹²	If existent then at least 1. If nonexistent then a value of 0 is noted. The maximum value is 9
Performance	Both weight and size of land are ratio scaled	Average of the given yield over 2014, 2015 and 2016, measured in kilograms. Controlled for the size of the land used for cultivation. Values are in kg/Ha ¹³	At least 0. Country-wise, the average yield ranges between 6 and 22 t/Ha in Kenya and between 7 and 15 t/Ha in Ethiopia over the same period (FAO 2000-2016). ¹⁴ These averages serve as reference points
Farmer Group size	Direct and ratio scaled	Given by (vice-) chairmen, secretaries or general managers of a respective Farmer Group	At least 2, theoretically no maximum value
Potato generation	Ordinal	Based on a given amount of harvests that were done with a seed potato; seed potatoes were then classified in categories ¹⁵	At least 1 with a maximum value of 11

¹² The underlying survey distinguished between governmental organizations, private breeders, public research and breeders, processors, input suppliers, credit facilities, private extensions, research and education organizations, and NGOs.

¹³ Kg/Ha stands for kilograms per hectare, while t/ha stands for tons per hectare.

¹⁴ Data from FAOSTAT, retrieved from <http://www.fao.org/faostat/en/#data/QC>. All rights belong to the respective owners.

¹⁵ Seed potatoes younger than generation three were classified as 'early generation', those that were between generations three and five were classified as 'standard generation' and those that were older than generation five were classified as 'old generation' seed potatoes.

3.4. Quality assurance

During the 1980s numerous authors conducting qualitative research have shied away from using quantitative measurements of research quality – reliability, internal and external validity – which, according to Seale (1999), has resulted in a proliferation of quality conceptualizations in qualitative research. A shift from assuring rigor during the course of the research towards post hoc justification and evaluation has led to impure verification; this resulted in confusion among qualitative researchers.

Some authors (like Morse et al., 2002) plea for a return to quantitative terminology, suggesting that the literature on validity has become muddled to the point that it is unrecognizable. Others, like Rudestam and Newton (2014), propose that using alternative terms for validity and reliability in qualitative dissertations is possible, as long as these issues are attended in a convincing way. Understandably, Davies and Todd (2002) argue that applying quantitative instruments to assess or establish rigor in qualitative research is a narrow way of understanding rigor. Authors that oppose Morse et al., like Golafshani (2003) and Stenbacka (2001), go as far as saying that the concept of reliability is irrelevant (Golafshani 2003, p. 601) or even misleading (Stenbacka 2001, p. 552) in qualitative research.

A well-known conceptualization of trustworthiness in qualitative research, devised by Lincoln and Guba (1985), has become exemplary in terms of alternative constructs: they proposed the usage of credibility, transferability, dependability and confirmability instead of internal validity, external validity, reliability and objectivity.¹⁶

This paragraph will recognize the legitimacy in Davies and Todd's argument that quantitative constructs are not always suited to assess rigor in qualitative research. According to them, if rigor is only understood in terms of quantitative objectivity, reliability, validity, standardization and rule, based on a measurable, systemized and uniform neutral approach, then other research methods that allow flexibility and incompleteness will always appear sloppy. At the same time, Morse et al. (2002) make a valid point by stating that introducing parallel terminology and criteria marginalizes qualitative inquiry. Post hoc strategies for *evaluating* rigor and trustworthiness do not *ensure* rigor.

¹⁶ Lincoln and Guba (1985) have built upon Guba's 1981 work.

Guba's (1981) qualitative measures are exceptional as he has proposed measures to ensure trustworthiness during as well as after the research inquiry.

As a result of the above contraposition, many researchers are hesitant to deviate from quantitative rigor terminology; this is unnecessary as authors like Morse et al. (2002) recognize the value of Guba's (and later on Lincoln and Guba's) alternative constructs as guidelines. Even more so, the verification strategies that Morse et al. propose show similarities with the research provisions that Guba (1981) devised which were endorsed, for example, by Shenton (2004). Although this paragraph acknowledges both insights, it leans heavily towards Guba's constructs (1981) and Shenton's (2004) provisions based on these constructs. Out of their constructs and provisions, only the ones relevant with regard to this research will be discussed.

3.4.1. Credibility, transferability, dependability, and confirmability.

As mentioned, Guba (1981) has introduced naturalistic terms for four scientific terms. These terms are similar to four aspects of trustworthiness of a research: its truth value, applicability, consistency and neutrality. The associated figure is included in Appendix C. Guba (1981) has also proposed steps that could be taken both during as after one's research to safeguard trustworthiness and its aspects. The figure on the next page is inserted for the purpose of visual clarification:

The Naturalistic Treatment of Trustworthiness

Inquiry can be affected by:	Which produce effects of:	To take account of which we:		In the hope these actions will lead to:	And produce findings that are:
		During:	After:		
Factor patternings	Noninterpretability	Use prolonged engagement Use persistent observation Use peer debriefing Do triangulation Collect referential adequacy materials Do member checks	Establish structural corroboration (coherence) Establish referential adequacy Do member checks	Credibility	Plausible
Situational uniquenesses	Noncomparability	Collect thick descriptive data Do theoretical/purposive sampling	Develop thick description	Transferability	Context-relevant
Instrumental changes	Instability	Use overlap methods Use stepwise replication Leave audit trail	Do dependability audit (process)	Dependability	Stable
Investigator predilections	Bias	Do triangulation Practice reflexivity (audit trail)	Do confirmability audit (product)	Confirmability	Investigator-free

Figure 2. Guba's naturalistic treatment of trustworthiness (Guba, 1981, p. 83).

Steps that were taken in the underlying research are highlighted in green and will be discussed individually next.

Provisions to increase *credibility* in a qualitative research aim to guard against confounding effects that make results uninterpretable. The underlying research applied prolonged engagement, persistent observation, peer reviewing, peer debriefing, and data triangulation in order to maximize credibility.

The researcher spent a notable time at the research site, including two five-week field studies in both Kenya and Ethiopia. This prolonged engagement enabled extended interaction with the environment and has led to an extensive understanding of its essentials and characteristics. Through persistent observation, the researcher was able to identify pervasive qualities as well as atypical attributes.

Also, the underlying research was reviewed by and debriefed at peers. Reviewing by peers relates to content validity in quantitative terms: a measure of how appropriate the item(s) seem(s) to a set of expert reviewers. Reviewers should have extensive knowledge of the subject. During the drafting of the underlying survey the composer was monitored by project supervisors and coordinators, all with sufficient knowledge of the research subject. This has greatly increased credibility as they were all well-engaged in the topic.

Furthermore, during the field studies, staff members were briefed at the local NGO before entering the field for data collection. Two workshops were held post research to validate the findings in the underlying research.

Data triangulation was applied on several aspects in the underlying research, ranging from the multiplicity of informants with regard to the variety of potatoes being produced (using both NGOs and farmers) to cross-checking of the research institutes and breeding stations' account with that of the local NGO. Conducting surveys at a wide range of participants, involving different Farmer Groups across both countries, resulted in triangulation via data sources. It allows for verification of individual viewpoints against others and a rich picture of behavior (Shenton, 2004).

Provisions to increase *transferability* are directly related to the situational uniqueness that is associated with qualitative research. This uniqueness that hinders generalizable truth statements is why 'external validity' is a loathed term in qualitative research; one should be satisfied with statements made with regard to a specific context. The purpose is to understand a social phenomenon. According to Stenbacka (2001), this understanding is achieved if the participant is part of the social phenomenon and has been given the opportunity to freely explain and speak about it. Purposive sampling is one such provision that maximizes the range of information uncovered (Guba, 1981). Purposive sampling was extensively assessed earlier in this chapter.¹⁷

An audit trail has been established in the underlying research; a complete research diary has been kept and could potentially be examined by an external auditor wishing to retrace the steps taken. This has increased *dependability* of the underlying research via potential replicability.

¹⁷ The reader is referred to the sampling paragraph; purposive sampling will not be explicated here due to space limitations.

3.4.2. Measurement equivalence

In the underlying research measurement equivalence – also referred to as measurement invariance – indicates whether a given measure was interpreted in a conceptually similar fashion among all subpopulations. When measurement equivalence is violated it prevents meaningful interpretation of the acquired data. Measurement variance was minimized by organizing workshops one day before participants had to take the survey. The participants received a comprehensive explanation of what the survey questions meant, how everything would take place, and they had the possibility to ask questions. Furthermore, a professional translator was present during the data collection to assure that respondents fully understood the questions and that they were given the option to communicate in their native language. This was done to minimize measurement variance due to misinterpretation of questions.

3.5. Research and data limitations

The final section of this chapter is the statement on limitations of the research and the data. Certain delimitations, like deliberate population restriction, have already been accounted for. This research encountered two restrictions which could not be controlled: a positive selection bias in Ethiopia and the absence of data on firm age. These will be discussed below.

3.5.1. Positive selection bias

Seeking negative cases is essential to ensure credibility and confirmability. Certain sampling decisions were made that resulted in selection bias. However, this is accepted as it is unavoidable when sampling purposively. As mentioned, participants that were chosen should have worked with local partners in the past and they should be located in regions that were known for relatively high seed potato production. The selected individuals should have similar traits and characteristics and should belong to a small seed potato Farmer Group. Only seed potato farmers that worked with quality seed were selected.

However, when providing farmers in an unbiased fashion, both positive and negative ‘cases’ should be present. The provided farmers should not be selected with the intention of distorting the general country image.

The provision of negative cases was undermined in Ethiopia: farmers that were provided mostly were successful and had high yields, while attempting not to provide farmers that had poor yields. This was probably done to enhance the country image. This positive selection of farmers resulted in a distorted sample as Ethiopians did not present a balanced selection of farmers belonging to Farmer Groups.

3.5.2. Data on Farmer Group age

As mentioned in chapter two, Farmer Group size has been controlled for. Its partner variable, Farmer Group age, could not be controlled for. It is one of the theoretical moderators that Stam, Arzlanian and Elfring (2014) have contrasted; they hypothesized that firm age had a significant different impact on various social capital aspects. Its missing is attributed to an error in the processing of data. When a member of a Farmer Group was surveyed, he or she was asked in which year the Farmer Group they belonged to was established. However, this data was not accessible as it did not end up in the underlying survey data file. Therefore, firm age could not be controlled for in this research, which is an obvious limitation.

4. Results

This chapter will contain evidence, potential counter-evidence, and outliers with regard to the research expectations. Findings obviously relate back to the conceptual framework presented earlier. Important and striking discoveries will be highlighted. At the same time, visualizations of exemplary ego-centric networks will be offered and relevant data presented. A top-down approach will be used: from comparing between countries towards comparing within regions. This allows for a meaningful discussion and significant conclusion in the remaining chapters.

4.1. Comparison between countries

Since the chosen approach is top-down, country averages will be presented first. Kenya had the bigger average network size and diversity of the two countries, while the average yield per hectare per season was lower than in Ethiopia. This is contrary to what the research expectations suggest. There was a small difference in average potato generation and average Farmer Group size. The table below is inserted for visual clarification¹⁸:

Table 2

Country-wise comparison

	Ethiopia N=14	Kenya N=14
Average network size:	4.3	5.1
Average network diversity:	2.4	3.5
Average yield (kg/Ha/season):	17.8	6.7
Average potato generation:	3.7	4.1
Average Farmer Group size:	68	53.8

The above averages indicate that a larger and more diverse network is not related to higher yields as illustrated by Kenyan farmers, despite using a similar generation of seed potatoes.

¹⁸ In all the following tables in this chapter, bold numbers indicate that it is the best value in a specific row category.

However, some considerations need to be made. Both country averages are based on respondents from three different regions. One specific region in Ethiopia – the Oromia region – had an enormous high yield per hectare when compared to the rest of the country. All respondents in Oromia reported yields of more than 30 kilograms per hectare per season. These extreme amounts inflated the average in Ethiopia and resulted in the slightly distorted picture above. When the Oromia region is excluded the average yield drops to slightly more than 10 kilograms per hectare while the average network size and diversity do not change significantly.

Although the average in Ethiopia would still be higher than in Kenya, this exclusion demonstrates that country-wise comparison is (to a degree) meaningless. This is aggravated by the positive selection bias that was encountered in Ethiopia. Subsequently, climatological and geographical variables potentially play a significant role as surveys were conducted in different regions in both Kenya and Ethiopia. Locations that are geographically apart might differ in terms of climate, soil fertility and other agricultural aspects, which are relevant for the potential yield per hectare. For example, Pereira et al. state that *“knowledge of climatic requirements of potato and its physiological responses to the environment is extremely important to help growers produce high yields with good tuber quality under site-specific atmospheric conditions”*, endorsing said climatological relevance (Pereira et al., 2008, p. 328). Moreover, van Oort et al. (2012) have stated that a wet start and end of the growing season influences potato yield. They mention that their findings are specific for the agro-meteorological conditions in the Netherlands; however, it is imaginable that rainfall and the duration of the wet season are relevant agro-meteorological conditions in Kenya and Ethiopia, as van Oort et al. have used generic methods. Furthermore, Maier et al. suggest that *“increased soil acidity may affect nutrient uptake and therefore plant chemical composition, productivity, and quality”*, which justifies the inclusion of geographical aspects (Maier et al., 2002, p. 524).

These explanatory variables differ between countries, as well as between regions. Although their exact impact is unknown, they should be kept in mind when comparing results between countries, regions, and within regions, as the mutual differences between these variables obviously influence the yield.

The limited comparability between countries is the main reason that this research narrows down to investigating within countries and within regions. The following paragraphs will assess the differences between and within regions in Ethiopia and Kenya.

4.2. Comparison between regions in Ethiopia

Comparing between regions in a country is purer than comparing between countries as these regions are geographically closer and therefore more alike. The table below shows the averages of three regions in Ethiopia: the SNNPR, Oromia and Amhara region.

Table 3
Region-wise comparison in Ethiopia

	Ethiopia		
	Oromia ^{N=5}	Amhara ^{N=5}	SNNPR ^{N=4}
Average network size:	5	3.4	4.5
Average network diversity:	2.6	2.4	2.3
Average yield (kg/Ha/season):	31.6	14.1	5.3
Average potato generation:	3.4	2.2	5.9
Average Farmer Group size:	32	102.2	70.3

As opposed to when country averages were compared, the Oromia values confirm the research expectations stated in chapter two when compared to the other two regions. Members from seed potato Farmer Groups in Oromia had the largest networks on average, which were slightly more diverse; at the same time, they had the biggest average yield in kilograms per hectare per season. They had the smallest Farmer Groups on average and they had access to older seed potatoes than members from seed potato Farmer Groups in Amhara; this however, did not prevent them from having the highest average yield.

The ego-centric network visualization inserted below is exemplary for the Oromia region: this respondent has the second highest network size in the Oromia region and the highest network diversity. This resulted in the highest yield per hectare per season in the region.

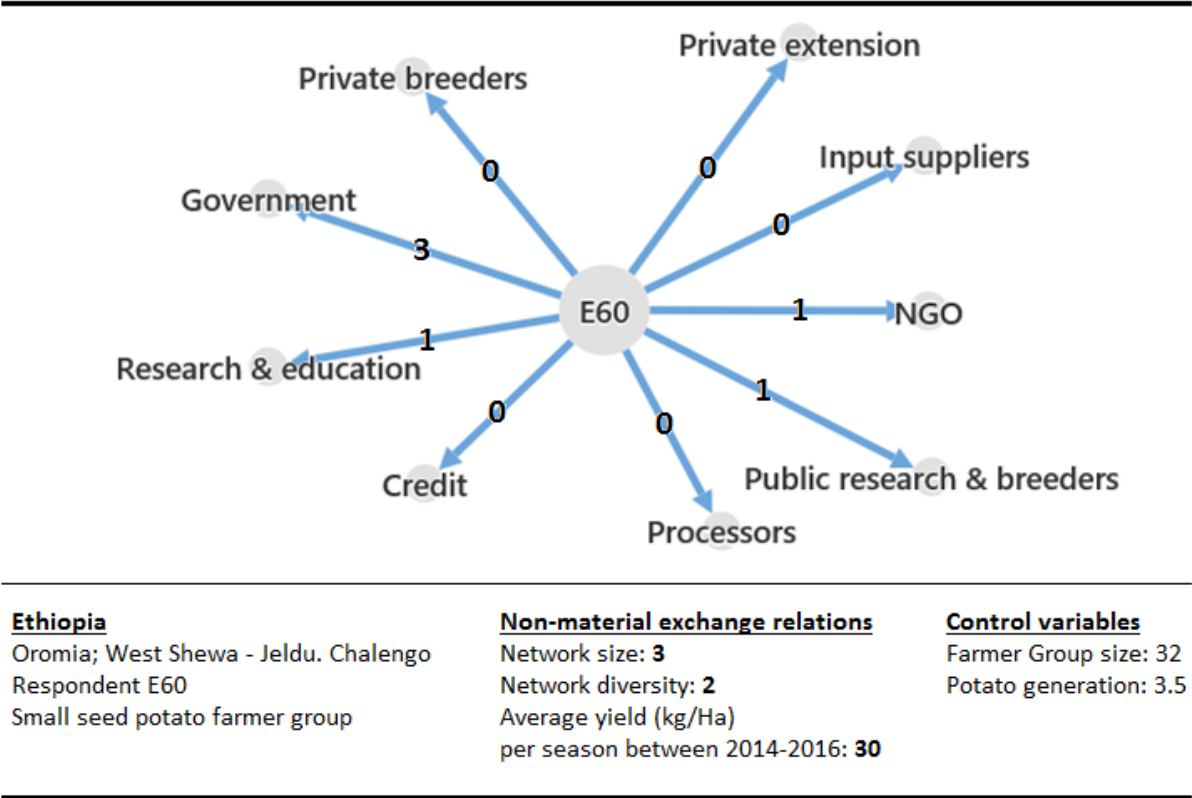


Figure 3. Ego-centric network of respondent E60.

A striking difference with the other ego-centric networks in Ethiopia is that this specific respondent was the only one that reported contact with a research and education organization. Although the specific influence of this tie is unknown, it is nevertheless interesting to note as this respondent had the highest yield out of all respondents in Ethiopia.

When comparing the Amhara region with the SNNPR region, the first research expectation holds true while the second research expectation does not. The average size of networks is lower in Amhara, while the average diversity is slightly higher. The average yield in the Amhara region is much higher. It should be noted that the average potato generation that members of seed potato Farmer Groups in Amhara had access to was 2.2, while the average potato generation that members had access to in the SNNPR was 5.9.

Also, the average Farmer Group size in Amhara was larger than in the SNNPR. Thus, despite having a larger network, the use of older generation seed potatoes might have played a role with regard to the lower yield in the SNNPR region.

As mentioned earlier in the country-wise comparison: climatological and geographical variables could play a significant role, as surveys were conducted in different regions in Ethiopia. These potential explanatory variables differ between regions, which is why this research applies a top-down approach to compare as pure as possible.¹⁹ Despite never achieving a perfect like-for-like comparison in social sciences, the above between-region comparison is not as exact as the within-region comparison later on is.

4.3. Comparison between regions in Kenya

The regions in Kenya were compared in the same fashion. The table below shows the averages of the three regions in Kenya: the Nayandarua, Bomet and Meru region.

Table 4

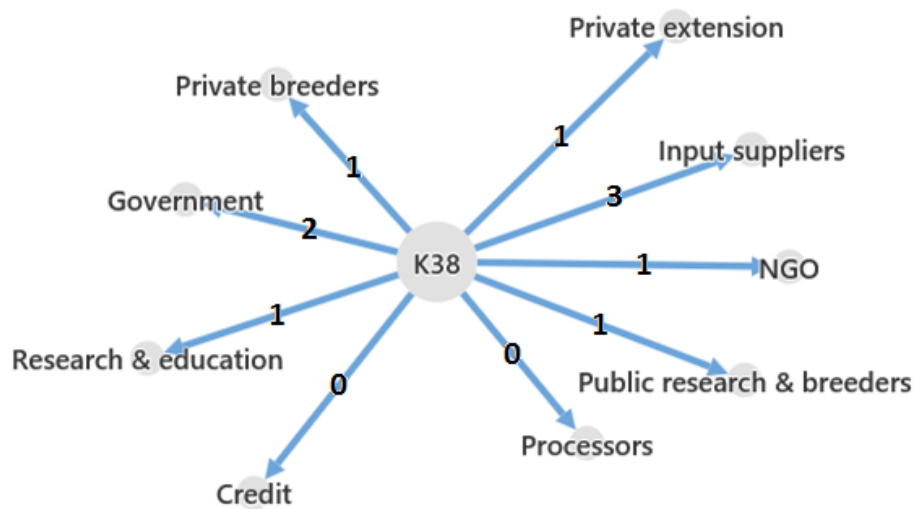
Region-wise comparison in Kenya

	Kenya		
	Nayandarua ^{N=7}	Bomet ^{N=5}	Meru ^{N=2}
Average network size:	7.3	3	2.5
Average network diversity:	5	2	2
Average yield (kg/Ha/season):	7.5	5.0	8.5
Average potato generation:	2.6	6.6	3.3
Average Farmer Group size:	17.6	114.6	28.5

Initially, the values in Kenya do not seem to unambiguously support both research expectations.

