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Scaling modern technology or scaling exclusion? The socio-political dynamics of accessing in malt barley innovation in two highland communities in Southern Ethiopia

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ABSTRACT

In this article we explore whether and how the dynamics of access shape the scaling of modern agricultural technologies. It is based on the experience of an agricultural research for development (AR4D) project called CASCAPE, which aims to validate and scale agricultural best practices for smallholder farmers in Ethiopia. The socio-political dynamics of external interventions are often taken for granted contextual factors in AR4D projects. By contrast, this article takes this context as the point of departure for its analysis. The aim of this in-depth case study is to unpack the concept of access as condition for scaling of agricultural technologies. We identify and analyse the mechanisms that determine access to the various components of a malt barley technology package which was introduced in two highland communities in southern Ethiopia (and later 'scaled' to a range of other communities). Our research approach is technographic, implying that we consider the technology to contain both material and social components. The findings suggest that social and clan-based exchange mechanisms (such as clan-based loyalty, reciprocity and vertical accountability) are often rendered invisible even though they are of critical importance in governing access to the material and social components of modern agricultural technologies. Ignoring this socio-political context in the malt barley interventions resulted in an unintended scaling effect in terms of widening the social and economic gap between a few better off farmers and a larger group of poor farmers. The paper thus provides evidence that the socio-political dynamics of access to technology can have an important influence on its wide spread application and may complicate efforts to scale the uptake of technology. Paying more attention to such processes would help to improve the effectiveness of AR4D efforts.

1. Introduction

It is often argued that one way to improve food security in developing countries is to encourage the wide-spread adoption of agricultural technologies by smallholder farmers. As a result, donors are increasingly pushing for 'outcomes at scale' within Agricultural Research for Development (AR4D) (Giller et al., 2017). In some low-income countries, this pressure results in a plethora of AR4D-initiatives targeting rural communities (Pingali and Spielman, 2016).

Adoption rates are a commonly accepted metric for measuring progress in AR4D, but these have increasingly become subject to critiques (Andersson and D'Souza, 2014; Glover et al., 2016). One main thread of these critiques is that adoption cannot be understood as a mere binary, timeless and individual choice for the use of a particular artefact by the wider target audience as this reflects a narrow understanding of what constitutes a technology and the process of technological change. Rather, one should consider technology as a combination of social practices and material elements (Jansen and Vellema, 2011). This understanding leads us to see the process of technological change as one of (re-)configuring the social and material, i.e. re-engineering the relations between the social and material elements of a system (Klerkx et al., 2010; Mosely, 2017). This should lead to greater acknowledgement of the importance of an enabling environment for scaling agricultural innovations. In this context much attention is paid to the challenge to of enhancing farmers' access to markets for inputs and outputs, for example through improving coordination among

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farmers and/or other actors within value chains (Bernard and Spielman, 2009; Develtere et al., 2008; Jack, 2011; Markelova and Mwangi, 2010).

The importance of access is well understood in the domain of natural resource management (see, for instance, Berry, 1989; Milgroom, 2012; Ribot and Peluso, 2003). However, these insights have not yet been applied to the domain of AR4D. Unpacking the concept of access is relevant, given the high expectations that policy makers and the donor community have for the successful scaling of improved agricultural technologies. The literature on natural resources specifically suggests that 'access' is not something that can be simply 'provided' or engineered from outside, but that it involves complex socio-political dynamics of inclusion and exclusion. Similarly, rural sociologists have provided key insights into how development projects and external interventions are often dominated by local politics (Mosse, 2005; Planel, 2017; Platteau, 2004) and may reproduce existing inequalities in local communities (Cleaver, 2005). Similar processes may occur when external interventions seek to enhance access knowledge, or the use of technology, due to the prevailing socio-political dynamics. To date AR4D has not paid much attention to these socio-political dynamics. Understanding of adoption processes and the obstacles to scaling would be enriched by paying more attention to whether and how these processes occur (see also De Roo et al., 2017) and may also provide insights on opportunities for improving the effectiveness of AR4D efforts.