¹⁹ With regard to climatological differences between regions in Ethiopia – i.e. seasonal rainfall and the amount of sunny days/hours – I refer to Appendix F. For geographical differences between regions in Ethiopia – i.e. soil acidity/fertility – I refer to Appendix G. With regard to climatological differences between regions in Kenya (seasonal rainfall) I refer to Appendix H. Again, the exact impact of these differences is unknown, as it was beyond the scope of this research.

Although members of seed potato Farmer Groups in the Nayandarua region on average have – by far – the largest and most diverse networks, their average yield is preceded by members of Farmer Groups in the Meru region. The latter have, on average, the smallest network size and the lowest amount of network diversity (tied with the Bomet region). This phenomenon cannot be attributed to differences in potato generation, as farmers in the Nayandarua region have access to the best seed potatoes (on average) in terms of generation, slightly better than farmers in the Meru region. A potential explanatory factor could be found in the used potato variety. Varieties do not suit every region equally well, hence it is possible that the used seed potato variety was not the most suitable one in the Nayandarua region. Unfortunately, no information on the used potato variety was found. Furthermore, the averages in the Meru region are based on a limited sample: data was provided by just two members of Farmer Groups. This limited sample might have resulted in a distorted picture. Both the Nayandarua and Bomet samples are bigger and therefore provide more rigid averages. When the Nayandarua and Bomet samples are compared, both research expectations do hold up. It should, however, be noted that Bomet farmers had to work with (far) worse seed potatoes in terms of generation type. The ego-centric network visualized on the next page exemplifies that a larger and more diverse network in the Nayandarua region might result in a better yield.



Kenya	Non-material exchange relations	Control variables
Nayandarua-Ol Kalou; Kanjuiri ward	Network size: 10	Farmer Group size: 10
Respondent K38	Network diversity: 7	Potato generation: 1.5
Small seed potato farmer group	Average yield (kg/Ha) per season between 2014-2016: 15	

Figure 4. Ego-centric network of respondent K38.

Although it should be noted that the above respondent’s potato generation is slightly better than the average in Nayandarua, its Farmer Group’s size is smaller than the average. Both its network size and diversity are well above average, which results in a yield per hectare per season over twice the average in the region. As opposed to the Meru region, these averages are based upon a larger sample.

4.4. Comparison within regions

Even though comparison between regions increases purity, this research narrows down to comparison *within* regions. This provides a smaller risk of geographical and climatological factors that might disrupt meaningful drawing of inferences. The Meru region will not be assessed as it is based on two respondents only.

4.3.1. Ethiopia: SNNPR

Surveys were conducted among four members of different Farmer Groups in Gamo Gofa, a zone within the SNNPR region. The results are visualized in the table below.

Even though the ego-centric networks of all four respondents are mostly similar, there is quite a difference in yield.²⁰

Table 5
Comparison in Ethiopia – The SNNPR

	SNNPR			
	E14	E16	E21	E22
Network size:	5	4	5	4
Network diversity:	2	2	3	2
Yield (kg/Ha/season):	1.8	6.5	7	5.8
Potato generation:	6	5	10.5	2
Farmer Group size:	80	69	85	47

The respondent with the largest network size (tied with another respondent) and biggest network diversity is respondent E21; he also has the highest yield, which is in line with both research expectations. This is even more impressive when looking at the generation of the seed potatoes used: respondent E21 managed to achieve the best yield even though having access to the worst seed potatoes. However, he is member of the biggest Farmer Group out of the four respondents, although this Farmer Group is just slightly bigger than the other three.

Although respondents E14 and E16 have similar network size and diversity, potato generation type, and Farmer Group size, the latter still has over three times as much yield as respondent E14. Data of the underlying survey indicates that respondent E16 has used over four times as much fertilizer as respondent E14 did. This is a potential explanatory factor for the difference in yield. Respondent E22 has just a slightly worse yield per hectare per season when compared to respondent E16, even though the former had access to better seed potatoes.

²⁰ I refer to Appendix D for all ego-centric network visualizations of members of Farmer Groups in the SNNPR. Subsequently, all ego-centric network visualizations can be found in Appendix D and E.

The minor difference in Farmer Group size might explain the small difference in yield to a degree. However, respondent E16 has used almost twice as much fertilizer as respondent E22, which seems a more viable explanatory factor.

The preliminary conclusion for this region reads that there appears to be a common thread, although it seems impossible to attribute the observed differences in yield specifically to differences in network size and diversity.

4.3.2. Ethiopia: Amhara

Surveys have been conducted among five members of different Farmer Groups in South Gondar, a zone within the Amhara region. The results are visualized in the table below.

Table 6
Comparison in Ethiopia – Amhara

	Amhara				
	E40	E46	E47	E48	E49
Network size:	4	4	4	0	5
Network diversity:	3	3	3	0	3
Yield (kg/Ha/season):	5.9	19.5	13.2	18.7	13.2
Potato generation:	1.5	1.5	1.5	1.5	5
Farmer Group size:	51	52	41	42	325

The fact that there is almost no difference in network size and diversity makes it difficult to compare between respondents’ social capital. Respondent E48 is a strange one however and will be discussed in the paragraph on outliers as well. Opposed to the research expectations stated in chapter two, said respondent has the second highest yield while reporting not to have had contact with any of the organizations mentioned before. The other four respondents possess an equivalent amount and diversity of network ties, respondent E49 being the only one with a slightly larger network. When looking at generation type, E49 is the only respondent to have access to worse seed potatoes.

This might explain why his yield is lower than that of respondents E46 and E48. His yield is comparable to that of respondent E47, while using the same amount of fertilizer. A potential explanation is that the larger size of the Farmer Group that E49 belongs to, compensates for the worse generation of seed potatoes that he has access to. At the same time, respondent E49 is the only respondent to report contact with more than one NGO. In Ethiopia, NGOs were reported to disseminate agricultural knowledge and skills, which will be discussed more in the next paragraph. The fact that said respondent maintained relationships with multiple NGOs might explain why he is able to perform equally well as respondent E47 despite having access to worse seed potatoes.

Respondent E40 uses around 33% to 50% less fertilizer than the other respondents in this region. This might explain the lower yield, despite the fact that he has access to seed potatoes of a good generation. Respondents E46, E47 and E48 are similar in terms of potato generation type and Farmer Group size. However, respondent E48 uses 25% more fertilizer than respondent E47, which might explain the former's bigger yield, even though the latter has a larger and more diverse network. A similar comparison can be made between respondent E46 and E47: the former uses 25% more fertilizer (the same amount as respondent E48) but has the same network properties.

The difference between their yields could be attributed to the difference in fertilizer usage. The preliminary conclusion for this region reads that the Amhara sample limits drawing conclusions as the social capital variables are too alike; the sole respondent that had smaller and less diverse network at the same time scores highest on fertilizer usage, which potentially explains why his yield opposes the research expectations.

4.3.3. Ethiopia: Oromia

In the last region in Ethiopia, Oromia, surveys have been conducted among five members of different Farmer Groups. All five respondents were active in the West Shewa zone.

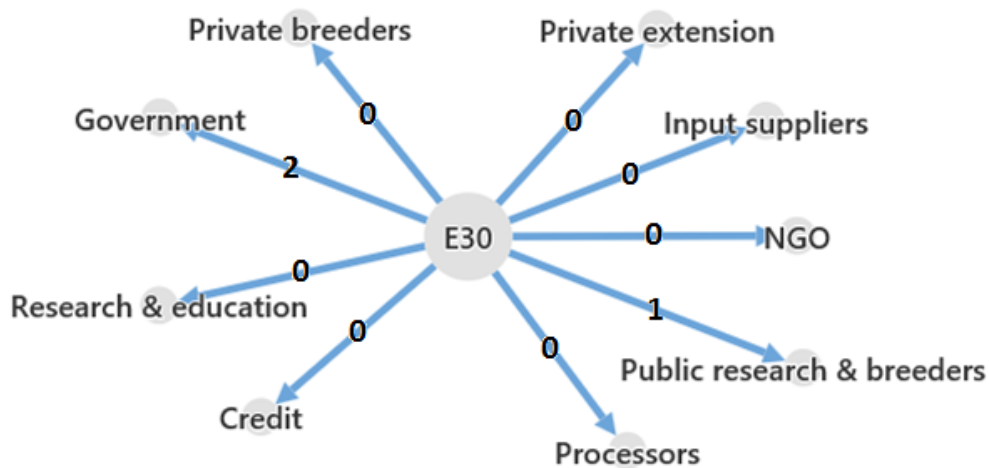
Table 7

Comparison in Ethiopia – Oromia

	Oromia				
	E28	E29	E30	E31	E60
Network size:	7	3	3	6	6
Network diversity:	3	2	2	2	4
Yield (kg/Ha/season):	30,2	30	30	32,6	35,1
Potato generation:	3,5	3,5	3,5	3,5	3
Farmer Group size:	15	39	32	9	65

Respondents E28, E31 and E60 had larger and more diverse networks than the other respondents in Oromia. The results indicate that on average these three respondents had almost 4% more yield per hectare per season. Even more so, they achieved this yield with around 20% less fertilizer on average; on the other hand, these respondents were members of slightly bigger Farmer Groups.

Respondents E60 and E31 clearly represent the value of bridging social capital in terms of network size and diversity on the average yield. Respondent E60's ego-centric network is visualized earlier in this chapter, while the visualization of respondent E31's ego-centric network is inserted on the next page. As mentioned, respondent E60 was unique in its contact with a research and education organization. Also, the three 'better performing' respondents mentioned above had more engagement with NGOs. According to Saka-Helmhout, Hofstede and Knoben's (2017) report, the role of NGOs in Ethiopia was far more conspicuous than in Kenya; NGOs indicate the suitable groups and have good linkages with (local) governments. Furthermore, one of their main roles in Ethiopia is to disseminate agricultural knowledge. Respondents' contact with such NGOs could be one of the reasons why these three respondents had better performances.



Ethiopia

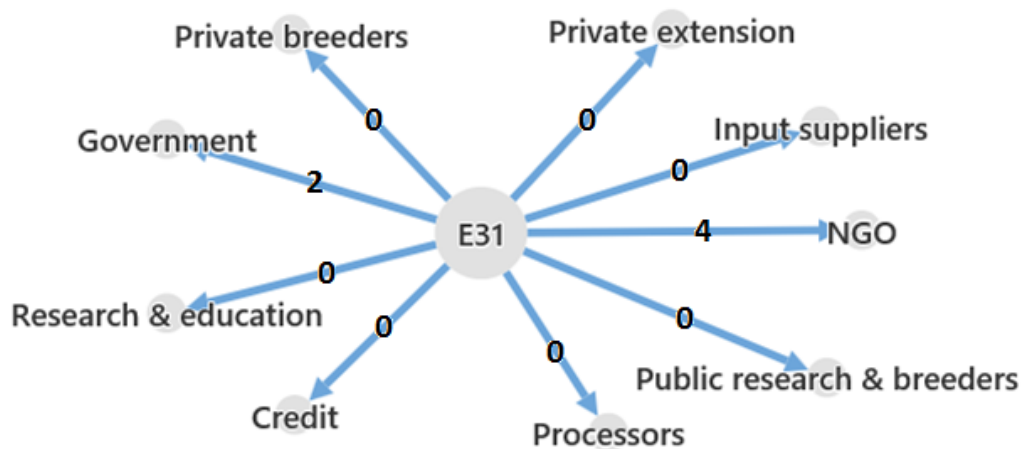
Oromia; West Shewa - Jeldu
Respondent E30
Small seed potato farmer group

Non-material exchange relations

Network size: **3**
Network diversity: **2**
Average yield (kg/Ha)
per season between 2014-2016: **30**

Control variables

Farmer Group size: 32
Potato generation: 3.5



Ethiopia

Oromia; West Shewa - Jeldu
Respondent E31
Small seed potato farmer group

Non-material exchange relations

Network size: **6**
Network diversity: **2**
Average yield (kg/Ha)
Per season between 2014-2016: **32.62**

Control variables

Farmer Group size: 9
Potato generation: 3.5

Figure 5. Ego-centric networks of respondents E30 and E31.

Comparing respondents E30 and E31 exemplifies the value of bridging structural social capital: they both had access to the same generation of seed potatoes, they used the same amount of fertilizer and respondent E31's Farmer Group size was even smaller than that of respondent E30. Nevertheless, respondent E31 had over 8% more yield per hectare per season; the only difference being the amount of bridging structural social capital, expressed in the size of respondent E31's network. The preliminary conclusion for this region reads that both research expectations are confirmed in this region's results.

4.3.4. Kenya: Nayandarua

Surveys have been conducted among seven members of different Farmer Groups in the Nayandarua region in Kenya. As this region contained seven different respondents, their respective 'scores' on the control variables varied. Therefore, similar cases will be compared, to enable a pure drawing of inferences.

Table 8

Comparison in Kenya – Nayandarua

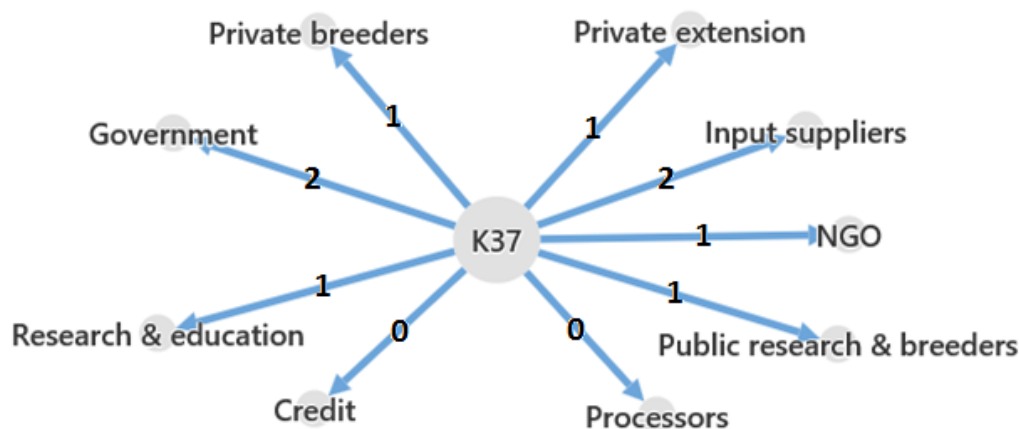
	Nayandarua						
	K37	K38	K39	K44	K45	K46	K49
Network size:	9	10	0	7	3	6	16
Network diversity:	7	7	0	6	3	4	8
Yield (kg/Ha/season):	5,5	15	4,4	8,8	0,8	9,6	8,3
Potato generation:	1	1,5	1	3	5	5,5	1
Farmer Group size:	20	10	25	15	10	13	30

Respondents K37, K38, K39 and K49 had access to comparable potatoes in terms of generation, as well as mostly similar Farmer Group sizes. Respondent K39 had the lowest network size and diversity (both zero), and accordingly had the lowest average yield per hectare per season, despite the fact that he used the biggest amount of fertilizer (an equal amount as respondent K37). Respondent K37, however, had a larger and more diverse network, which resulted in 25% more yield per hectare per season.

The two respondents with the largest and most diverse networks were K38 and K49; although the latter had a larger and slightly more diverse network, the former had – by far – the best yield per hectare per season. However, the former also used almost 20% more fertilizer per season which, to a degree, might explain this difference. At the same time, their diversity was almost the same. The fact that 6 out of 16 contacts from respondent K49 were NGOs could suggest that said respondent had a higher degree of redundancy, which might consume time, as opposed to respondent K38 who had contact with one NGO. Nevertheless, the results from the above four respondents are in line with the two research expectations that a larger and more diverse network results in access to better yield.

Respondents K45 and K46 had access to comparable potatoes in terms of generation as well as similar Farmer Group sizes; nevertheless, respondent K46 had over ten times as much yield per hectare per season. Even though respondent K45 used almost 20% more fertilizer per season, K46's larger and more diverse network appears to confirm both research expectations. This respondent will be discussed at the outlier section as his yield was the second best despite having a smaller and less diverse network compared to others, as well as having access to worse seed potatoes.

Respondent K44 comes across as a stranger in their midst: he has a smaller and less diverse network than others, while having access to worse seed potatoes. However, the average yield per hectare per season is higher. This cannot be due to fertilizer use as he used 20% less than respondent K37 for example. For the sake of clarification, the visualization of both ego-centric networks is inserted on the next page.



Kenya

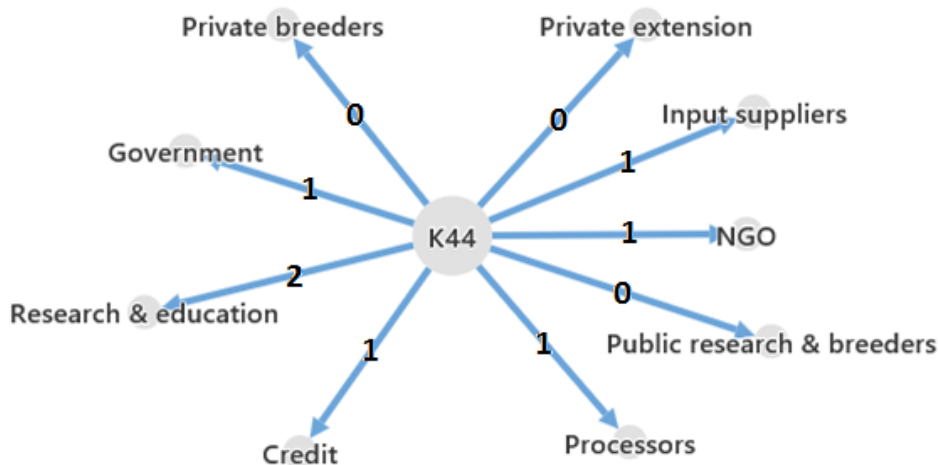
Nayandarua-Ol Kalou; Rurii ward
Respondent K37
Small seed potato farmer group

Non-material exchange relations

Network size: 9
Network diversity: 7
Average yield (kg/Ha)
Per season between 2014-2016: 5.5

Control variables

Farmer Group size: 20
Potato generation: 1



Kenya

Nayandarua-Ol Jorok; Weru ward
Respondent K44
Small seed potato farmer group

Non-material exchange relations

Network size: 7
Network diversity: 6
Average yield (kg/Ha)
Per season between 2014-2016: 8.82

Control variables

Farmer Group size: 15
Potato generation: 3

Figure 6. Ego-centric networks of respondents K37 and K44.

The most striking difference is that respondent K44 had contact with two research and education organizations; as mentioned earlier, it is interesting to note that respondents that have contact with one or multiple of these research and education organizations seem to achieve better results (e.g. due to better knowledge among respondents or an improvement of their agricultural skillset). Respondents K37, K38, K44, K49 all had contact with at least one of these organizations. Respondent K44’s contact with multiple of those research and education organizations appears to be an advantage.

The preliminary conclusion for this region reads that the ‘better connected’ respondents had access to better yields; both research expectations can be regarded as confirmed.

4.3.5. Kenya: Bomet

Five respondents, members of different Farmer Groups, were active in the Bomet region in Kenya. The results from the surveys conducted in this region were not as interpretable as results from other regions; the Bomet region contained almost no ‘similar’ cases to compare but did contain a strange outlier. The table below is inserted for visual clarification.

Table 9
Comparison in Kenya – Bomet

	Bomet				
	K53	K57	K61	K62	K64
Network size:	6	0	3	6	0
Network diversity:	4	0	2	4	0
Yield (kg/Ha/season):	6.7	9.7	2.5	4.6	1.3
Potato generation:	5	7.5	11	2	7.5
Farmer Group size:	500	12	20	16	25

Despite having a score of zero on network size and diversity. Respondent K57 yielded the most kilograms per hectare per season.

This outlier is striking when considering that respondent K57 has access to the second worst potato generation (tied with respondent K64) and used the smallest amount of fertilizer (tied with respondent K61). This outlier will be discussed more in detail in the next paragraph.

Respondents K53 and K62 had the largest and most diverse networks in the Bomet region. If the outlying respondent K57 is disregarded, it would lead to the former two respondents having the best yields in this region. However, this does not unambiguously confirm the two research expectations as these two respondents had access to the best generation seed potatoes in this region; furthermore, respondent K53's Farmer Group was by far the largest in size. Conclusions with regard to this region would be partially meaningless as it is unsure whether the difference in yield can be attributed to the difference in social capital indicators. Comparing respondent K61 to respondent K64 is interesting though: although the latter respondent had access to better seed potatoes in terms of potato generation and used almost 3 times as much fertilizer, the former respondent still reported 80% more yield per hectare per season. This could potentially be attributed to the fact that respondent K64's network size and diversity were 0, while respondent K61 had a network size of three and diversity of two.

The preliminary conclusion for this region reads that the Bomet sample is too divergent and therefore incomparable. The comparison between respondents K61 and K64 hints towards confirmation of both research expectations; however, respondent K57 is an outlier.

In summary: out of the five within-region comparisons, two appear to confirm both research expectations – one region in Ethiopia and one in Kenya. Two other regions (one in both countries respectively) did not allow for such an unequivocal conclusion, due to the variables being either too alike or too divergent. The last region, in Ethiopia, did not unambiguously confirm both research expectations, as it hinted only slightly towards the confirmation of both research statements.

The comparison between regions in Ethiopia resulted in a confirmation of both research expectations, while said comparison did not result in confirmation of both research expectations in Kenya. These comparisons, however, are less like-for-like and therefore less meaningful. The same goes for the comparison between countries.

The most interesting findings will be discussed more in detail in the next chapter, while a final conclusion will be presented in the last chapter of this research; outliers will be discussed next.

4.5. Outliers

This research contained three outliers: respondents E48 in Amhara (Ethiopia) and K57 in Bomet (Kenya) both stated to have had no contacts with any organization between 2014 and 2016. Nevertheless, they had the second best and best yield respectively in their respective regions. Respondent K46 in Nayandarua (Kenya) is an outlier as well, but different from the above two: despite having only a slightly bigger and more diverse network than a respondent with access to a similar generation of seed potatoes in the region, this respondent's yield was over ten times better. Each outlier will be briefly discussed below.

Respondent E48 is similar to respondents E40, E46 and E47 in terms of potato generation and Farmer Group size. However, the former has not engaged with before mentioned organizations between 2014 and 2016 and therefore has a network size and diversity of zero. The other three respondents had 'equivalent' networks; they all had engaged with two governmental organizations and one public research and breeder organization. Despite the fact that respondent E48 had far less social capital based on the theoretically substantiated network properties, it had far better yield than respondents E40 and E47, and just a slightly worse yield than respondent E46.²¹ As mentioned earlier, the main potential explanatory variable is the used amount of fertilizer. Respondent E48 used twice as much fertilizer as respondent E40, which might be why the former had over three times as much yield.

Respondent E46 is most similar to outlier E48, as he used the same amount of fertilizer. However, respondent E46's yield exceeded that of the outlier by just 4%, despite having a larger and more diverse network. As this research only focuses on the out-group social capital (bridging), it is possible that respondent E48 had far more bonding (in-group) social capital. This is subject to further research as the underlying survey only investigated out-group relationships.

²¹ Table 6 on page 44 can be consulted for a display of numerical values of the relevant variables.

A potential, yet unlikely, explanation is found in the climatological and geographical explanatory variables that differ per location. Gayint and Farta are so-called 'woredas' (i.e. administrative divisions) which are not that far apart in South Gondar, however, the extent to which certain agricultural relevant factors differ (e.g. soil acidity and rainfall, as referred to earlier) is not measured and therefore unknown. This topic will be discussed more in detail later on in the discussion and future research sections.

Respondent K57 in the Bomet region had a network size and diversity of zero as well. Unlike respondent E48 in Amhara, this outlier used the least amount of fertilizer in his region, tied with one other respondent. At the same time this respondent had access to the second worst generation of seed potatoes, tied with respondent K64; the respondent that had the least amount of yield per hectare per season. Similar to the outlier discussed above, a potential, yet unlikely, explanation can be found in the climatological and geographical explanatory variables.

Out of the five respondents in Bomet, only two were active in the same 'ward' (zones within a sub-county), while the rest was active in different wards or sub-counties. Again, the extent to which said agricultural relevant factors differ in those sub-counties is not measured and unknown. Also, similar to respondent E48, no data is available in this study with regard to the amount of bonding social capital. It is unknown if respondent K57 possessed large amounts of bonding social capital to potentially overcome the lack of bridging social capital.

Respondent K46 in the Nayandarua region stood out as an outlier because his yield was over ten times better than respondent K45, while both had access to similar seed potatoes in terms of generation and the latter had used 20% more fertilizer per season.²² Although respondent K46's network properties were better (a larger and slightly more diverse network), this does not fully justify the big difference in yield. Potential differences in geographical and climatological variables are irrelevant as both respondents were active in the same ward. The most notable difference is that respondent K46 had a larger network in terms of connections with governmental organizations; K46 reported the highest amount of connections with said organizations in both the region as well as in Kenya.

²² I refer to Table 8 on page 48 for a display of all numerical values.

Although almost all respondents in the Nayandarua region had contact with governmental organizations it is plausible that the amount of governmental contacts that respondent K46 had has given him advantages (e.g. local governmental support with regard to agricultural knowledge) that resulted in a better yield. The extent to which these contacts have led to advantages is unknown however, as this research could not delve into the nature and quality of specific ties.

5. Discussion

Prior to drawing the final conclusion regarding the research expectations and the related research question, this chapter will discuss the theoretical and managerial implications of this research. Also, the strengths and limitations of the research will be assessed and discussed, while future research directions will be named and substantiated. Lastly, a brief critical self-reflection – including a consideration of potential researcher bias – will be offered. A decent amount of cohesion between the last two chapters of this research will be noticeable as the discussion and final conclusion are two interrelated topics in qualitative research.

5.1. Theoretical implications

As evidence appeared to be lacking (Ansari, Munir & Gregg, 2012) to ‘solve’ the empirical puzzle highlighted in chapter one, this research aimed to fill that specific gap in existing literature. Previous attempts were made to theoretically resolve the hiatus with regard to information networks at the BoP and their potential effectiveness in enabling access to affordable yields; however, no empirical results have been acquired yet. This research aimed to bring BoP social capital theory and practice together. In order to gain critical empirical insight, relevant constructs on social capital – directly related to the amount of information and resources one has access to – were operationalized and tested in a specific context, namely the sub-Saharan African countries Kenya and Ethiopia. By conducting network analysis based on the operationalization of said relevant constructs, this research strived to provide the necessary insight that Ansari, Munir and Gregg (2012) specifically refer to in their future research agenda. This has resulted in a significant academic contribution. So how did this research contribute to the area?

On the one hand, this research pioneered the social capital framework (with regard to network size and diversity) in a specific setting in Sub-Saharan Africa. Ansari, Munir and Gregg (2012) voiced a specific need for the creation of network maps to help identify current and potential social capital flows. This research has done so by mapping ego-centric networks at the BoP: surprisingly, relationships with out-group organizations were present (i.e. bridging social capital), contradicting Ansari, Munir and Gregg’s statement that the poor often lack these more diffuse and extensive relationships.

Merely 7% of the respondents in Ethiopia and 22% in Kenya indicated that they had zero out-group relationships.

At the same time, respondents that possessed large amounts of said bridging structural social capital appeared to perform better, which suggests that those are 'getting ahead', whereas respondents that did not possess such cross-cutting intergroup relationships appeared to perform worse and might be 'getting by' more. Hence, evidence has been found – in certain regions – of the importance of network size and diversity in the access to quality yields, although deeming said evidence irrefutable would be premature.

It is possible that respondents that were supposedly 'getting by' possessed more bonding social capital, however, this is unknown as in-group ties were not investigated in the underlying survey and it was beyond the scope of this research. Nevertheless, this research at least partially confirms that Nahapiet and Ghoshal's (1998) theoretic framework is indeed usable in the BoP environment; network size and network diversity appear to be related to performance at the BoP.

Although farmers' individual skillsets and degree of agricultural knowledge were not investigated, it was interesting to note that bridging structural social capital in the form of contact with research and education organizations appeared to be quite important. Several respondents in Kenya as well as in Ethiopia appeared to benefit greatly from their out-group relationship with said organizations, although it would be hasty to regard this new insight to be an established fact. It does, however, hint towards better agricultural knowledge amongst those that have established ties with said organizations. Simultaneously, better performing respondents in Ethiopia possessed more out-group relationships with NGOs which, according to a report by Saka-Helmhout, Hofstede and Knoblen (2017), play an important role in disseminating agricultural knowledge. It is fascinating to note that some ties appeared to be more important than others, which endorses the need for tie quality and frequency investigation in future research.

Moreover, it was surprising to notice that an ideal Farmer Group size appeared to exist. A group size between twenty and thirty appeared to be ideal for higher yield; however, this was not as clearly present as the association between potato generation and yield (which will be discussed in the next paragraph).

5.2. Managerial implications

Most importantly, the results at least suggest that respondents with large amounts of bridging structural social capital outperform those that possess less of such capital. Therefore, managers are advised to accumulate and 'invest in' bridging structural social capital. Portes (1998) argued that bridging social capital should be fostered specifically in poor communities, as it grants access to numerous resources such as experts and their knowledge base. Adler and Kwon's (2002) before mentioned task contingency should be kept in mind when managers decide to invest in bridging structural social capital: it is important for them to make substantiated decisions in their search for the perfect ratio between weak ties, commonly found in sparse networks, and strong ties, commonly found in closed networks. BoP networks tend to need more peripheral ties, high in unique resources, as bridging social capital is more likely to come from weak ties outside of the core (Ansari, Munir & Gregg, 2012; Granovetter, 1973). As mentioned in the theoretical implications, further research should be conducted with regard to tie quality and frequency of contact. Nevertheless, managers should aim to configure their network, in terms of openness versus closeness, in a ratio that is most beneficial for its purpose.

Subsequently, as certain ties appeared to be more important than others, managers should be selective in their tie choice and aim to invest in cross-cutting ties that are an asset for their network. Possessing ties with NGOs in Ethiopia and research and education organizations in both countries seems to be essential; however, managers should be aware of redundancy and definitely not put all of their eggs in one basket. This is in related to the ideal Farmer Group size mentioned earlier; it is possible that an extremely large group size exceeds the initial aim of a Farmer Group and that some kind of equilibrium exists.

Also, this research unveiled an association between the standard generation of seed potatoes and performance. Seed potato generation was rightfully used as a control variable: farmers that had access to better generation seed potatoes typically outperformed those that had access to older generation seed potatoes. This confirms the theoretical relation between gradual decomposition of seed potatoes and yield. Managers that consider investing in the seed potato value chain should prioritize that their network contains ties with consistent access to early generation seed potatoes as this increases the chance of success for their venture.

5.3. Strengths and limitations of the research

Qualitative research generally has certain strengths, of which some were present in this research. One of the main strengths was the appliance of qualitative social network analysis instead of the more common quantitative version. This allowed for a meaningful analysis: it enabled ‘decomposition’ and comparison of a complex and unique setting that would otherwise be less expressive or even impossible. This research has made the most out of the underlying survey’s small sample by playing to the strengths of the chosen method.

Another specific strength that this research possesses is the purity of comparison: this research applied a top-down approach as it enables the ‘purest’ drawing of inferences. Using this top-down approach also enabled the inclusion of control and explanatory variables which might not be ‘significant’ in a small sample quantitative research.

Despite its strengths, this research also has some limitations.²³ Firstly, even though purposive sampling does not demand a set number of participants – as mentioned in chapter three – the limited sample of the underlying survey hindered a complete and rich comparison. This limitation resulted in a fragile comparison and a vulnerability to outliers. The within region comparison of the Meru region was even excluded due to the extremely limited sample. Transferability was regarded not to be an issue in chapter three, however, good research still demands a certain amount of rigidity in order to at least be internally credible.

Secondly, this research was unable to account for the frequency of contact. Wu (2008) has investigated the mediating role of information sharing. His research confirmed that the more frequent repeated interaction between parties was, the more inclined parties were to share information. It was also confirmed that information sharing played a mediating role in the relationships between different dimensions of social capital. Therefore, it would have been useful and interesting to measure the frequency of contact as well.

Thirdly, although the underlying survey did distinguish between different types of organizations that respondents had contact with (i.e. number and diversity of ties), it did not delve into the quality and nature of these ties.

²³ The positive selection bias encountered in Ethiopia and the inaccessibility of Farmer Group age data are limitations that have been discussed in chapter three already and will not be repeated here due to space limitations.

This rendered investigation of the influence of specific ties impossible, other than signaling the prevalence of contact with certain organizations.

Fourthly, the unfamiliarity with the potential explanatory geographical and climatological variables limited the (meaningful) drawing of inferences in this research. Although it was beyond the scope of this research, it would have been useful to have accurate data on the geographical and climatological differences that are relevant in agricultural cultivation. More importantly, to what degree these factors influence the annual yield per hectare. This would purify the comparison within regions, between regions and between countries.

Understandably, the underlying survey did not provide adequate data on these topics which results in a limitation in this research.

Lastly, and less noteworthy, the underlying data did not contain any variables which indicate the current level of agricultural skills and knowledge. Although it is hard to effectively map the existing level of skills among smallholder farmers and the quality of their practices, one should keep in mind that said factors might influence performance. The report by Saka-Helmhout, Hofstede and Knobben (2017) presents country averages with regard to labor market quality, however, these national averages probably do not represent smallholder farmers accurately. Although both countries score similar on labor market quality, it would be ideal to have data on the agricultural skill level of (individual) smallholder farmers.

5.4. Future research directions

The mentioned limitations result in a number of potential future research directions. The first direction that could be explored is research that builds on the above 'pilot' framework. It should draw a bigger sample while attempting to acquire data on relevant explanatory variables. For example, the start and end of the wet season, as well as the average amount of seasonal rainfall could be reported and controlled for. Subsequently, the amount of sunny days and degree of soil fertility could be monitored and potentially controlled for. This results in more complete research. A bigger sample allows for purer comparison, as one can distinguish between respondent categories: each category should ideally contain respondents with access to the same generation of seed potatoes, which use a similar amount of fertilizer and belong to Farmer Groups of similar size. Even though the situational uniqueness should be kept in mind, it is best to compare differences in yield and social capital variables only under the rule of *ceteris paribus*.

Thus, qualitative comparisons between administrative zones, regions or even countries should ideally be made when data is available on all (or most) relevant explanatory and control variables. At the very least, one should strive to draw like-for-like comparisons as much as possible, as this allows for the drawing of unequivocal conclusions.

A second research direction would be to include bonding social capital, as it is the 'other half' of social capital. Ansari, Munir and Gregg (2012) state that leveraging in-group bonding social capital increases the likelihood of new capabilities being retained by a community. It would be interesting to compare the performance of network members that possess more in-group bonding social capital to network members that possess more out-group bridging social capital, in a specific BoP setting.

A third direction would be the investigation of different regions or even different countries, like Uganda. Other research, for example by Gildemacher et al. (2009a, 2009b & 2009c), has consistently included Uganda, as it is similar to Kenya and Ethiopia. It would be interesting to investigate the impact of bridging social capital on the seed potato value chain in Uganda, provided that the above requirements, which enable a like-for-like comparison, are met.

The last potential research direction is slightly different from the above two: it would be interesting to investigate individual farmers instead of those that are member of Farmer Groups, as the latter already possess a certain amount of (bonding) social capital via their Farmer Group. Individual smallholder farmers might be more 'on their own' than Farmer Group members are, which potentially amplifies the impact of bridging social capital when compared to other smallholder farmers. At the same time, it would be fascinating to investigate the differences in yield between individual farmers and Farmer Group members and their respective accrued social capital.

5.5. Reflection and consideration

Good research includes a paragraph where one reflects on his (or her) own influence on the data, including on how he/she may have introduced bias. This research used an underlying survey as primary data, resulting in a negligible influence on the raw data itself. Potential bias might have been introduced via the chosen method; although undersigned author has multiple years of experience in the strategic management field, this was the first time that qualitative social network analysis was conducted.

6. Conclusion

The last part of this research will contain the final conclusion that indicates whether or not the 'empirical puzzle' was solved. This research aimed to answer the following research question:

'Does bridging structural social capital of Farmer Group members active in the seed potato value chain have a positive effect on access to affordable quality yields in sub-Saharan Africa, specifically in Kenya and Ethiopia?'

After conceptualizing bridging structural social capital, two expectations have been stated with regard to its effect on the access to yield. These expectations connected network size and network diversity to performance:

Research expectation one: *Members of a seed potato Farmer Group in sub-Saharan Africa, more specifically Ethiopia and Kenya, benefit from having a large network since it leads to more yield per hectare.*

Research expectation two: *Members of a seed potato Farmer Group in sub-Saharan Africa, more specifically Ethiopia and Kenya, benefit from having a more diverse network since it leads to more yield per hectare.*

To fulfill the need for network analysis that Ansari, Munir and Gregg (2012) have mentioned, this research attempted to validate the above expectations by means of qualitative ego-centric network analysis. Owing to the top-down approach and a within region comparison, reasonably pure comparisons have been drawn: the Oromia region in Ethiopia and the Nayandarua region in Kenya were exemplary as their results confirmed the expectations that respondents that possessed a larger and more diverse network, in fact, did have a better yield per hectare.

On the other hand, the Bomet (and Meru) region(s) in Kenya and the Amhara region in Ethiopia exemplified the Achilles heel of this research: the small sample size. This limited sample size resulted in a fragile comparison within regions, as respondents had either too alike or too different network properties to enable a meaningful drawing of inferences.

Although theoretically sample size is not an issue when applying a purposive sampling method, it turned out to be a practical issue in this research.

Even if the small sample size is overlooked, one can question the validity in the 'confirmed' research expectations as multiple other factors potentially play a major (confounding) role. Some of these were not investigated in the underlying survey or beyond the scope of this research (e.g. the climatological and geographical differences relevant in agriculture); others have been investigated and were controlled for, but differed significantly within and between regions (e.g. the generation of seed potatoes and Farmer Group size). Increasing the sample size might solve the first issue, however, the second issue requires more than just an increase in sample size.

Thus, concluding that bridging structural social capital seems to have an observable positive effect would be too impulsive. On the one hand, it is uncertain whether said effect was due to a difference in social capital or due to other explanatory factor(s); on the other hand, the limited sample makes such conclusions fragile and premature. The results are too thin to regard the empirical puzzle to be solved. At the same time, some regions did not even provide results that allowed a confirmation of both research expectations, let alone provide results that allow for such an unequivocal conclusion. Certain outliers even contradicted the above research expectations, which – for now – leads to rejecting the above research expectations. Despite the fact that the analysis contained hints towards confirming both research expectations, one has to acquire a larger sample to credibly and unambiguously substantiate such a confirmation and the corresponding conclusion. One could state that the research limitations were in the way of a well-considered answer to the research question. Although the limited sample did not allow for an unequivocal conclusion with regard to the research question, it is not ruled out that such a positive effect exists. Future research could draw a richer sample and acquire data on all the relevant factors in order to draw meaningful conclusions, as there appears to be a solution for one of the numerous puzzles at the BoP.

This research has paved the way for such future qualitative social capital research in sub-Saharan Africa. The above empiric exploration has complemented Ansari, Munir and Gregg's (2012) research by answering their call, thereby creating network maps that identified

certain social capital flows. Nahapiet and Ghoshals's (1998) conceptual framework has been successfully applied to a specific agricultural setting at the sub-Saharan BoP.

At the same time, this research has attempted to identify focus points for upcoming agricultural value chain research in the area, as well as providing recommendations for managerial use.

This research could be regarded as the pioneering extension that transitioned social capital theory at the sub-Saharan BoP into practice. Throughout this research, it has become clear that value chain initiatives at the sub-Saharan BoP might achieve the desired improvements if adequate attention is paid to certain social capital dynamics.

References

- Adler, P. S., & Kwon, S. W. (2002). Social capital: Prospects for a new concept. *Academy of Management review*, vol. 27 (1), 17-40.
- Ahuja, G. (2000). Collaboration networks, structural holes, and innovation: A longitudinal study. *Administrative science quarterly*, vol. 45 (3), 425-455.
- Ansari, S., Munir, K. & Gregg, T. (2012). Impact at the 'bottom of the pyramid': the role of social capital in capability development and community empowerment. *Journal of Management Studies*, vol. 49 (4), 813-842.
- Baker, W.E. (1990). Market networks and corporate behavior. *American Journal of Sociology*, vol. 96 (3), 589-625.
- Bernard, H.R. (2011). *Research methods in anthropology: Qualitative and quantitative approaches*. Plymouth, UK: Alta Mira Press.
- Biemer, P. P., & Lyberg, L. E. (2003). *Introduction to survey quality*. Hoboken, NJ: John Wiley & Sons.
- Borgatti, S.P., Jones, C. & Everett, M.G. (1998). Network measures of social capital. *Connections*, vol. 21 (2), 27-36
- Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. *Science*, vol. 323 (5916), 892-895.
- Bourdieu, P. (1980). Le capital social: Notes provisoires. *Actes de la Recherche en Sciences Sociales*, vol. 31 (1), 2-3.
- Bourdieu, P. & Wacquant, L.J.D. (1992). *An invitation to Reflexive Sociology*. Chicago, IL: University of Chicago press.
- Boyle, S.E. (1968). Estimate of the Number and Size Distribution of Domestic Joint Subsidiaries, *Antitrust Law and Economics review*, vol. 1 (3), 81-92.
- Burt, R.S. (1983). Range. In R.S. Burt and M.J. Minor (Eds.), *Applied Network Analysis* (pp. 176-194). Beverly Hills, CA: Sage.
- Burt, R.S. (1992). The Social Structure of Competition. In R. Swedberg (Ed.), *Explorations in Economic Sociology* (pp. 65-104). New York, NY: Russell Sage Foundation.
- Burt, R.S. (1997). The Contingent Value of Social Capital. *Administrative Science Quarterly*, vol. 42 (2), 339-365.
- Burt, R.S. (2000). The network structure of social capital. *Research in Organizational Behaviour*, vol. 22, 345-423.