In this paper we aim to unpack the concept of access as condition for scaling agricultural technologies. In doing so, we take a technographic approach (Jansen and Vellema, 2011) which distinguishes between, and gives equal weight to, the material and social components of a technology. We identify and analyse the mechanisms that determined access to components of a malt barley technology package which was introduced in 2012–2014 in two highland communities in southern Ethiopia (and later scaled to a range of other communities). While the malt-barley technology has specific material characteristics, the insights from this study have a more general relevance for agricultural innovations that are being introduced to increase agricultural productivity and food security and to reduce poverty.

This paper is structured as follows. Section two presents the theoretical framing, and section three describes the research methodology and methods that we applied. Section four describes the introduction of the malt barley technology (MBT) package in the two highland communities and the extent to which farmers applied the full package or components of it. In section five we explore the farmers' access to different components of the MBT package. Section six presents an interpretation of the underlying mechanisms that explain (non) access to the different components of the MBT package. We conclude with a discussion on the conceptual and policy implications of the findings of this case study.

2. Theoretical framing

In early adoption research, the dominant idea about the scaling of technology was that scaling results from an aggregation of individual adoption decisions by farmers (or other innovators and adaptors). Such ideas originate from earlier work on adoption and the diffusion of innovations, as synthesised by Rogers (1995). Nowadays, much more attention is given to the ways in which the broader social and institutional environment enables or constrains the use of new technologies, giving rise to the idea that that innovation is about re-configuring social and material components, including economic and institutional practices and rules (Geels, 2002; Jansen and Vellema, 2011; Klerkx et al., 2010). In essence, this means that innovation always involves multiple and simultaneous social and technical changes in a network of stakeholders who depend on each other in realising their ambitions for change (Wigboldus et al., 2016). Thus, scaling does not primarily result from isolated individual decisions about adoption, but from interactions among stakeholders who need to somehow enable each other to move forward. However, despite this increased recognition of the importance of 'enabling environments' for the scaling of technology, AR4D still places most of its emphasis on the technical rather than the institutional and social dimensions of innovation (Hounkonnou et al., 2012; Leeuwis et al., 2017; Schut et al., 2016). In the context of AR4D interventions, the creation of a conducive environment frequently includes efforts to disseminate knowledge about agronomic technologies to farmers, or enhancing farmers' access to input markets (seeds, fertiliser, pesticides, manpower, credit, etc.) and output markets. Many studies suggest that it is far from easy to effectively provide access to markets for smallholders due to a range of issues, including weaknesses in value chain governance (Barrett, 2008; Poulton et al., 2010), poor horizontal coordination among farmers (Bernard and Spielman, 2009; Develtere et al., 2008; Markelova and Mwangi, 2010) and/or non-conducive trade and market regulations. In this article we take a micro level perspective and explore the difficulties associated with accessing a technology and on the processes that occur in and around communities when external interventions offer access to new technologies and market opportunities. This approach is inspired by studies on access to natural resources which suggest that access is a complex socio-political process (Berry, 1989; Milgroom, 2012; Ribot and Peluso, 2003).

Sara Berry's, 1989 paper "Social institutions and access to resources" makes an important contribution to understanding the concept of access. It provides a historical account of the various ways in which social institutions shape access to natural resources in Africa, focusing on how these institutions have adapted to the economic, environmental and political changes that have affected the continent in the past decades. She points out the importance of social relations in determining access to resources. Since people often access the means of production through indirect means, social identity and status become objects, as well as instruments, of investment. Hence, the establishment or strengthening of social relations is an integral part of peoples' strategies of production and accumulation, since these social relations often affect the terms on which people gain access to resources (Berry, 1989).

Ribot and Pelusos' "Theory of access" (2003) makes another important contribution to understanding access, positing that access to natural resources is shaped by socio-political dynamics. They define access as the ability of people to benefit from things—including material objects, people, institutions, and symbols (p. 153). In doing so, they focus on ability rather than on rights, arguing that rights do not always result in an actual ability to use, let alone to benefit from, the use of a resource. They also use the notion of "webs of access" (p. 154) to refer to the dynamic processes and relationships that shape access to resources and distinguish between *controlling* and *maintaining* access. Control of access refers to the mechanisms that regulate direct access to a certain resource, maintenance of access refers to the indirect mechanisms that people rely on to gain access to a resource (often through others). Maintaining access is particularly relevant in situations in which many, if not a majority of, smallholder farmers (or any other group), can only access certain (scarce) resources by maintaining good relations with those who control access to these resources.