- Burt, R.S. (2001). Structural Holes versus Network Closure as Social Capital. In N. Lin, K. Cook and R. S. Burt (Eds.), *Social Capital: Theory and Research* (pp. 31-56). New Brunswick, NJ: Transaction Publishers.
- Carrington, P. J., Scott, J., & Wasserman, S. (Eds.), (2005). *Models and methods in social network analysis*. Cambridge University press.
- CIP (2009). International Potato Center: World Potato Atlas.
Retrieved from: <https://research.cip.cgiar.org/confluence/display/wpa/Ethiopia>
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science quarterly*, vol. 35 (1), 128-152.
- Coleman, J.S. (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, vol. 94 (supplement), 95-120.
- Collier, P., & Gunning, J. W. (1999). Explaining African economic performance. *Journal of economic literature*, vol. 37 (1), 64-111.
- Cresswell, J.W. & Plano Clark, V.L. (2011). *Designing and Conducting mixed method research*. Thousand Oaks, CA: Sage.
- Crissman, C., McArthur Crissman, L., & Carli, C. (1993). *Seed potato systems in Kenya: A case study*. Lima: International Potato Center.
- Davies, D., & Dodd, J. (2002). Qualitative research and the question of rigor. *Qualitative health research*, vol. 12 (2), 279-289.
- Dyer, J.H. & Nobeoka, K. (2000). Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal*, vol. 21 (3), 345-367.
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, vol. 5 (1), 1-4.
- Fafchamps, M. (2003). *Market institutions in sub-Saharan Africa: Theory and evidence*. Cambridge, MA: MIT press.
- Fafchamps, M., & Minten, B. (1999). Relationships and traders in Madagascar. *The Journal of Development Studies*, vol. 35 (6), 1-35.
- FAOSTAT (2000-2016). *Commodities per country*. Accessed on 01-17-2018.
Retrieved from: <http://www.fao.org/faostat/en/#data/QC>
- Fink, A. (2003a). *How to Sample in Surveys*. Thousand Oaks, CA: Sage.
- Fink, A. (2003b). *The Survey Handbook*. Thousand Oaks, CA: Sage.

- Fischer, E., & Qaim, M. (2012). Linking smallholders to markets: determinants and impacts of farmer collective action in Kenya. *World Development*, vol. 40 (6), 1255-1268.
- Flap, H. (2002). No man is an island: the research programme of a social capital theory. *Conventions and Structures in Economic Organisations: Markets and Hierarchies*. Cheltenham: Edward Elgar.
- Gildemacher, P.R., Demo, P., Barker, I., Kaguongo, W., Woldegiorgis, G., Wagoire, W.W., ... & Struik, P.C. (2009a). A description of seed potato systems in Kenya, Uganda and Ethiopia. *American journal of potato research*, vol. 86 (5), 373-382.
- Gildemacher, P.R., Kaguongo, W., Ortiz, O., Tesfaye, A., Woldegiorgis, G., Wagoire, W.W., ... & Leeuwis, C. (2009b). Improving potato production in Kenya, Uganda and Ethiopia: a system diagnosis. *Potato Research*, vol. 52 (2), 173-205.
- Gildemacher, P., Maina, P., Nyongesa, M., Kinyae, P., Woldegiorgis, G., Lema, Y., ... & Musoke, C. (2009c). Participatory analysis of the potato knowledge and information system in Ethiopia, Kenya and Uganda. *Innovation Africa: Enriching farmers' livelihoods*, 153-165.
- Gitell, R. & Vidal, A. (1998). *Community Organizing: Building Social Capital as a Development Strategy*. Newbury Park, CA: Sage.
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, vol. 8 (4), 597-606
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, vol. 78(6), 1360-1380.
- Granovetter, M.S. (1976). Network Sampling: Some First Steps. *American Journal of Sociology*, vol. 81 (6), 1287-1303.
- Granovetter, M.S. (1983). The strength of weak ties: A network theory revisited. *Sociological theory*, vol. 1, 201-233.
- Granovetter, M.S. (1985). Economic action and social structure: The problem of embeddedness. *American journal of Sociology*, vol. 91 (3), 481-510.
- Grootaert, C., & Van Bastelaer, T. (Eds.), (2002). *The role of social capital in development: An empirical assessment*. Cambridge University Press.
- Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Technology Research and Development*, vol. 29 (2), 75-91.
- Guillemois, D. (2013). The use of social network theory in value chain analysis. In *2013 AAAE Fourth International Conference, September 22-25, 2013, Hammamet, Tunisia* (No. 159703). African Association of Agricultural Economists (AAAE).

- Hanneman, R.A. & Riddle, M. (2005). *Introduction to Social Network Methods*.
Retrieved from:
https://www.researchgate.net/profile/Robert_Hanneman/publication/235737492_Introduction_to_Social_Network_Methods/links/0deec52261e1577e6c000000/Introduction-to-Social-Network-Methods.pdf
- Hanneman, R.A & Riddle, M. (2011). Concepts and Measures for Basic Network Analysis. In J. Scott, & P.J. Carrington (Eds.), *The SAGE Handbook of Social Network Analysis* (pp. 340-369). London: Sage.
- Hansen, M. T. (1998). *Combining network centrality and related knowledge: Explaining effective knowledge sharing in multiunit firms*. Division of Research, Harvard Business School.
- Hansen, M. T. (1999). The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. *Administrative Science quarterly*, vol. 44 (1), 82-111.
- Hirpa, A., Meuwissen, M. P. M., Lommen, W. J. M., Lansink, A. O., Tsegaye, A., & Struik, P. C. (2016). Improving seed potato quality in Ethiopia: a value chain perspective. In *Quality and innovation in food chains: Lessons and insights from Africa* (pp. 84-122). Wageningen Academic Publishers.
- Hirpa, A., Meuwissen, M. P., Tesfaye, A., Lommen, W. J., Lansink, A. O., Tsegaye, A., & Struik, P. C. (2010). Analysis of seed potato systems in Ethiopia. *American journal of potato research*, vol. 87 (6), 537-552.
- Hoeffler, H. (2006). 'Promoting the Kenyan potato value chain: Can contract farming help build trust and reduce transaction risks', *paper presented at the 99th EAAE Seminar on Trust and Risks in Business Networks*, Bonn, Germany, 8-10 February.
- Hollstein, B. (2011). Qualitative Approaches. In J. Scott, & P.J. Carrington (Eds.), *The SAGE Handbook of Social network Analysis* (pp. 405-416). London: Sage.
- Hoyle, R. H., Harris, M. J., & Judd, C. M. (2002). *Research Methods in Social Relations*. Belmont, CA: Thomson Learning.
- Inkpen, A.C. & Tsang, E.W. (2005). Social capital, networks, and knowledge transfer. *Academy of Management review*, vol. 30 (1), 146-165.
- Janssens, S.R.M., Wiersema, S.G., Goos, H. & Wiersma, W. (2013). *The value chain for seed and ware potatoes in Kenya: Opportunities for development*. Research report: Wageningen University
- Jarosz, L. (2000). Understanding agri-food networks as social relations. *Agriculture and human values*, vol. 17 (3), 279-283.

- Johnson, S. (2007). SC Johnson builds business at the base of the pyramid. *Global Business and Organizational Excellence*, vol. 26 (6), 6-17.
- Ketema, K., Deressa, H., Ketema, M., Dechassa, N. & Amanu, T. (2015). Potato Value Chain Analysis in Eastern Ethiopia. In E. Eyasu & C.L. van Beek (Eds.), *Scaling Innovations and Agricultural Best Practices in Ethiopia: Experiences and Challenges. Proceedings of the CASCAPE National Stakeholder Conference, 23-24 April 2014, Addis Ababa, Ethiopia* (pp. 255-264). CASCAPE Project, Wageningen University and Research Centre (WUR), Wageningen, The Netherlands.
- Kherallah, M., & Kirsten, J. F. (2002). The new institutional economics: applications for agricultural policy research in developing countries. *Agrekon*, vol. 41 (2), 110-133.
- Kirk, J., & Miller, M. L. (1986). *Reliability and validity in qualitative research*. Beverly Hills, CA: Sage.
- Knoke, D. & Yang, S. (2008). *Social network analysis*. London: Sage.
- Kolk, A., Rivera-Santos, M., & Rufín, C. (2014). Reviewing a decade of research on the “base/bottom of the pyramid” (BOP) concept. *Business & Society*, vol. 53 (3), 338-377.
- Krackhardt, D. (1992). The Strength of Strong Ties: The Importance of *Philos* in Organizations. In N. Nohria & R.G. Eccles (Eds.), *Networks and Organizations: Structure, Form and Action* (pp. 216-239). Cambridge, MA: Harvard Business School Press.
- Krackhardt, D., & Hanson, J. R. (1993). Informal networks: The Company behind the chart. *Harvard business review*, vol. 71 (4), 104-111.
- Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care*, vol. 4 (3), 324-327.
- Lin, N. (1982). Social Resources and Instrumental Action. In N. Lin & P.V. Marsden (Eds.), *Social Structure and Network Analysis* (pp. 131-145). Beverly Hills, CA: Sage.
- Lin, N. (1999). Building a Network Theory of Social Capital. *Connections*, vol. 22 (1), 28-51.
- Lin, N. (2002). *Social capital: A theory of social structure and action*. Cambridge university press.
- Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.
- Litwin, M.S. (1995). *How to Measure Survey Reliability and Validity*. Thousand Oaks, CA: Sage.
- London, T., & Hart, S. L. (2004). Reinventing strategies for emerging markets: beyond the transnational model. *Journal of International Business studies*, vol. 35 (5), 350-370.

- Lorenzoni, G., & Lipparini, A. (1999). The leveraging of interfirm relationships as a distinctive organizational capability: a longitudinal study. *Strategic Management Journal*, vol. 20 (4) 317-338.
- Maier, N. A., McLaughlin, M. J., Heap, M., Butt, M., & Smart, M. K. (2002). Effect of nitrogen source and calcitic lime on soil pH and potato yield, leaf chemical composition, and tuber cadmium concentrations. *Journal of Plant Nutrition*, vol. 25 (3), 523-544.
- Marsden, P.V. (2005). Recent Developments in Network Measurement. In P.J. Carrington, J. Scott & S. Wasserman (Eds.), *Models and Methods in Social Network Analysis* (pp. 8-30). Cambridge University press.
- Marsden, P.V. (2011). Survey Methods for Network Data. In J. Scott & P.J. Carrington (Eds.), *The SAGE Handbook of Social network Analysis* (pp. 370-388). London: Sage.
- McEvily, B., & Zaheer, A. (1999). Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic management Journal*, vol. 20 (12), 1133-1156.
- Meadows, L. & Morse, J.M. (2001). Constructing evidence within the qualitative project. In J.M. Morse, J. Swanson & A. Kuzel (Eds.), *The nature of evidence in qualitative inquiry* (pp. 187-202), Thousand Oaks, CA: Sage.
- Minten, B., & Fafchamps, M. (1999). Social capital and the firm: evidence from agricultural trade. *Department of Economics, Stanford University*.
- Morgan, D. L., Neal, M. B., & Carder, P. (1996). The stability of core and peripheral networks over time. *Social networks*, vol. 19 (1), 9-25.
- Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification strategies for establishing reliability and validity in qualitative research. *International Journal of Qualitative methods*, vol. 1 (2), 13-22.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management review*, vol. 23 (2), 242-266.
- Narayan, D., & Cassidy, M. F. (2001). A dimensional approach to measuring social capital: development and validation of a social capital inventory. *Current sociology*, vol. 49 (2), 59-102.
- Narayan, D. (2002). Bonds and bridges: social capital and poverty. In J. Isham, T. Kelly & S. Ramaswamy (Eds.), *Social Capital and Economic Development: well-being in developing countries* (pp. 58-81). Northampton, MA: Edward Elgar.
- van Oort, P. A. J., Timmermans, B. G. H., Meinke, H., & Van Ittersum, M. K. (2012). Key weather extremes affecting potato production in The Netherlands. *European Journal of Agronomy*, vol. 37 (1), 11-22.

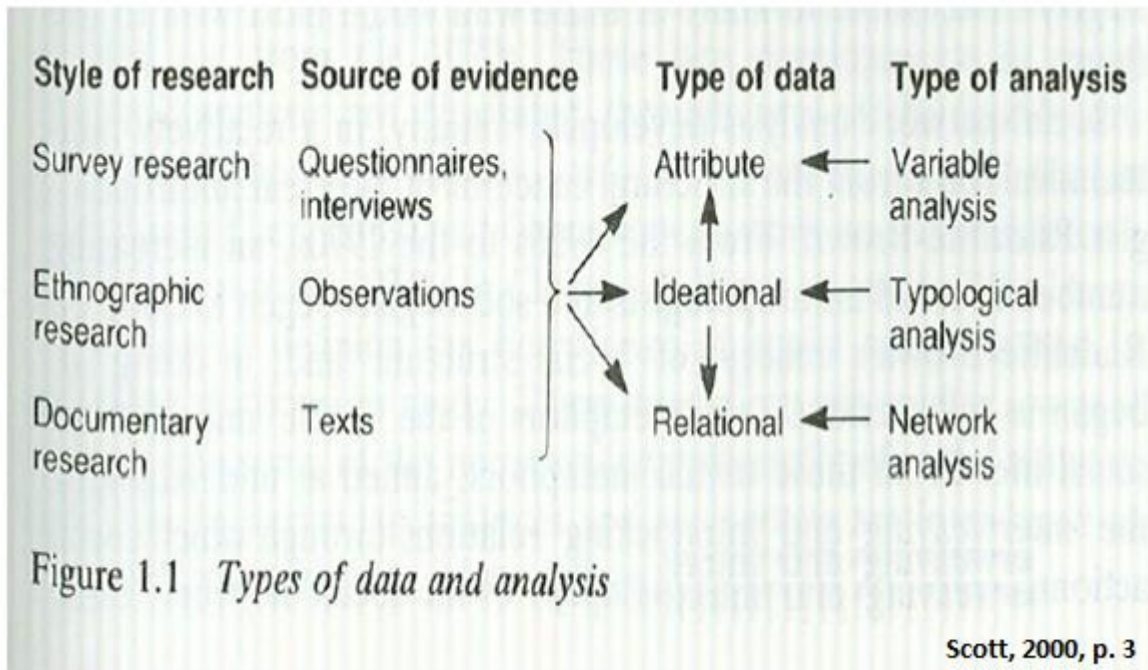
- Pereira, A. B., Nova, V., Augusto, N., Ramos, V. J., & Pereira, A. R. (2008). Potato potential yield based on climatic elements and cultivar characteristics. *Bragantia*, vol. 67 (2), 327-334.
- Portes, A. (1996). Unsolved Mysteries: The Tocqueville Files II. *The American Prospect*, vol. 7 (26).
- Portes, A. (1998). Social Capital: Its Origins and Applications in Modern Sociology. *Annual Review of Sociology*, vol. 24 (1), 1-24.
- Powell, W.W. & Brantley, P. (1992). Competitive Cooperation in Biotechnology: Learning through Networks? In N. Nohria & R.G. Eccles (Eds.), *Networks and Organizations: Structure, Form and Action* (pp. 366-394). Cambridge, MA: Harvard Business School Press.
- Prahalad, C. K., & Hammond, A. (2002). Serving the world's poor, profitably. *Harvard business review*, vol. 80 (9), 48-59.
- Prahalad, C. K., & Hart, S. L. (2002). The Fortune at the Bottom of the Pyramid in *Strategy+ Business*, vol. 26 (First Quarter), 2-14.
- Provan, K. G., Fish, A., & Sydow, J. (2007). Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management*, vol. 33 (3), 479-516.
- Putnam, R. D. (1993). The prosperous community: social capital and public life. *The American prospect*, vol. 4 (13), 35-42.
- Putnam, R.D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy*, vol. 6 (1), 65-78.
- Putnam, R.D. (2001). Social capital: Measurement and consequences. *Canadian Journal of Policy Research*, vol. 2 (1), 41-51.
- Rahman, M. S., Akanda, A. M., Mian, I. H., Bhuiyan, M. K. A., & Karim, M. R. (2010). Growth and yield performance of different generations of seed potato as affected by PVY and PLRV. *Bangladesh Journal of Agricultural Research*, vol. 35 (1), 37-50.
- Rivera-Santos, M., & Rufín, C. (2010). Global village vs. small town: Understanding networks at the Base of the Pyramid. *International Business Review*, vol. 19 (2), 126-139.
- Rudestam, K. E., & Newton, R. R. (2014). *Surviving your dissertation: A comprehensive guide to content and process*. Sage Publications.
- Saka-Helmhout, A., Hofstede, H. & Knobben, J. (2017). *The Effectiveness of Networks in Seed Potato Sector Development in sub-Saharan Africa*. Nijmegen, the Netherlands: Radboud University, Nijmegen School of Management.

- Sandefur, R. L., & Laumann, E. O. (1998). A paradigm for social capital. *Rationality and society*, vol. 10 (4), 481-501.
- Schepis, D. (2011). Social Network Analysis from a Qualitative Perspective. Conference Paper, ANZMAC.
Retrieved from:
https://www.researchgate.net/profile/Daniel_Schepis/publication/311614546_Social_Network_Analysis_from_a_Qualitative_Perspective/links/5850f34e08ae8f37381949cb/Social-Network-Analysis-from-a-Qualitative-Perspective.pdf
- Scott, J. (2000). *Social Network Analysis: a handbook*. London: Sage.
- Scott, J. & Carrington, P.J. (2011). *The SAGE Handbook of Social Network Analysis*. London: Sage.
- Seale, C. (1999). Quality in qualitative research. *Qualitative inquiry*, vol. 5 (4), 465-478.
- Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, vol. 22 (2), 63-75.
- Siisiäinen, M. (2000). Two Concepts of Social Capital: Bourdieu vs. Putnam. *International Journal of Contemporary Sociology*, vol. 40 (2), 183-204.
- Small, M. L. (2009). How many cases do I need?' On science and the logic of case selection in field-based research. *Ethnography*, vol. 10 (1), 5-38.
- Stam, W., Arzlanian, S., & Elfring, T. (2014). Social capital of entrepreneurs and small firm performance: A meta-analysis of contextual and methodological moderators. *Journal of Business Venturing*, vol. 29 (1), 152-173.
- Stenbacka, C. (2001). Qualitative research requires quality concepts of its own. *Management decision*, vol. 39 (7), 551-556.
- Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *Academy of management Journal*, vol. 41 (4), 464-476.
- Uphoff, N., & Wijayarathna, C. M. (2000). Demonstrated benefits from social capital: the productivity of farmer organizations in Gal Oya, Sri Lanka. *World development*, vol. 28 (11), 1875-1890.
- Uzzi, B. (1997). Social structure and competition in interfirm networks: The paradox of embeddedness. *Administrative Science quarterly*, vol. 42 (1), 35-67.
- Wageningen UR (2013). Seed Potato Development in Kenya – Phase II of the public-private support project: Introductory note.
Retrieved from:
<http://www.wur.nl/en/show/Seed-Potato-Development-in-Kenya.html>

- Walker, G., Kogut, B., & Shan, W. (1997). Social capital, structural holes and the formation of an industry network. *Organization science*, vol. 8 (2), 109-125.
- Wambugu, S. N., Okello, J. J., Nyikal, R. A., & Shiferaw, B. (2009, August). Effect of social capital on performance of smallholder producer organizations: the case of groundnut growers in Western Kenya. *International Association of Agricultural Economists Conference* (pp. 16-22).
- Wasserman, S., & Faust, K. (1994). *Social network analysis: Methods and Applications*. Cambridge university press.
- Wheeler, D., McKague, K., Thomson, J., Davies, R., Medalye, J., & Prada, M. (2005). Creating sustainable local enterprise networks. *MIT Sloan Management Review*, vol. 47 (1), 33.
- White, K., & Watkins, S. C. (2000). Accuracy, stability and reciprocity in informal conversational networks in rural Kenya. *Social Networks*, vol. 22 (4), 337-355.
- Winter, G. (2000). A Comparative Discussion of the Notion of 'Validity' in Qualitative and Quantitative Research. *The Qualitative Report*, 4(3).
- Woolcock, M. (1998). Social capital and economic development: Toward a theoretical synthesis and policy framework. *Theory and society*, vol. 27 (2), 151-208.
- Woolcock, M., & Narayan, D. (2000). Social capital: Implications for development theory, research, and policy. *The World Bank research observer*, vol. 15 (2), 225-249.
- World Bank (2017). World Development Indicators database; Gross Domestic Product per capita at purchasing power parity.
Retrieved from:
<http://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?view=chart>,
- Wu, W. P. (2008). Dimensions of social capital and firm competitiveness improvement: The mediating role of information sharing. *Journal of management studies*, vol. 45 (1), 122-146.
- Yilma, S. (1989). The potential of true potato seeds in potato production in Ethiopia. In *International Symposium on Horticultural Economics in Developing Countries* 270 (pp. 389-394).

Appendices

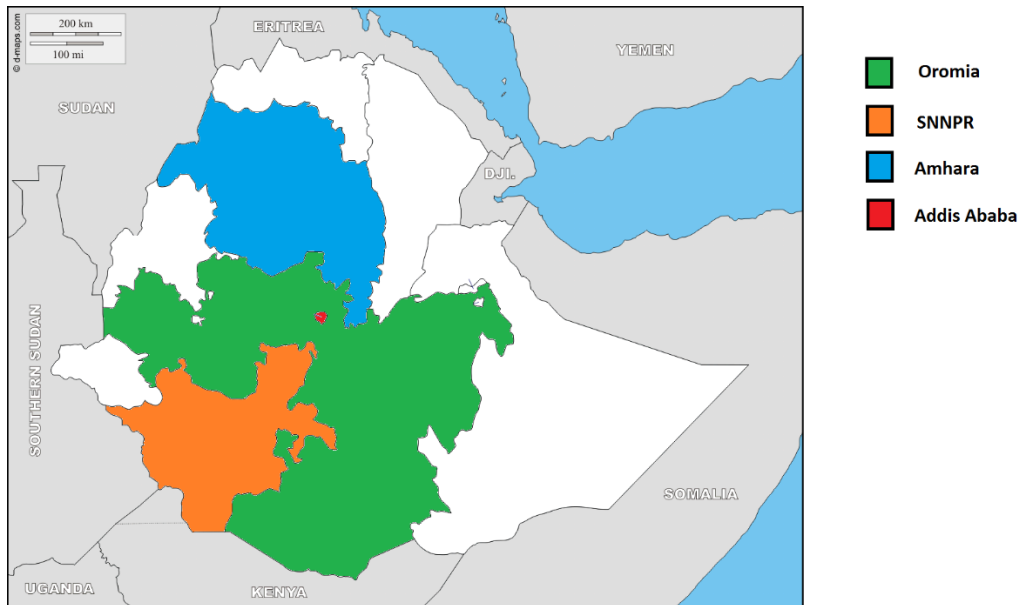
Appendix A. Scott's types of data and analysis



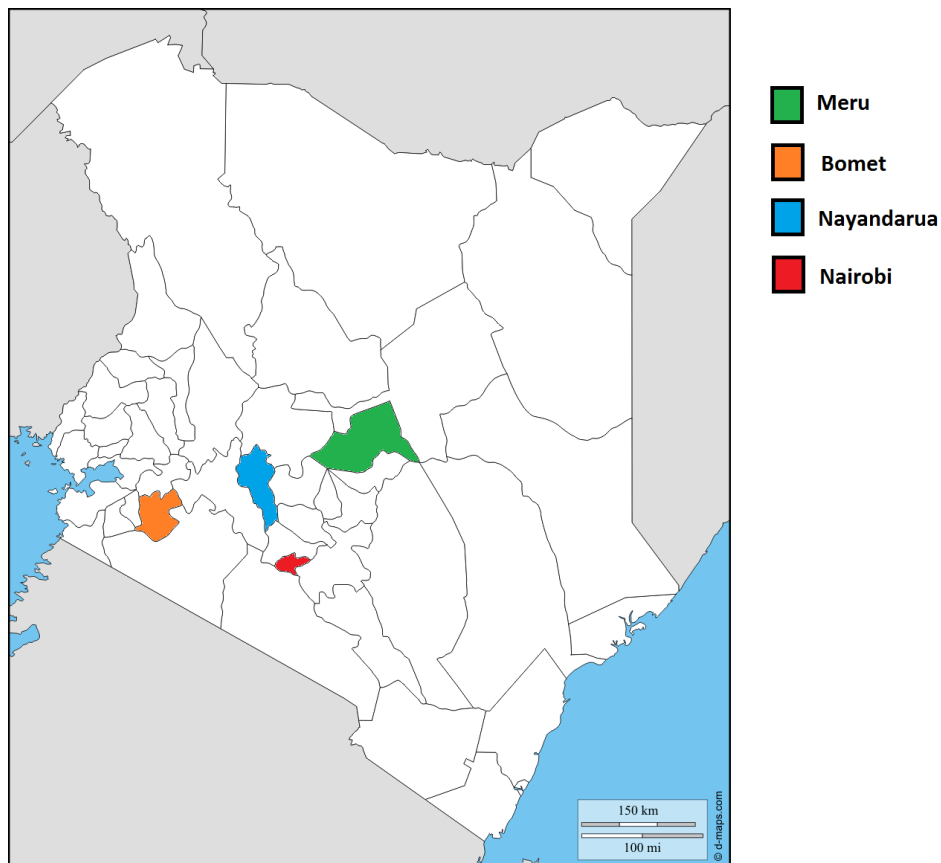
SCOTT, 2000, P. 3

Appendix B. Maps of the relevant regions in Ethiopia and Kenya

Ethiopia²⁴:



Kenya²⁵:



²⁴ Both blank maps were obtained from www.d-maps.com and all rights belong to the respective owners. This particular map is obtained from http://d-maps.com/carte.php?num_car=4258&lang=en. Highlights were not present but were added for the sake of clarification.

²⁵ Obtained from http://d-maps.com/carte.php?num_car=236&lang=en

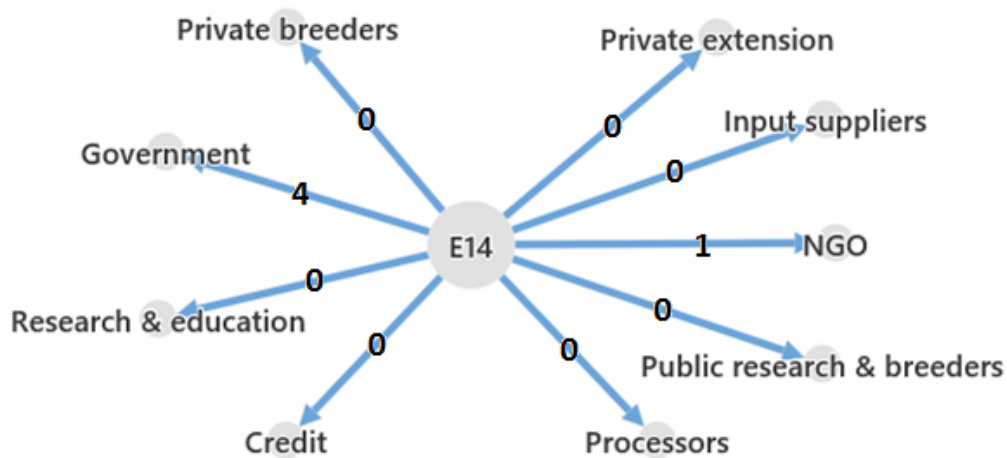
Appendix C. Guba's conceptualization of trustworthiness

TABLE 1
Scientific and Naturalistic Terms Appropriate to the Four Aspects of Trustworthiness

<i>Aspect</i>	<i>Scientific Term</i>	<i>Naturalistic Term</i>
Truth Value	Internal Validity	Credibility
Applicability	External Validity Generalizability	Transferability
Consistency	Reliability	Dependability
Neutrality	Objectivity	Confirmability

GUBA (1981), P. 80

Appendix D. Ego-centric networks – Ethiopia



Ethiopia

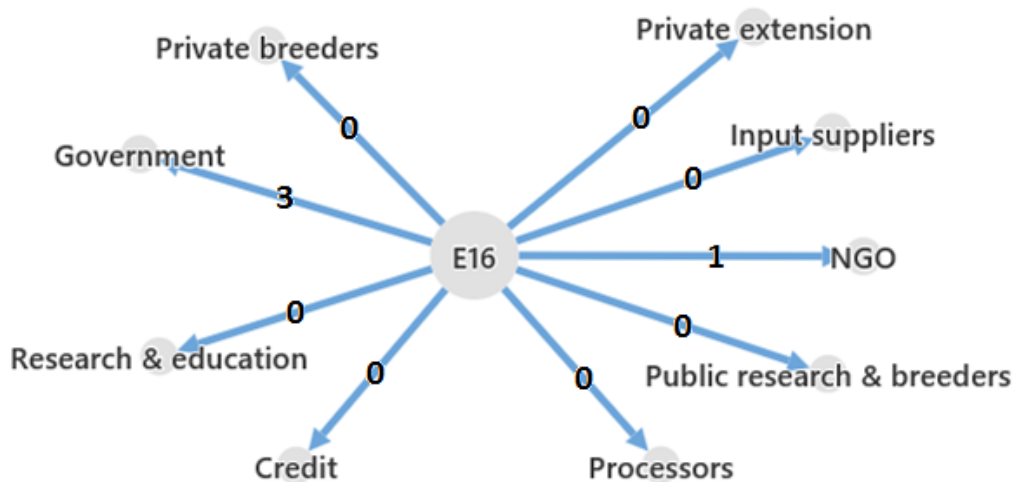
SNNPR; Gamo Gofa - Chench. Doko Danbo
Respondent E14
Small seed potato farmer group

Non-material exchange relations

Network size: **5**
Network diversity: **2**
Average yield (kg/Ha)
Per season between 2014-2016: **1.78**

Control variables

Farmer Group size: 80
Potato generation: 6



Ethiopia

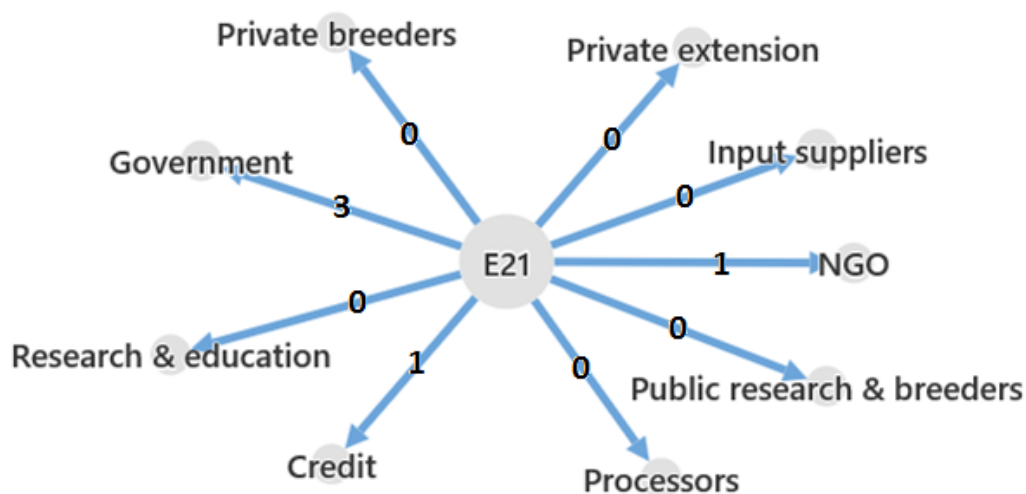
SNNPR; Gamo Gofa - Dita. Koda
Respondent E16
Small seed potato farmer group

Non-material exchange relations

Network size: **4**
Network diversity: **2**
Average yield (kg/Ha)
Per season between 2014-2016: **6.45**

Control variables

Farmer Group size: 69
Potato generation: 5



Ethiopia

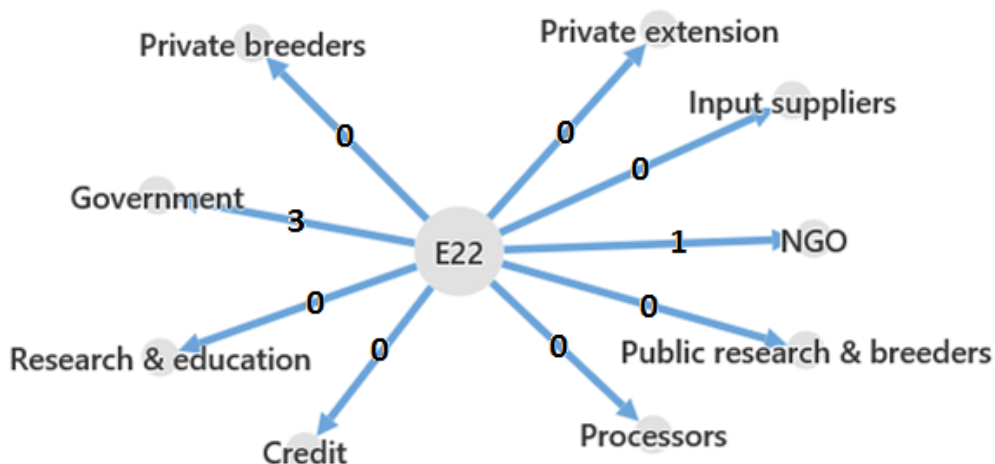
SNNPR; Gamo Gofa - Chench. Yoyera
Respondent E21
Small seed potato farmer group

Non-material exchange relations

Network size: **5**
Network diversity: **3**
Average yield (kg/Ha)
Per season between 2014-2016: **7**

Control variables

Farmer Group size: 85
Potato generation: 10.5



Ethiopia

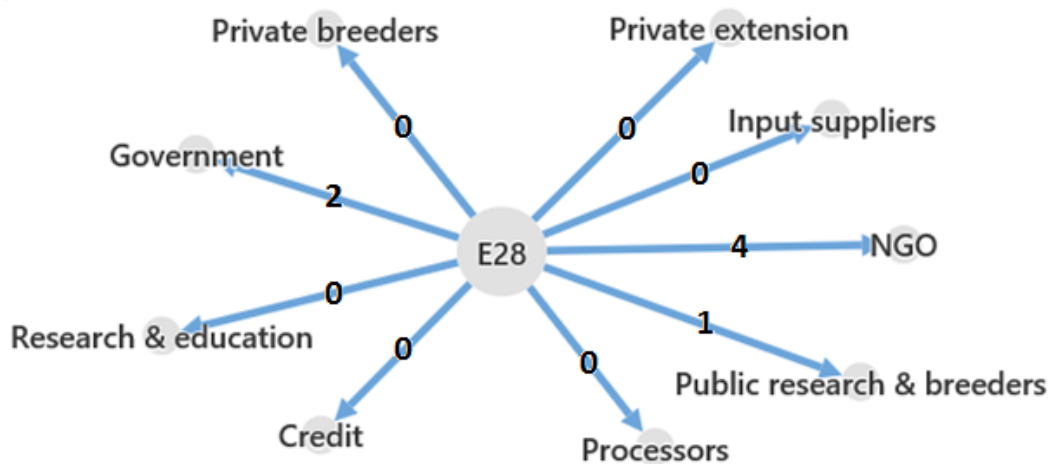
SNNPR; Gamo Gofa - Chench. Dalona Zara
Respondent E22
Small seed potato farmer group

Non-material exchange relations

Network size: **4**
Network diversity: **2**
Average yield (kg/Ha)
Per season between 2014-2016: **5.80**

Control variables

Farmer Group size: 47
Potato generation: 2



Ethiopia

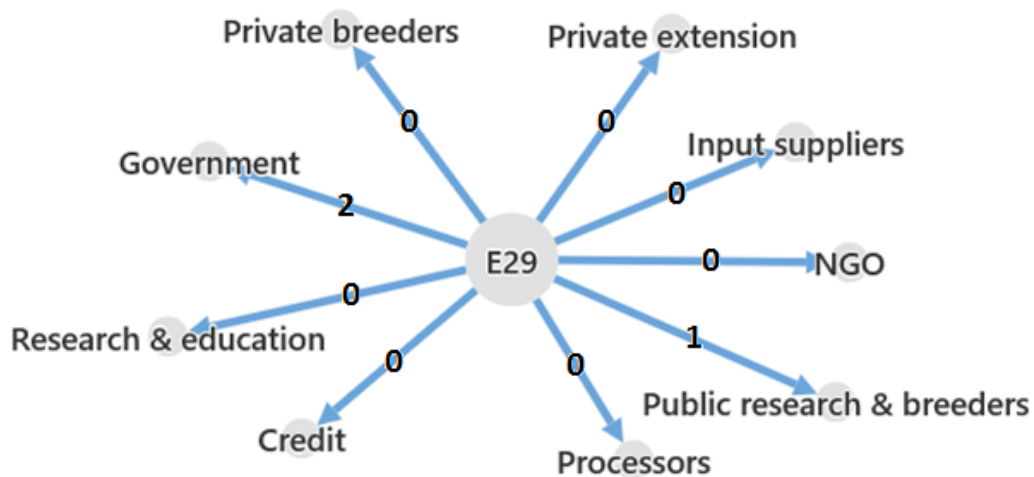
Oromia; West Shewa - Jeldu
Respondent E28
Small seed potato farmer group

Non-material exchange relations

Network size: 7
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: 30.19

Control variables

Farmer Group size: 15
Potato generation: 3.5



Ethiopia

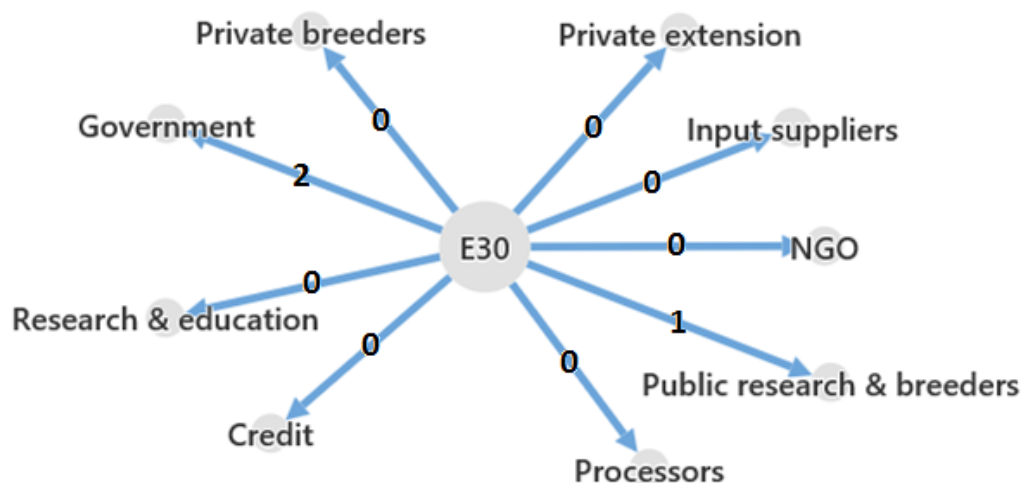
Oromia; West Shewa - Jeldu
Respondent E29
Small seed potato farmer group

Non-material exchange relations

Network size: 3
Network diversity: 2
Average yield (kg/Ha)
Per season between 2014-2016: 30

Control variables

Farmer Group size: 39
Potato generation: 3.5



Ethiopia

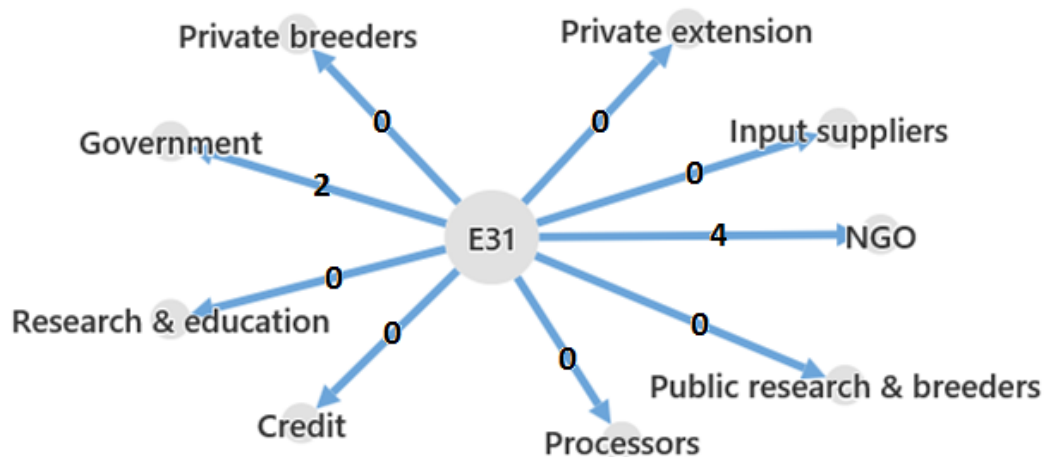
Oromia; West Shewa - Jeldu
Respondent E30
Small seed potato farmer group

Non-material exchange relations

Network size: **3**
Network diversity: **2**
Average yield (kg/Ha)
per season between 2014-2016: **30**

Control variables

Farmer Group size: 32
Potato generation: 3.5



Ethiopia

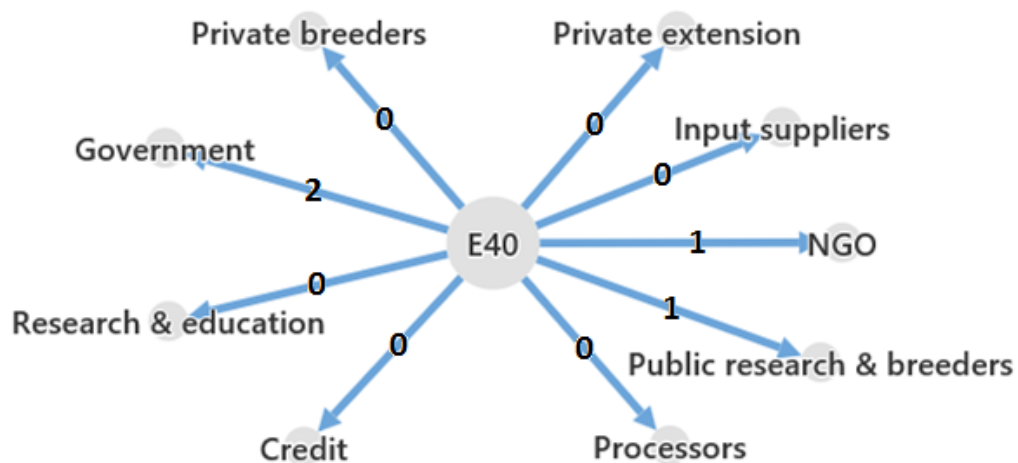
Oromia; West Shewa - Jeldu
Respondent E31
Small seed potato farmer group

Non-material exchange relations

Network size: **6**
Network diversity: **2**
Average yield (kg/Ha)
Per season between 2014-2016: **32.62**