These two articles provide a useful basis for understanding access as a socio-political process. Since their analysis focuses on the domain of natural resource management, they frame access to technology, knowledge, and markets merely as means for exploiting natural resources. As of yet, there have been (to our knowledge) no attempts to apply these insights to the domain of AR4D, where the focus is on how farmers access markets, knowledge and technologies. This paper aims to explore whether, and how, dynamic processes of accessing interact with efforts to foster an enabling environment for scaling modern agricultural technologies. We follow Jansen and Vellema (2011) and take a technographic approach, distinguishing between the material and the social components of a technology. Material components have a physical reality and include land, inputs (seed of an improved variety, organic and inorganic fertilisers, pesticides), manpower, oxen, oxen plough and a donkey cart. Examples of social components of a

technology would include agronomic and marketing knowledge, being connected to the 'right people' and cooperative membership.

In our quest to identify the mechanisms that explain access we apply a network approach in which the community is the unit of analysis, rather than individual household strategies (Bebbington, 1999; Cleaver, 2005; Fafchamps and Quisumbing, 2005). The use of a network approach allows us to move away from the linear and binary notion of adoption and focus on the context in which technologies are being introduced. Following Ribot and Peluso, we pay explicit attention to the mechanisms that enable or prevent people from indirectly accessing components of a technology (i.e. access maintenance), which has the benefit of regarding access as a dynamic process (Ribot and Peluso, 2003, p. 158).We broadly define mechanisms as the structures, powers, relations and processes that are often not directly observable but which can be identified through their effects. Mechanisms explain 'how things work'; they are the processes through which people in specific situations gain access (or not) to the components of a technology, representing situations of scarcity.

3. Materials and methods

3.1. Technology selection

We studied the introduction and application of the Malt Barley Technology (MBT) package, introduced through a joint effort of the Ethiopian Ministry of Agriculture and CASCAPE project.[1] CASCAPE is an AR4D project financed by the Royal Netherlands Embassy in Addis Ababa and managed by Wageningen University and Research and five Ethiopian universities. It aims to increase agricultural productivity in the Ethiopian highlands through the validation and promotion of best practices in agriculture (Wageningen University and Research, 2015).

We chose to study the Malt Barley Technology package for a number of reasons. Malt barley is a strategic cash-crop which has received substantial policy support in Ethiopia due to its perceived potential to reduce the government's dependency on import which coats a significant foreign currency earnings and the contributions that selling the crop can make to smallholder incomes (Dumara, 2017). The two main supporters of the introduction of the MBT package see the malt barley innovation as a success story of how modern technologies contribute to food security and farmer incomes (Abebe et al., 2015). Secondly, the first and last authors of this paper were involved (as advisor and regional manager respectively) to the CASCAPE project when the MBT package was introduced, which facilitated our access to local facilities for fieldwork as well as to internal project documents.

3.2. Study sites, sampling techniques and data analysis

The research took place in the Malga Woreda, Sidama Zone in the southern region of Ethiopia (SNNPR). Malga woreda was selected it is known as a high potential area for malt barley production and because the CASCAPE project selected it as their target area, allowing the authors easy access to the woreda's administration and its farming community. We selected two neighbouring kebeles (villages): Guguma and Gomeshe-Tulu.

Related research by the first author in the two study kebeles made it possible to draw random samples of 65 households in each kebele (130 in total) (Dumara, 2017). From this sample basic we derived quantitative data on households' asset base and their access to components of the malt barley package. From this sample, we purposively selected 4 households with relative good and 4 households with limited, or no, access to the material and social components of the malt barley package in each kebele. These households formed the sample for the qualitative data collection, which mostly consisted of participant observation and in-depth interviews. Additionally, we conducted interviews with a DA (development agent), an elderly farmer, a member of the cooperative management, the kebele manager (in both kebeles), the credit manager the kebele chairman (just in Guguma) and the woreda's representative for agriculture (in Malga). In total, 33 in-depth interviews were conducted.

The interviews were conducted with a translator who did not know the two kebeles and could thus maintain a certain level of independence from the community members. Qualitative data was analysed using Atlas.ti. A pre-coding procedure was used to explore the factors that influence access control and/or access maintenance to the material and social components of the MBT package. A second coding was done to identify the underlying mechanisms that could explain why certain farmers had access control (or not) and/or access maintenance (or not).

4. The technology package and its introduction

4.1. The prescription

The MBT package is described in the Best Fit Practice Manual developed by the CASCAPE project (Abebe et al., 2015) and its main features can be summarised as follows:

- seed of a modern variety (Sabine or Traveler) sourced from a credible institution (malt barley cooperative or the regular extension system, but not via the market or self-saved);
- ploughing frequency (at least 3 times before planting and 1 time during row planting);
- row planting (spacing of 20 cm between rows and planting depth of 3–5 cm in rain-fed conditions);
- seeding rate (75–100 kg/ha);
- a fertiliser recommendation of 100 kg DAP and 50 kg UREA per ha;
- weeding frequency (twice after planting, at specified periods), and;
- harvesting the barley when the grain moisture content is lower than 18%.

The description of this package was the entry-point for our analysis of the extent to which farmers complied or partially complied with these protocols. However, during the fieldwork, several other components were mentioned repeatedly by our respondents as indispensable components which they needed access to in order to apply the prescribed package. This made us realise that we needed to include additional components in our analysis. These included both material components (oxen, oxen plough, land, manpower, donkey cart) and social components (agronomic knowledge, marketing knowledge, being connected to the right people and cooperative membership).

4.2. Technology promotion in the Ethiopian context

Ethiopians are often referred to as 'the people of the plough': more than 85% of the country's population still lives in rural areas, where agriculture is the main economic activity (IFPRI, 2018; McCann, 1995). The Ethiopian government has been prioritising investments in agricultural development, as exemplified by the Agricultural Development Led Industrialisation (ADLI) and the Plan for Accelerated and Sustained Development Programmes (PASDEP) in the nineties and early 2000s, and the subsequent Agricultural Transformation Plans (AGP I, II and III), and the Productive Safety Net Programmes (PSNP I-IV) which are currently being implemented throughout the country. These programmes have brought huge investments in the agricultural sector with an enormous increase in number of extension agents (called development agents) and farmer training centres, improvements in modern seed and fertiliser distribution, and more recently, agro-processing and market development (Oqubay and African Development Group, 2017). Under different names and forms, a central component of these

[1] CASCAPE stands for Capacity Building for Scaling-up of Evidence-based Best Practice in Agriculture in Ethiopia

programmes has been the 'agricultural technology package approach' (Moanr, 2017). In addition, Ethiopian agricultural programmes make use of the model-follower system: so-called model farmers are the first among the community to try out new best practices. They are seen by the kebeles' administrations as role models who are expected to transfer their knowledge to their peers. While these approaches have been widely criticised for being top-down, technocratic and one-size fits all (Planel, 2017; Teferi, 2012), they have been reported to contribute to an annual increase in agricultural factor productivity of 2.3% over the past decade (IFAD, 2016). In conjunction with this, numerous publications over the last two decades pointed to a strong entanglement of agricultural development, local politics and power dynamics (Berhanu, 2012; Lefort, 2012; Teferi, 2012). In Tigray for instance, local development officials have been appealing to institutions of the revolutionary past to mobilise smallholders, and to proclaim a refusal to adopt agricultural technologies as an act of dissent (similar to not taking part in the revolution during the Derg regime) (Segers et al., 2009). Planel (2017) by contrast, links agricultural development policies to the idea of *encadrement*, understood as" the incorporation into structures of control" (Planel, 2017), implying that the implementation of agricultural policies at the local level has the dual purpose of extending state control to the household level, as well as enrolling smallholders into development programmes in order to prevent future political unrest. In the literature we find accounts of the interface of politics, power and rural development in the regional states of Amhara (Lefort, 2012; Teferi, 2012), Tigray (Segers et al., 2009) and Oromiya (Emmenegger, 2016). No equivalent in-depth case studies have been done in the SNNPR. In this respect, this case study adds a perspective of the local realities in a village in the Southern highlands.