Control variables

Farmer Group size: 9
Potato generation: 3.5



Ethiopia

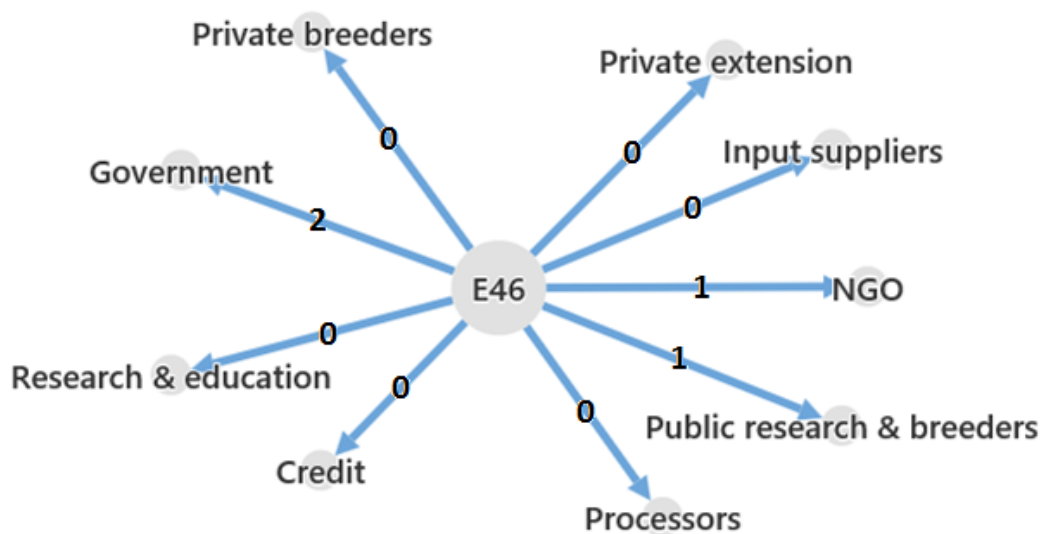
Amhara; South Gondar - Farta. Ata
Respondent E40
Small seed potato farmer group

Non-material exchange relations

Network size: 4
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: **5.88**

Control variables

Farmer Group size: 51
Potato generation: 1.5



Ethiopia

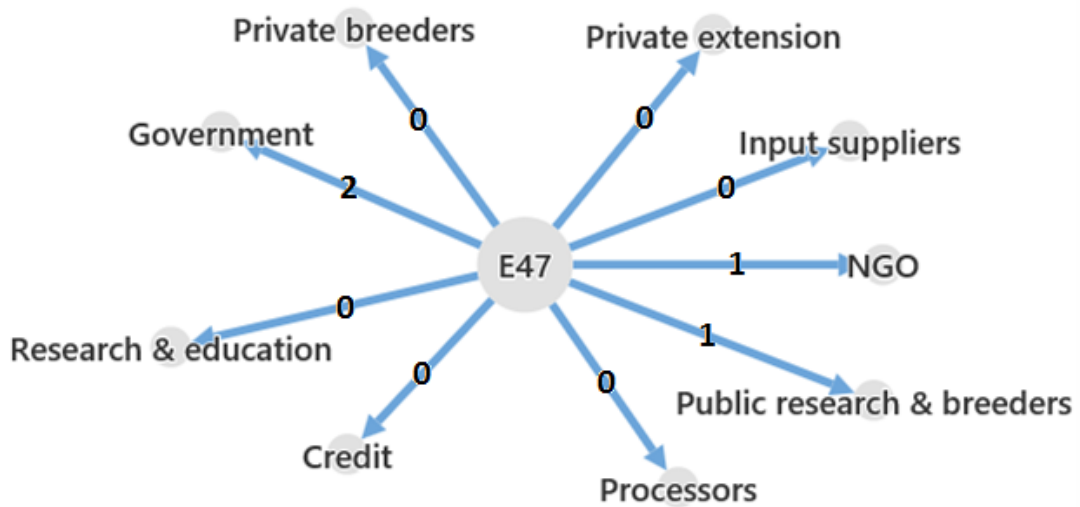
Amhara; South Gondar - Farta. Arga
Respondent E46
Small seed potato farmer group

Non-material exchange relations

Network size: 4
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: **19.50**

Control variables

Farmer Group size: 52
Potato generation: 1.5



Ethiopia

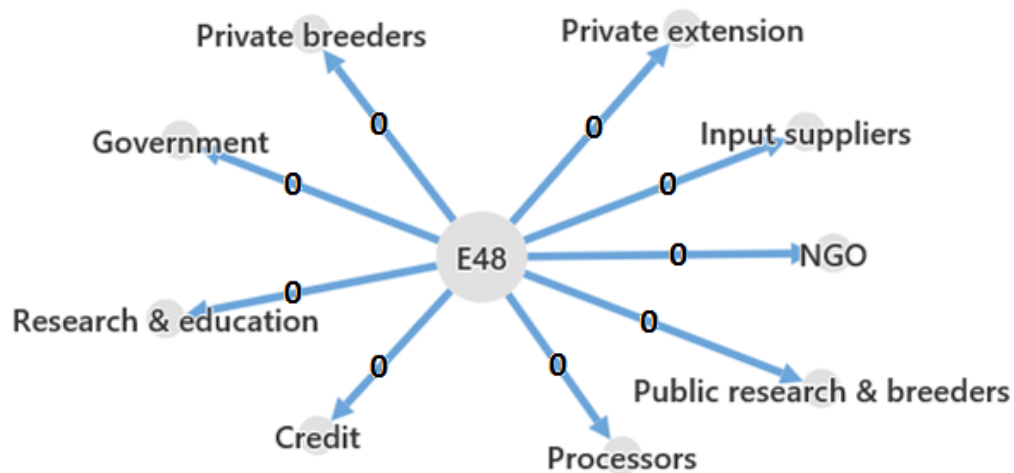
Amhara; South Gondar - Lay Gayint 09
Respondent E47
Small seed potato farmer group

Non-material exchange relations

Network size: 4
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: **13.24**

Control variables

Farmer Group size: 41
Potato generation: 1.5



Ethiopia

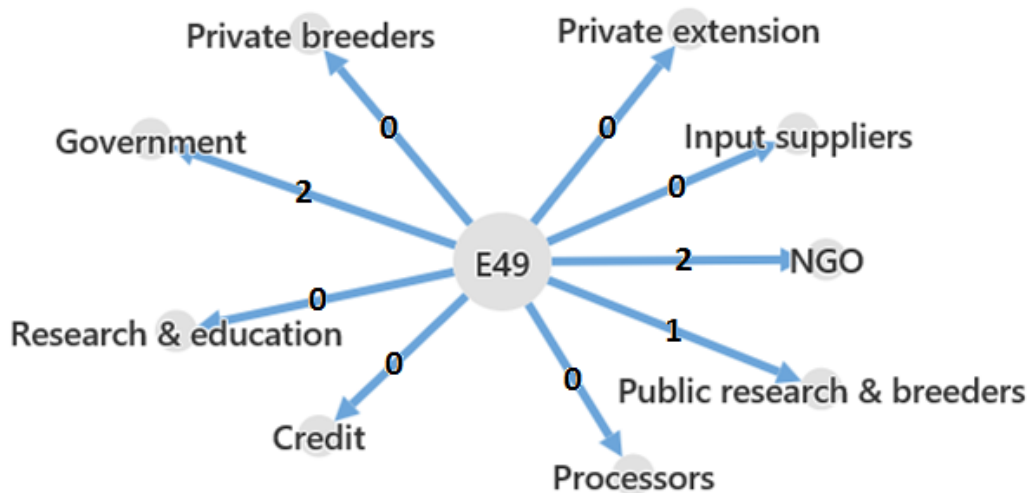
Amhara; South Gondar - Lay Gayint 13
Respondent E48
Small seed potato farmer group

Non-material exchange relations

Network size: 0
Network diversity: 0
Average yield (kg/Ha)
Per season between 2014-2016: **18.70**

Control variables

Farmer Group size: 42
Potato generation: 1.5



Ethiopia

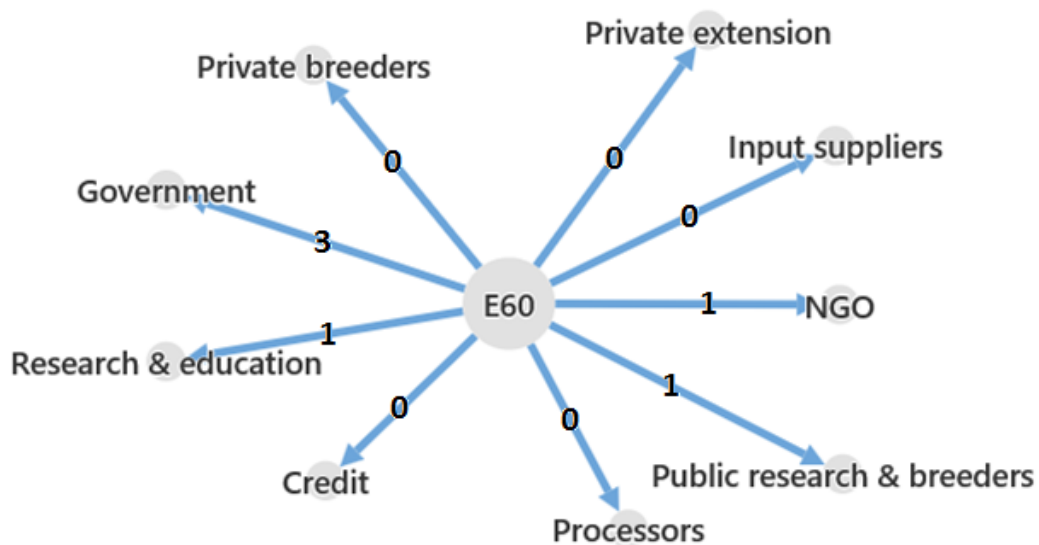
Amhara; South Gondar - Lay Gayint 01
Respondent E49
Small seed potato farmer group

Non-material exchange relations

Network size: 5
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: 13.22

Control variables

Farmer Group size: 325
Potato generation: 5



Ethiopia

Oromia; West Shewa - Jeldu. Chalengo
Respondent E60
Small seed potato farmer group

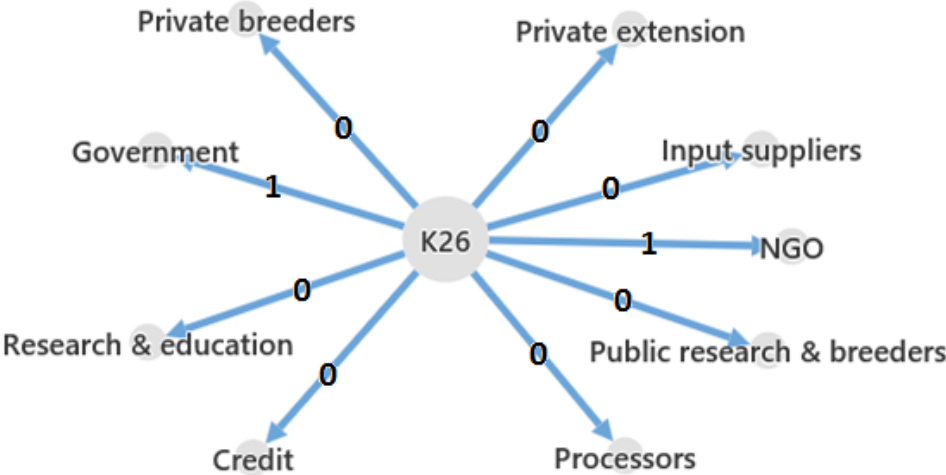
Non-material exchange relations

Network size: 6
Network diversity: 4
Average yield (kg/Ha)
Per season between 2014-2016: 35.13

Control variables

Farmer Group size: 65
Potato generation: 3

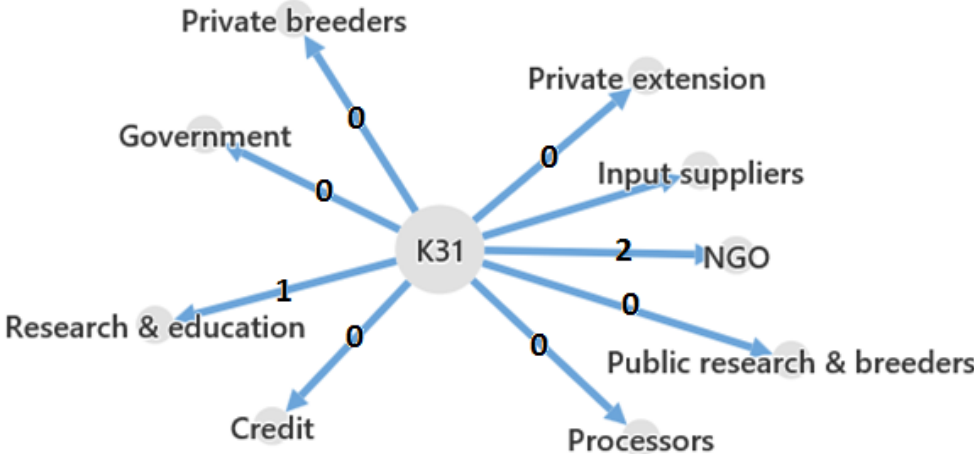
Appendix E. Ego-centric networks – Kenya



Kenya
 Meru - Meru Central
 Respondent K26
 Small seed potato farmer group

Non-material exchange relations
 Network size: 2
 Network diversity: 2
 Average yield (kg/Ha)
 Per season between 2014-2016: 11.25

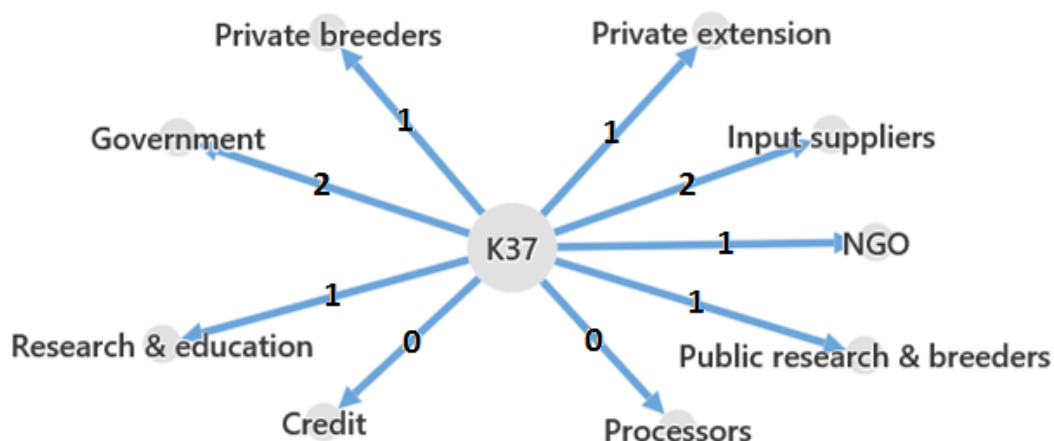
Control variables
 Farmer Group size: 25
 Potato generation: 3



Kenya
 Meru-Buuri; Timau ward
 Respondent K31
 Small seed potato farmer group

Non-material exchange relations
 Network size: 3
 Network diversity: 2
 Average yield (kg/Ha)
 Per season between 2014-2016: 5.71

Control variables
 Farmer Group size: 32
 Potato generation: 3.5



Kenya

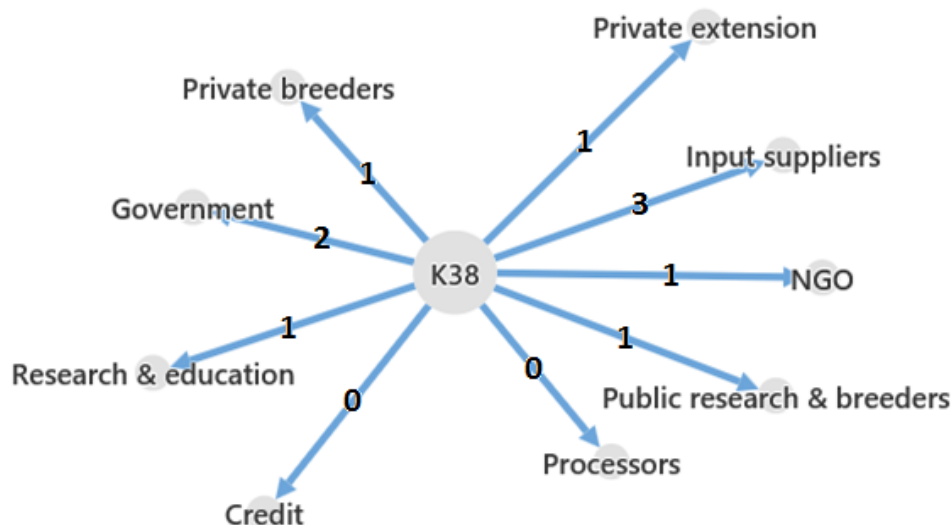
Nayandarua-Ol Kalou; Rurii ward
Respondent K37
Small seed potato farmer group

Non-material exchange relations

Network size: **9**
Network diversity: **7**
Average yield (kg/Ha)
Per season between 2014-2016: **5.5**

Control variables

Farmer Group size: 20
Potato generation: 1



Kenya

Nayandarua-Ol Kalou; Kanjuiri ward
Respondent K38
Small seed potato farmer group

Non-material exchange relations

Network size: **10**
Network diversity: **7**
Average yield (kg/Ha)
per season between 2014-2016: **15**

Control variables

Farmer Group size: 10
Potato generation: 1.5



Kenya

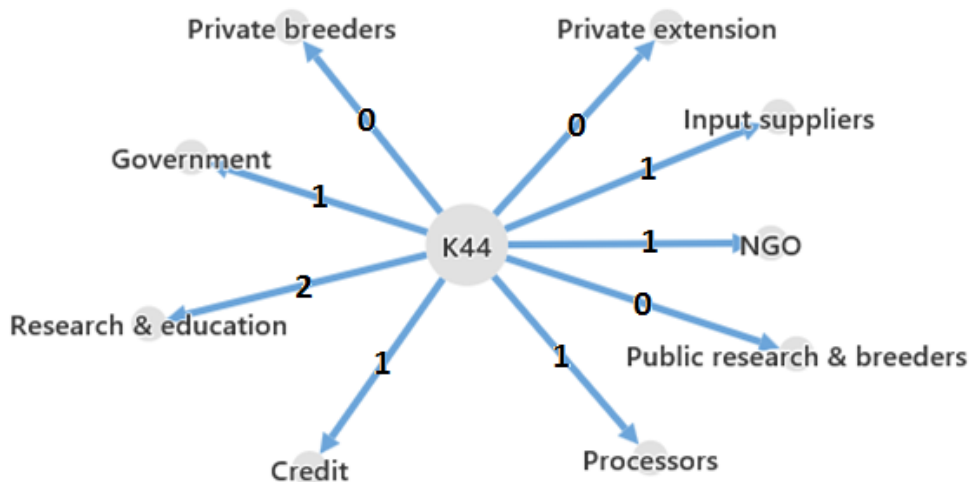
Nayandarua-Kipipiri; Wanjohi ward
Respondent K39
Small seed potato farmer group

Non-material exchange relations

Network size: 0
Network diversity: 0
Average yield (kg/Ha)
Per season between 2014-2016: 4.4

Control variables

Farmer Group size: 25
Potato generation: 1



Kenya

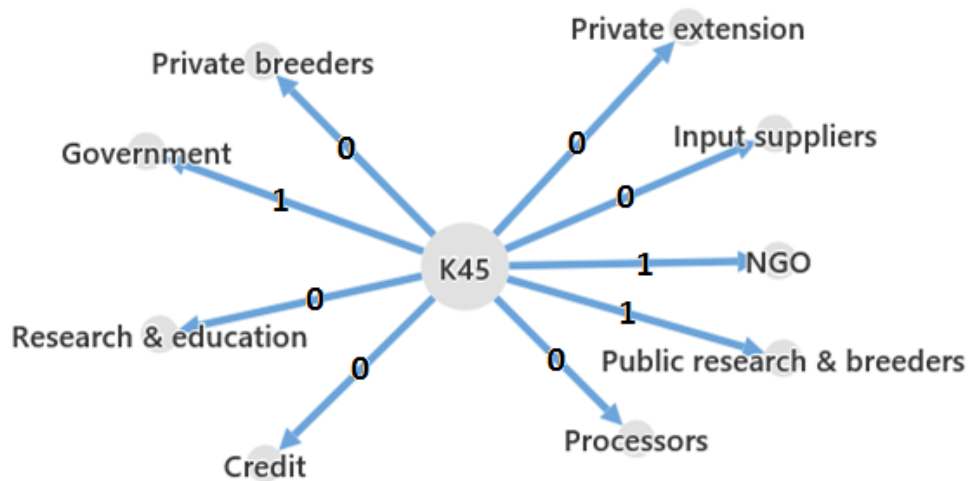
Nayandarua-Ol Jorok; Weru ward
Respondent K44
Small seed potato farmer group

Non-material exchange relations

Network size: 7
Network diversity: 6
Average yield (kg/Ha)
Per season between 2014-2016: 8.82

Control variables

Farmer Group size: 15
Potato generation: 3



Kenya

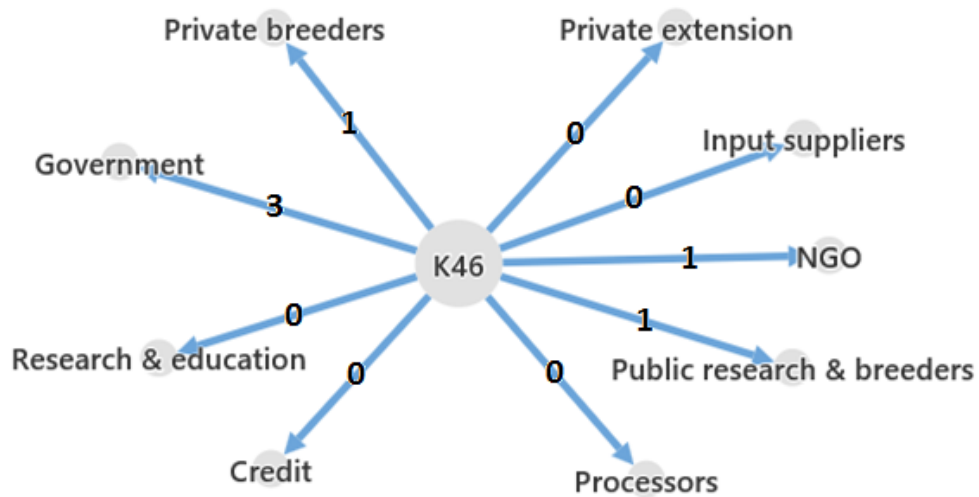
Nayandarua-Ol Jorok; Weru ward
Respondent K45
Small seed potato farmer group

Non-material exchange relations

Network size: 3
Network diversity: 3
Average yield (kg/Ha)
Per season between 2014-2016: **0.75**

Control variables

Farmer Group size: 10
Potato generation: 5



Kenya

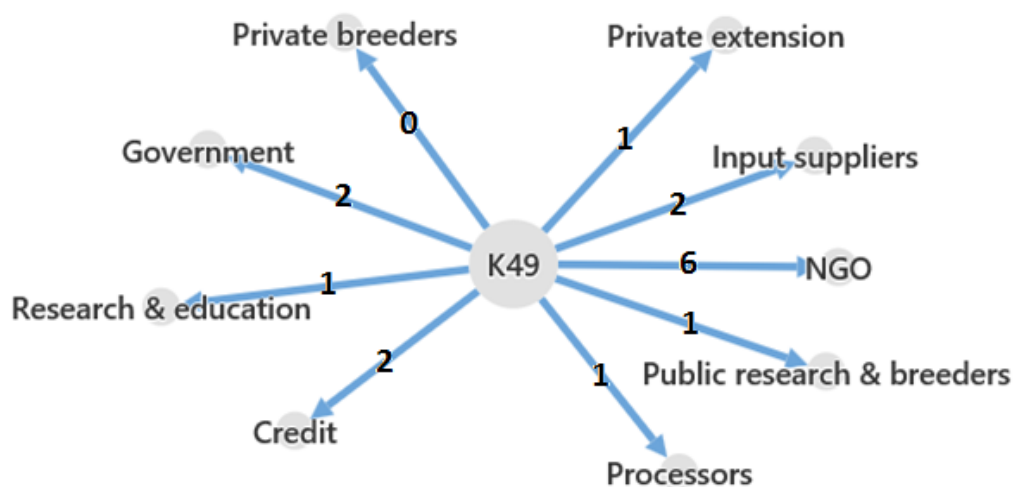
Nayandarua-Ol Jorok; Weru ward
Respondent K46
Small seed potato farmer group

Non-material exchange relations

Network size: 6
Network diversity: 4
Average yield (kg/Ha)
Per season between 2014-2016: **9.58**

Control variables

Farmer Group size: 13
Potato generation: 5.5



Kenya

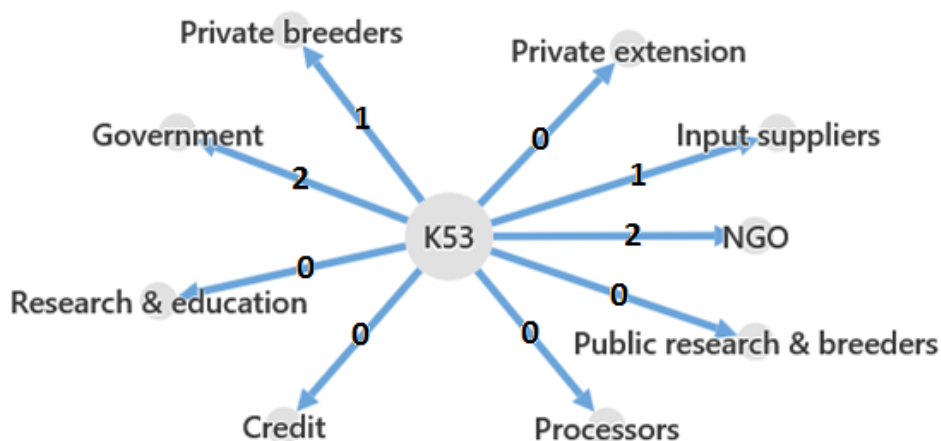
Nayandarua-Kinangop; Kinangop North ward
Respondent K49
Small seed potato farmer group

Non-material exchange relations

Network size: **16**
Network diversity: **8**
Average yield (kg/Ha)
Per season between 2014-2016: **8.3**

Control variables

Farmer Group size: 30
Potato generation: 1



Kenya

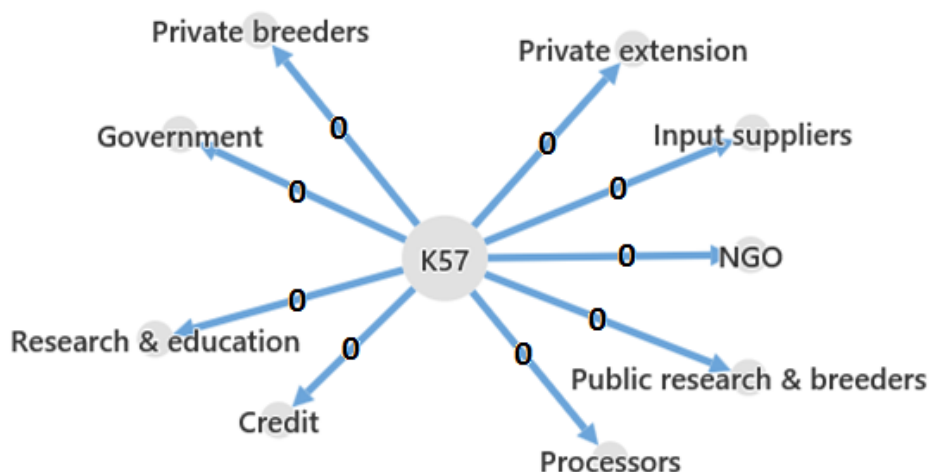
Bomet; Bomet Central - Ndaraweta ward
Respondent K53
Small seed potato farmer group

Non-material exchange relations

Network size: **6**
Network diversity: **4**
Average yield (kg/Ha)
Per season between 2014-2016: **6.67**

Control variables

Farmer Group size: 500
Potato generation: 5



Kenya

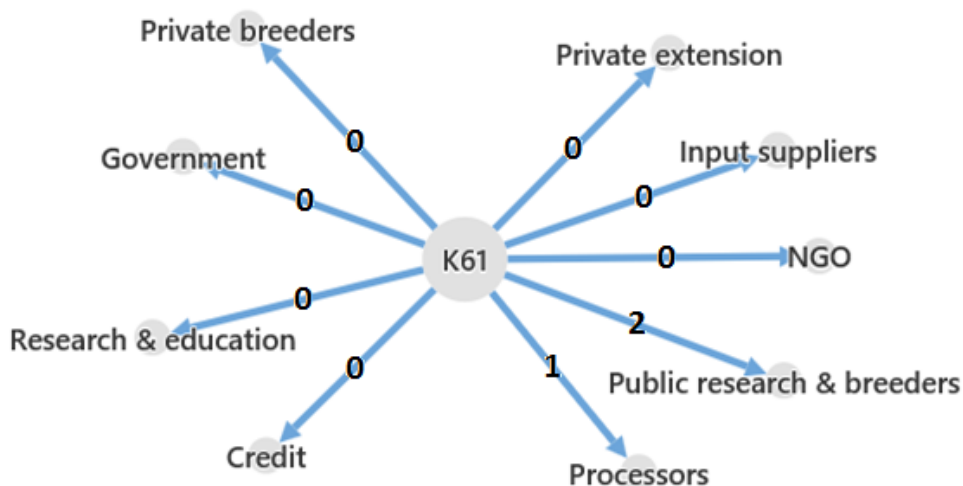
Bomet; Bomet East - Kembu ward
Respondent K57
Small seed potato farmer group

Non-material exchange relations

Network size: 0
Network diversity: 0
Average yield (kg/Ha)
Per season between 2014-2016: 9.69

Control variables

Farmer Group size: 12
Potato generation: 7.5



Kenya

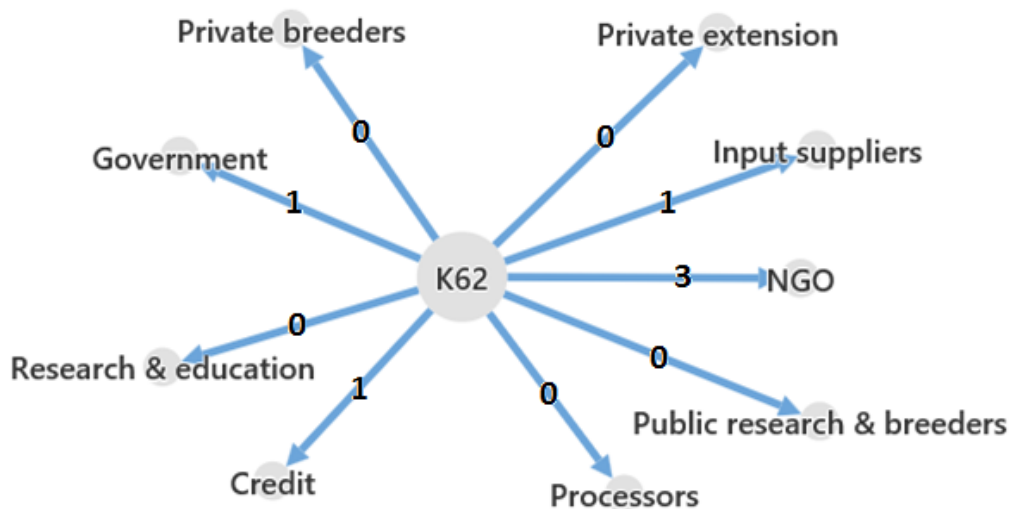
Bomet; Bomet Central; Township ward
Respondent K61
Small seed potato farmer group

Non-material exchange relations

Network size: 3
Network diversity: 2
Average yield (kg/Ha)
Per season between 2014-2016: 2.5

Control variables

Farmer Group size: 20
Potato generation: 11



Kenya

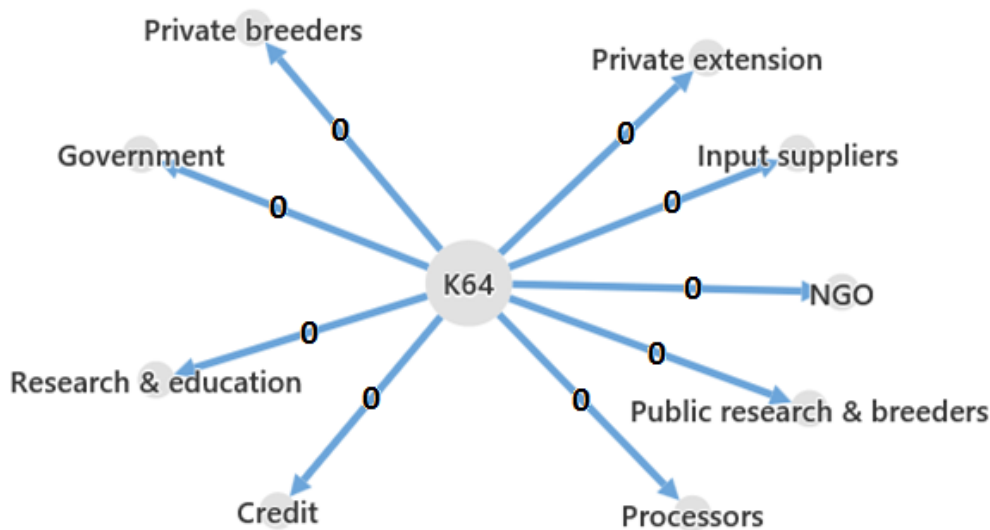
Bomet; Bomet Central - Township ward
Respondent K62
Small seed potato farmer group

Non-material exchange relations

Network size: **6**
Network diversity: **4**
Average yield (kg/Ha)
Per season between 2014-2016: **4.57**

Control variables

Farmer Group size: 16
Potato generation: 2



Kenya

Bomet; Konoin - Embomos ward
Respondent K64
Small seed potato farmer group

Non-material exchange relations

Network size: **0**
Network diversity: **0**
Average yield (kg/Ha)
Per season between 2014-2016: **1.34**

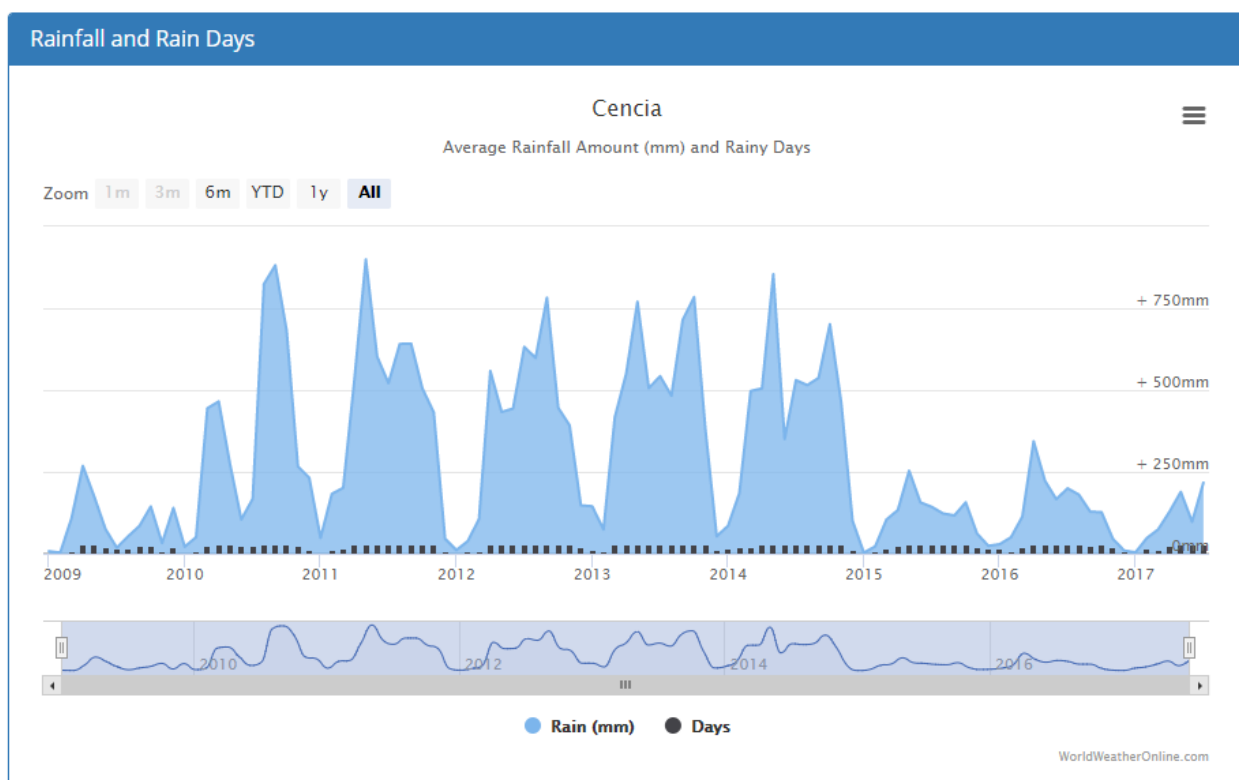
Control variables

Farmer Group size: 25
Potato generation: 7.5

Appendix F: Climatologic differences between Ethiopian regions²⁶

The images below represent the average rainfall and average sun hours and days in Chencha (SNNPR region), Jeldu (Oromia region) and Gayint (Amhara region). Historically, the average rainfall in Chencha is higher than in the other two regions. In addition, the rainy season in Chencha lasts longer throughout the year as well. The rainfall in Jeldu and Gayint appears comparable, although dry seasons appear to be 'drier' in Gayint. Also, the rainfall in Gayint seems more constant.

Furthermore, Chencha has had far less 'sunny' days than Jeldu and Gayint did during the same period. This is relevant, as Pereira et al. state that *"potato yield improvements might be obtained by increasing the net daily photosynthetically radiation (PAR) through higher solar irradiance or longer photoperiod"* (Pereira et al., 2008, p. 328).



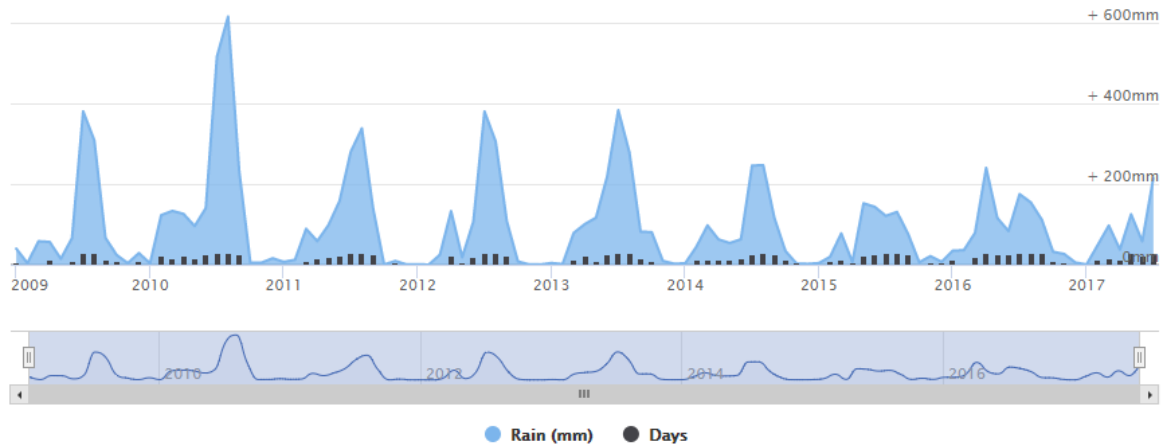
²⁶ Data and images were provided by World Weather Online, retrieved from <https://www.worldweatheronline.com/> and all rights belong to the respective owners.