In 2012 the CASCAPE project approached the administrations of the woreda (Malga) and kebele (Guguma) to request their support for testing new varieties of malt barley which would be supplied by Kulumsa Agricultural Research Centre. CASCAPE was also practicing the model-follower system under the assumption that once model farmers applied for the MBT package, and sufficient quality seed was produced and made available through the seed cooperatives, the majority of farmers would follow the model farmers. In 2012–2013 the first on-farm trials took place on different farms in Guguma. Eight selected model farmers were the first to try the MBT package on their land. They received support from the CASCAPE project and extension system in terms of agronomic knowledge on how to multiply the malt barley seed (planting methods), the seed itself (variety Sabine) and the use of chemical fertiliser. Some farmers also received financial support to employ daily labourers to help the cultivation of the crop. The CASCAPE project also established a seed multiplication cooperative in Guguma, which was presented as an institutional innovation accompanying the agronomic innovation. The project also established a grain cooperative in Gomeshe-Tulu, which received significant support from the project: trainings on agronomy and cooperative management, networking support in terms of market linkages that were established between the cooperatives and Asella Malt Factory and a grant to construct a seed and grain storage facility and a seed cleaning machine (located in Guguma).

4.3. Practicing the MBT

According to our respondents, about 20% of households in the study kebeles practice the full package, combining all the recommendations according to the MBT package as introduced by CASCAPE and the government. Although quite a few farmers mentioned (at public places or during interviews) that they fully comply with the package description, our own observations indicated that not all farmers who claimed to comply did actually apply the full package. For instance, some farmers did not practice row planting, deviated from the seed and/or fertiliser rate, or used farm-saved or market-purchased seed (rather than that supplied by the government). The most often mentioned reason for not applying (the full package) was because households were unable to access all the components. Land, oxen, manpower, seed, and fertiliser are scarce and many farmers face constraints in accessing these components of the technology (although some of these constraints are implicit rather than explicit).

The farmers who have started to grow malt barley – even if they only apply part of the package – are generally positive about the benefits. The most frequently mentioned benefits were improved clothing, food, livestock and housing conditions. All the respondents who applied the full package mentioned they had constructed a new (bigger) house and some had even constructed a house in town. Farmers also mentioned immaterial benefits. Some mentioned that they were able to pay for the higher education of their children. Additionally, compliance with the government's recommendations increases the status of farmers. Farmers with a long standing reputation of 'being serious', are also rewarded for openly complying with the extension system by getting new opportunities. One farmer said: *"If you perform well, you are asked to take on more and more responsibilities. I accept it because it is an honour to do these kind of things for the community" (Respondent 1, Male, Guguma, July 18, 2016)*. However, some respondents also mentioned negative effects of applying (part of) the MBT package: they became indebted because they could not reimburse the credit they had taken to purchase the seed and fertiliser. This affected their social status, because it is socially unacceptable to be poor in the study communities. In line with this, these signs of non-adoption or 'refusal' are often interpreted by local officials and other community members as 'resisting development', as observed in other Ethiopian case studies (Emmenegger, 2016; Segers et al., 2009; Teferi, 2012).

On the basis of prescriptions for the package and interviews, we developed the following schematic depiction of the malt barley technology (see Fig. 1) showing the different material and social components that a farmer needs to access and the practices that farmers apply (or do not apply) as part of this technology. The arrows point to relations between a given component and practice.

The discrepancies between what farmers said publicly and during personal and/or informal interviews, motivated us to further explore the mechanisms underlying non-access. We explored access to the material components (land, seed, fertiliser, manpower, oxen, oxen plough) and how that access is interwoven with the social components of the technology (agronomic knowledge, marketing knowledge, being connected to the right people and cooperative membership).

5. Access to components of the technology

5.1. Access to material components

5.1.1. Land

In Ethiopia, land is owned by the government, not by the individual farmers. The Derg regime marked an important shift in land tenure. With the slogan "Land for the tillers, education for all", land in rural areas was taken from the rich and redistributed to poor and/or landless people. Families that did not farm their land lost it to other families that needed farming land. The slogan "Land for the tillers" remained an important pillar of land policy after the defeat of the Derg regime in 1991 (McCann, 1995) although population increase in recent decades has resulted in households having smaller plots, a trend that also exists in in Guguma and Gomeshe-Tulu (source: personal communication with elderly farmer and kebele Chairmen, 2016).

Our survey indicates that 43% of the households in the two kebeles have secure access to 1 ha or less of farmland, generally perceived as too little to be a commercial farmer in Ethiopia (Samuel and Gebreselassie, 2006). 42% of the households have access to 1–2 ha and only 15% has more than 2 ha.[2] Due to the clan-based inheritance

[2] These averages are significantly higher than the reported average land size

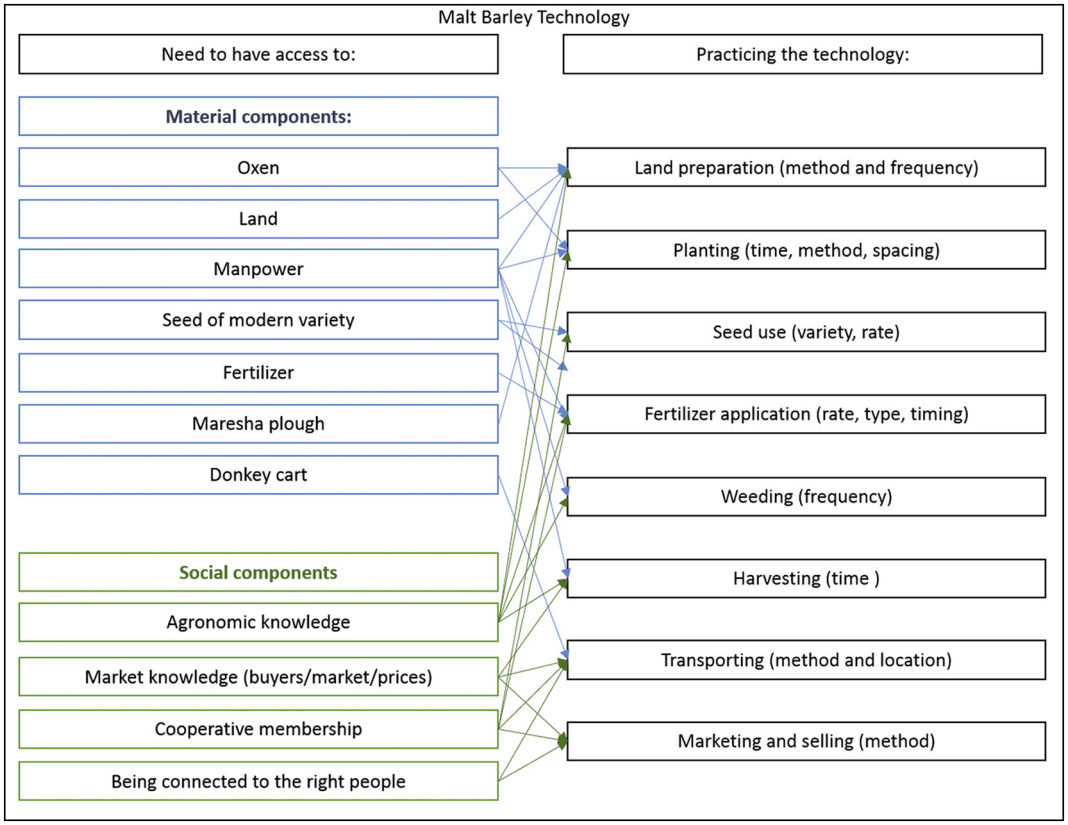

Fig. 1. Components and their relations within the malt barley technology.

system, young men born in large families from the Sidama and Oromo clans are likely to be land constrained. When brothers remain in rural areas the situation can be constraining, especially for the youngest. *"I only have a very small plot next to my house. That is not enough to plant malt barley. My father divided the land between me and my brothers. I am one of the younger ones in the family so I got a small plot" (Respondent 11, Male, Guguma, July 16, 2016).*

Most land is accessed directly, and can be seen as a form of access control. Acquiring access to extra land is possible through leasing land from others (i.e. indirectly). This is a normal practice for wealthier farmers. Poor farmers, and in particular female farmers who are head of a household, commonly lease-out their land. Sometimes they work on their leased-out land in return for cash or part of the harvest. At the intra-household level, young women can only access land through their husbands, brothers or fathers (i.e. access maintenance). Widowed women often retain control over the land of their deceased husband, but divorced women do not have this right under traditional customs. One woman described her way of maintaining her access to land as follows: *"The land is my husband's. But he has been sick for a long time now. I cultivate Qat and other cash crops. So far I have not been able to get hold of the inputs for malt barley. DAs don't like to work with women..." (Respondent 26, Female, Guguma, September 3, 2017).*

Households with limited land are often among the poorest in the community. Families who were historically disadvantaged face additional problems as they were not able to expand their asset base in the past. In Guguma and Gomeshe-Tulu a large portion of the households with very limited access to land prioritises growing food crops over cash crops and thus do not grow malt barley.