Rainfall and Rain Days

Jeldu

Average Rainfall Amount (mm) and Rainy Days

Zoom 1m 3m 6m YTD 1y **All**



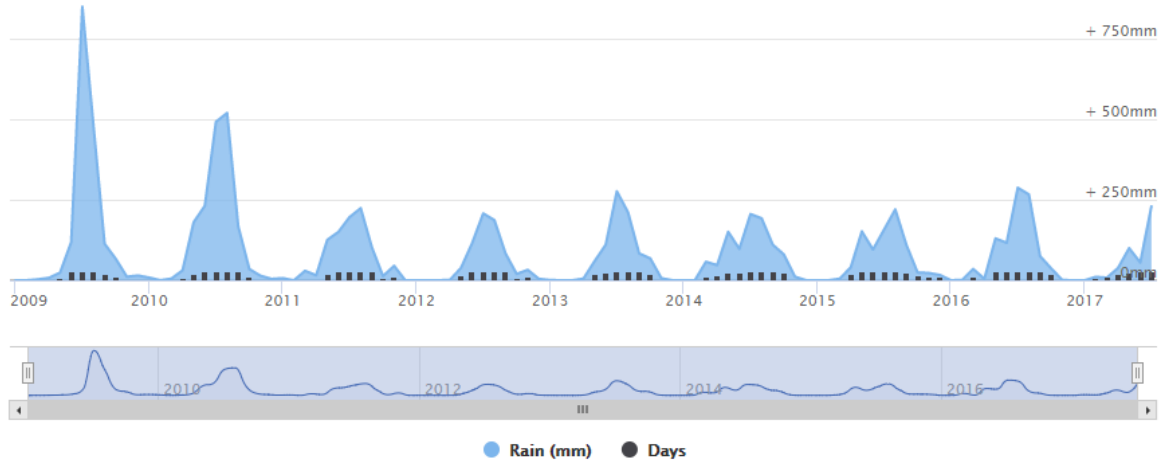
WorldWeatherOnline.com

Rainfall and Rain Days

Gayint

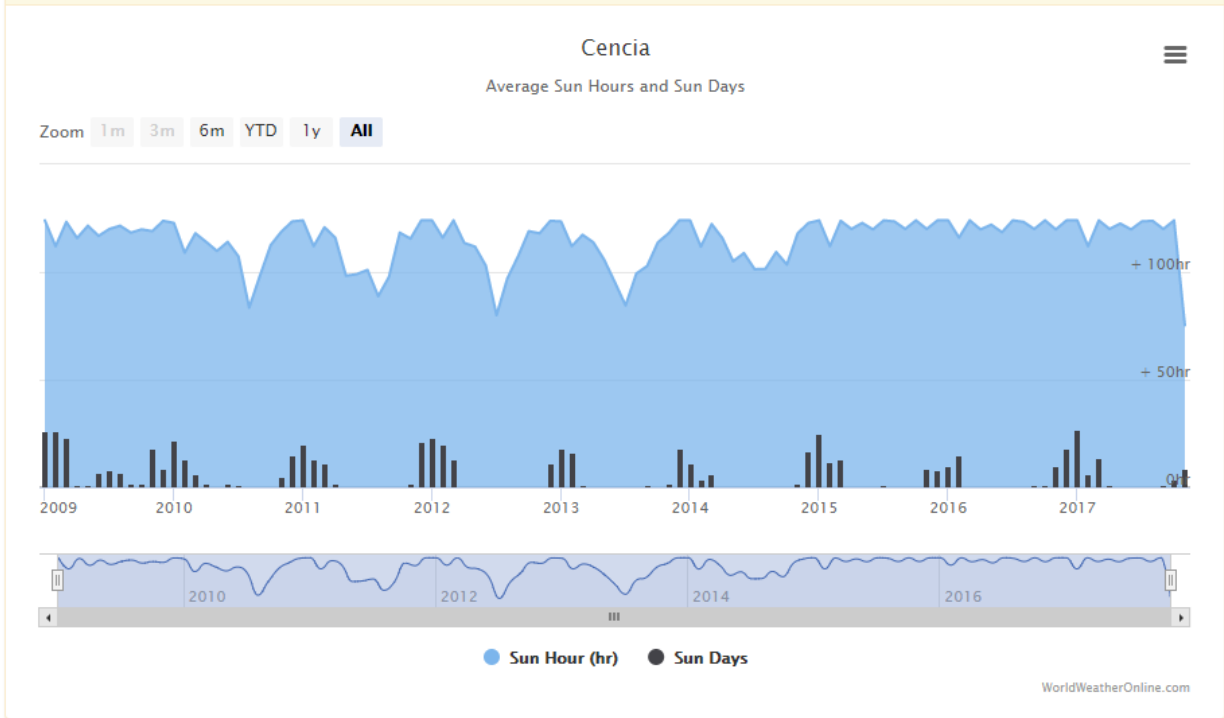
Average Rainfall Amount (mm) and Rainy Days

Zoom 1m 3m 6m YTD 1y **All**

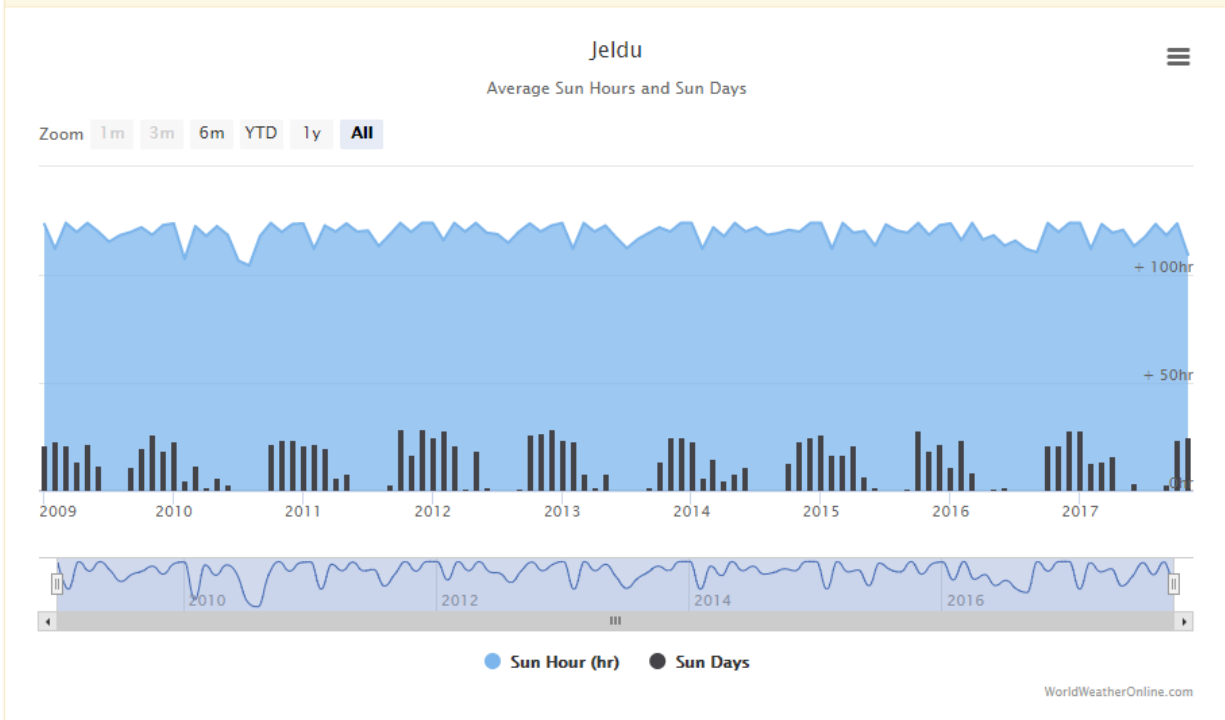


WorldWeatherOnline.com

Sun Hours and Sun Days



Sun Hours and Sun Days

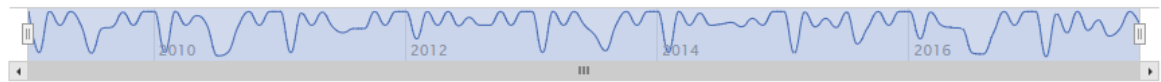
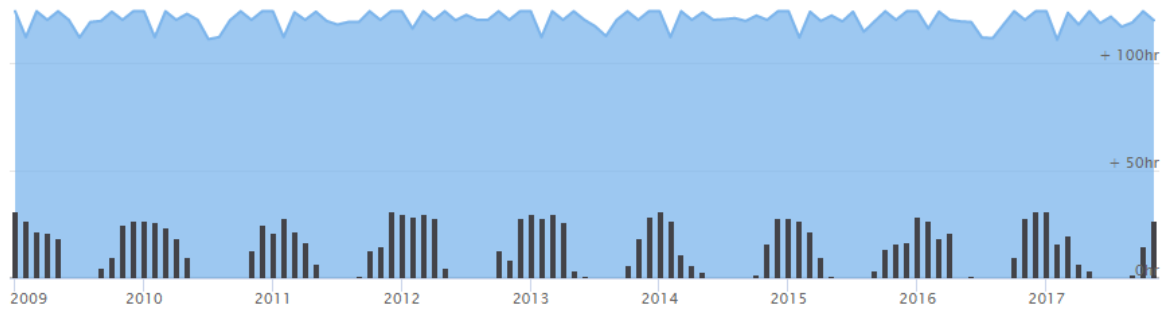


Sun Hours and Sun Days

Gayint

Average Sun Hours and Sun Days

Zoom 1m 3m 6m YTD 1y **All**

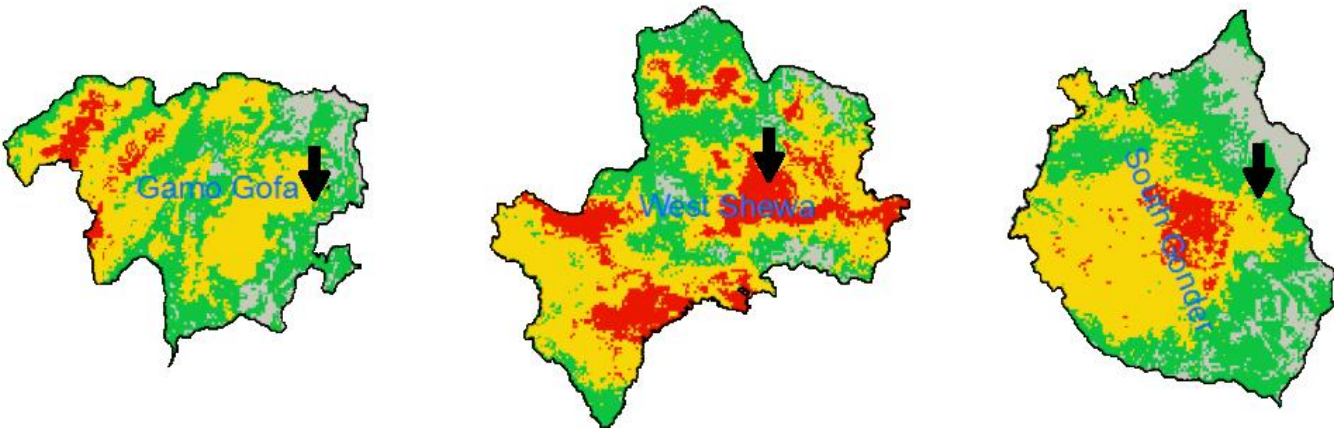


● Sun Hour (hr) ● Sun Days

WorldWeatherOnline.com

(SNNPR region), Jeldu in West Shewa (Oromia region) and Gayinth in South Gondar (Amhara region). Chenchu appears to possess a neutral acidic zone (in terms of pH), Jeldu has a strongly acidic soil and Gayinth seems to have a neutral to moderate acidic soil.

Jeldu (West Shewa; Oromia)

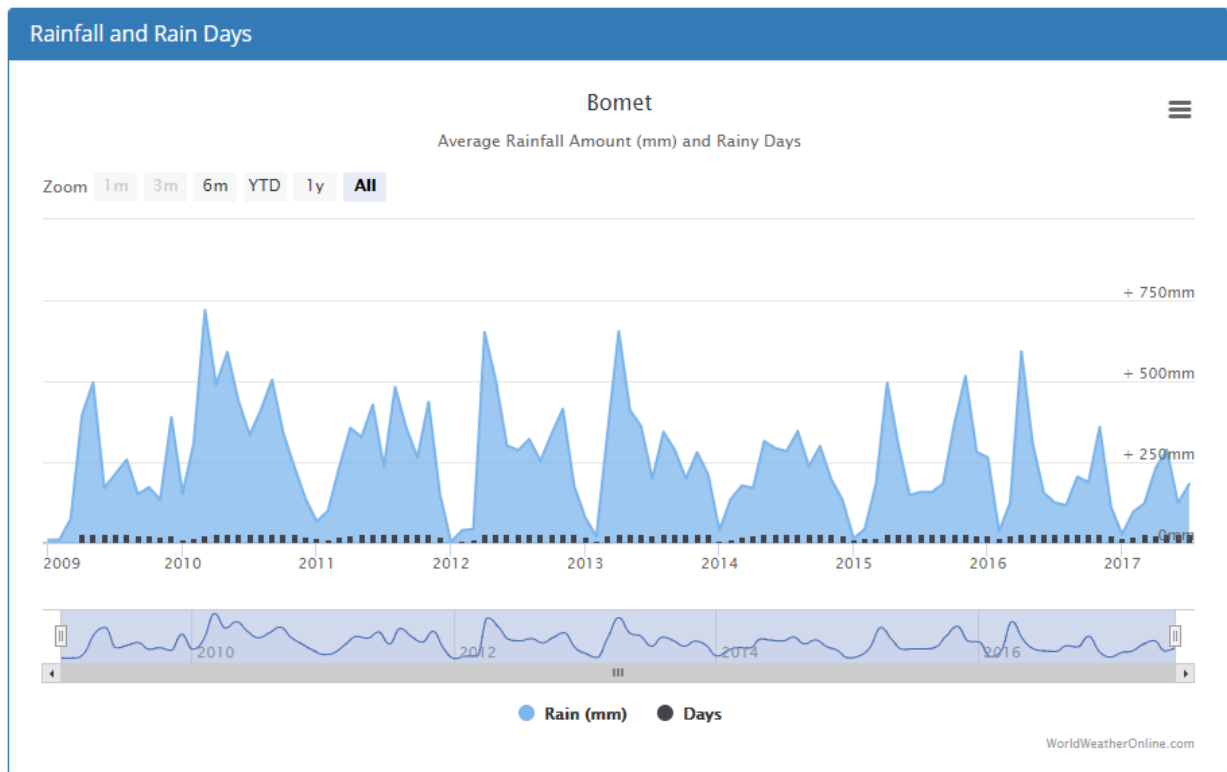


Chenchu (Gamo Gofa; SNNPR)

Gayinth (South Gondar; Amhara)

Appendix H: Climatologic differences between Kenyan regions²⁸

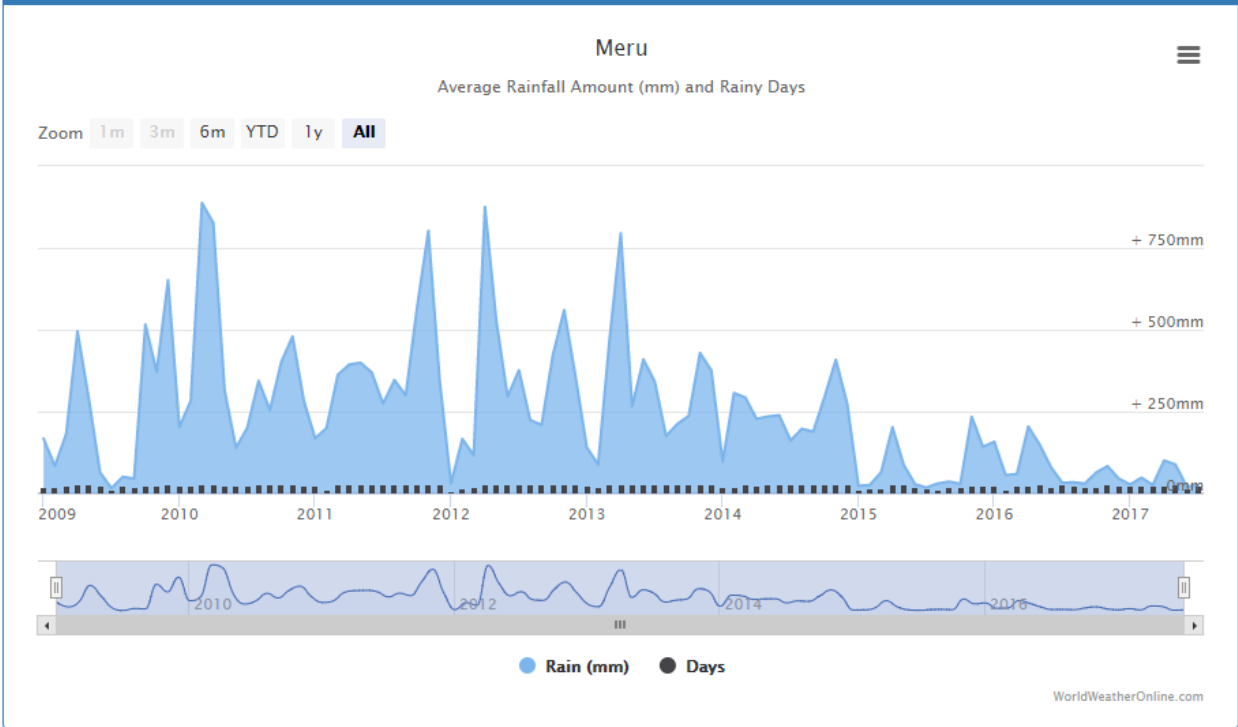
The images below depict the average rainfall in Bomet (Bomet region), Meru (Meru region) and Ol Jorok, Ol Kalou and Kinangop (Nayandarua region). The rainfall of three different wards in Nayandarua is shown as these were slightly apart.



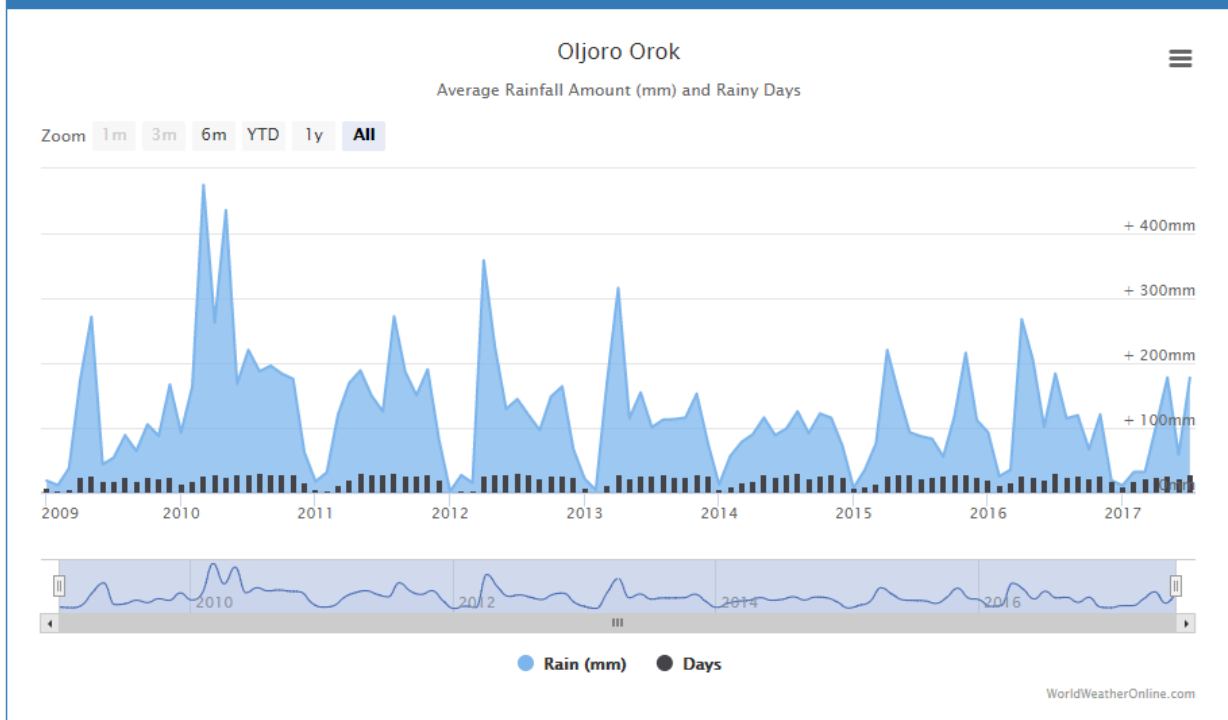
Historically, the average rainfall in both Bomet and Meru is higher than in the three wards of the Nayandarua region. The three locations in Nayandarua average between 100 and 300 millimeters during the rainy season, while both Bomet and Meru have peaks between 500 and 700 millimeters during the rainy season. The latter two appear to be 'wetter' regions than the Nayandarua region; they rarely have less than 200 millimeters of rainfall, while Ol Jorok, Ol Kalou and Kinangop rarely have more than 200 millimeters of rainfall.

²⁸ Data and images were retrieved from <https://www.worldweatheronline.com/> and all rights belong to the respective owners.

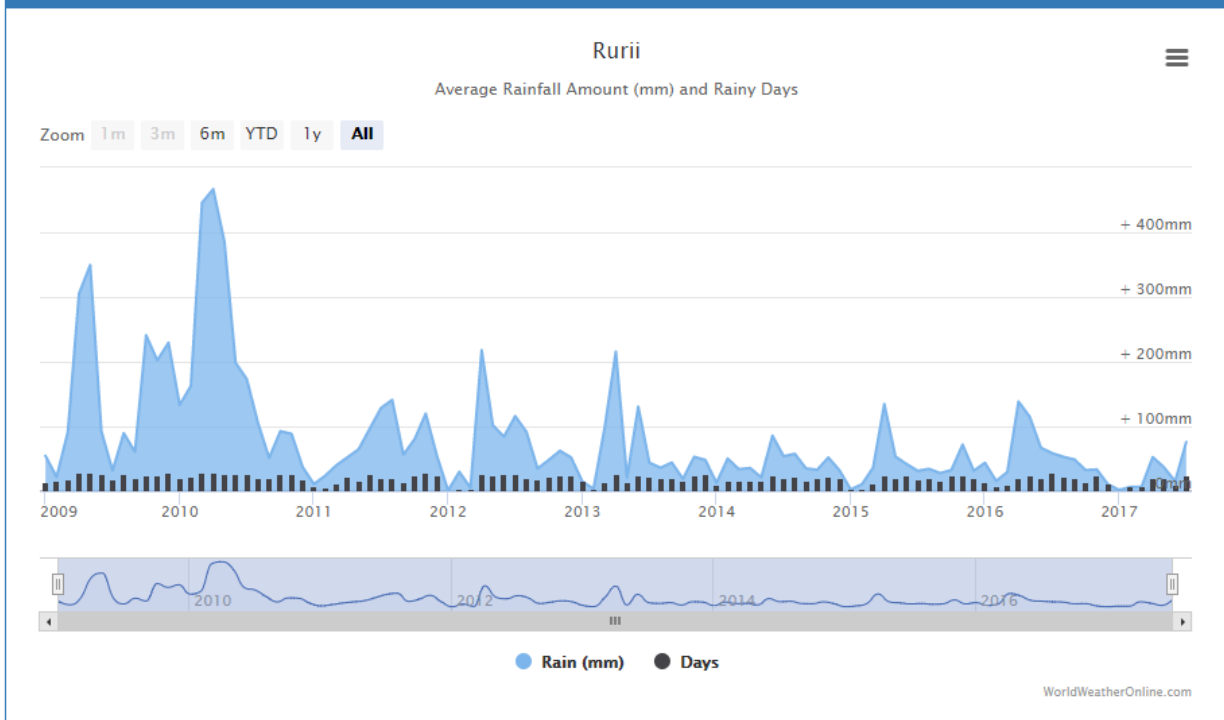
Rainfall and Rain Days



Rainfall and Rain Days



Rainfall and Rain Days



Rainfall and Rain Days