5.1.2. Manpower and oxen traction

The MBT package recommends ploughing the soil three to four times before planting, and a final time when planting. At the planting stage, rows of approximately 20 cm wide are created. The malt barley seeds are placed in the furrows, together with fertiliser. This is done as a team effort: one person ploughs the rows, while another sows the seed with the fertiliser. The timing is crucial: planting too late reduces the yield potential. To plough the soil, a pair of oxen are needed. Our data show that only 8% of the households in Guguma and Gomeshe-Tulu owns a pair of oxen; the remaining 92% of households have to rely on various exchange mechanisms to access oxen for ploughing. The extension system uses what is sometimes called 1–5 groups, which serve several purposes including neighbours sharing their oxen. These groups are set up by local government in parallel to the system of model-follower farmers. While the model-follower farmers set-up is not directly linked to the dominant political party, the 1–5 groups are linked to party membership. Several 1–5 groups (called cells) are gathered in larger groups, headed by members of the ruling political party. While the farmers say that it is in their culture to share oxen, not all farmers are satisfied with the oxen sharing system. One farmer told us: *"The problem is that I only have 1 ox, and I have to share mine with others and get one ox from others to plant in rows. That is the reason why I plant late." (respondent 11, Male, July 26, 2016).* Access to oxen has also consequences for applying the MBT package: *"Government people force people to plant in rows. But there is no-one in place afterward to support you. If you do not have oxen, how can you plant in rows?" (Respondent 6, Female, July 22, 2016).*

Poor households with small plots of land, in particular households with children too young to help much on the land, can find it difficult to produce enough to feed themselves. They have limited available manpower and limited financial means to purchase and maintain oxen. This means that they need to ask for support from others to be able to plough their land. Asking for support is seen as a sign of poverty and

(*footnote continued*)
in the Southern Nations and Nationalities and Peoples Region of Ethiopia, which is estimated at 0.3 ha per household (Teshome, 2014).

emphasizes their low social ranking. *"It brings shame on you when you have to beg for seed. People will not respect you, they will know you are very poor." (Respondent 18, Male, Gomeshe-Tulu, September 6, 2017)*. This discourages many poor farmers from cultivating modern crop packages. Rather, these households engage in daily labour on other farms, or non-farm activities, to earn an income. The result is that generally who can find a way to access oxen (either direct or indirect) can take (full) advantage of the MBT package.

5.1.3. Seed and fertilisers

National extension policy dictates that at the beginning of each agricultural season, the DAs make an assessment of the amount of seed and fertiliser needed for their kebele. As part of the woreda development plans, each kebele also plans the amount of land to be planted with modern varieties and the expected yields. With the MBT package, the farmers had to indicate the amount of land they were planning to plant with the malt barley package. On the basis of these estimates and the recommended seed and fertiliser rate, the kebele administration determined how much malt barley seed and fertiliser it would need and passed this information onto the woreda. This message was finally passed onto the federal level, where the Ministry of Agriculture was responsible for ensuring that the requested amounts of fertiliser and malt barley seed were distributed to the participating kebeles before planting time. Fertilisers are generally distributed through the co-operative union or primary cooperative at kebele level.

Quality seed for malt barley is scarce and it is problematic to arrange for its timely availability. DAs face the pressure of meeting their production targets for their kebele (interviews with DAs in Guguma and Gomeshe-Tulu, 2017) and this leads them to tend to select households that they have confidence will be willing and financially able to purchase the recommended seed and fertiliser rates. This results in a selection process whereby certain households are more likely to access seed and fertiliser than others. A quote from a DA illustrates this point: *"The condition for receiving fertiliser is that you have to prepare your land well." (DA, Guguma, July 2017)*. A farmer described problems faced by farmers in Guguma*: "First there are availability issues. The inputs are difficult to get. Seed and fertiliser are not available to all farmers. Seed is only available to members (of the cooperative). Others have to get it in the market. But in the market you don't know about the quality. And besides, it is not allowed to purchase seed at the market!" (Respondent 23, Male, Guguma, September 2, 2017)*.

In Guguma, the President of the seed cooperative is also the President of the fertiliser union. In Gomeshe-Tulu the President of the grain cooperative is the former chairman of the kebele. In both cases the presidents of the cooperatives are leading figures with a long record of holding influential positions. Since direct access to seed and fertiliser controlled by a small group of people, most households have to find indirect ways to access them. One farmer said that the DAs never visited his farm: "*I asked many times but they won't come. When I saw the malt barley in my neighbour's field, I became interested. I sold a calf and bought seed and fertiliser in the market." (Respondent 23, Male, Gomeshe-Tulu, September 10, 2017)*. Another farmer stated: *"Through my friends I saw what I could do with malt barley on my land. I accessed the seed and fertiliser through the market." (Respondent 17, Male, Gomeshe-Tulu, September 6, 2017)*. In the absence of direct access control, many farmers who want to apply the MBT package are obliged to purchase seeds and fertiliser on the market, a mechanism of access maintenance.

5.2. Access to social components

5.2.1. Agronomic knowledge

The DAs initially approach model farmers to share their agronomic knowledge on specific new technologies or practices. Although most interviewees said that they accessed agronomic knowledge on the MBT package through their fellow farmers (access maintenance), they did not experience accessing agronomic knowledge as problematic. In fact, even farmers who did not apply the MBT practices, were aware of the claimed advantages. Nearly all the farmers we interviewed had heard about the importance of row planting, weed management, and harvesting techniques, either during trainings, demonstrations, or via other farmers.

5.2.2. Cooperative membership and marketing knowledge

After the on-farm trials in Guguma in 2013, the kebele administration organised a meeting to establish a new institution to organise seed multiplication for malt barley: the Derrera Seed Producer Primary Cooperative. They invited 21 male farmers to this meeting, who all became members. They received training on cooperative management and agronomic techniques as well as a grant to construct a seed storage facility. In subsequent years the cooperative expanded to 55 members, even though the membership fee increased from 500 to 2000 Birr. In 2015, in Gomeshe-Tulu a grain cooperative was established with 19 farmer members, which had expanded to 56 at the time of data collection (2017).

Members of the cooperative had a better chance of accessing seed through their own cooperative. In addition, membership of the co-operative provides the option to purchase seed and fertiliser on credit, without interest. Non-members can only make use of a credit arrangement if they are identified by the kebele administration as poor, and even then the credit arrangement has an interest rate of 10–15% (personal communication with the Credit Manager of Gomeshe-Tulu, 2017). Thirdly, membership of the cooperative secures access to a buyer who purchases the harvested malt barley, for a premium price, reported to be 22% higher than that on the local market (CASCAPE, 2016). Thus, cooperative membership also guarantees access to a better and more secure market. Only 1 out of the 10 inhabitants in Guguma and Gomeshe-Tulu is a member of one of the two cooperatives (Malga Bureau of Agriculture, personal communication, September 2017). Those who are not members of one of the cooperatives face more difficulties in accessing the MTB inputs.

5.2.3. Being connected to the right people

In hindsight, the on-farm trials and subsequent meetings where membership of the cooperatives were determined (in Guguma in 2014 and in Gomeshe-Tulu in 2015) were crucial events because they created an exclusive and privileged situation for some households, increasing their ability to access improved seed (Sabine and Traveler), fertiliser (with interest free credit) and a secured buyer who guaranteed a premium price for harvested malt barley. However, regardless cooperative membership, being connected to the right people serves a purpose, as is clear from the following quote from a farmer: *"Only those farmers 'who are near to' can get inputs […] from DAs. 'Being near' means having a good relationship with them, through your clan, and by living near the main road." (Respondent 18, Male, Gomeshe-Tulu, September 6, 2017)*. Conversely, the people who are not well-connected to influential people face constraints, even if they manage to become cooperative members. As one farmer describe it: *"There are some problems with distribution. Some people get more benefits than others. Those who are distributing [the seed and fertiliser] give more to certain farmers and less or none at all to others. Or they sell it [i.e. fertiliser] to merchants." (Respondent 7, Male, Guguma, July 22, 2016)*. It is apparent that 'being connected to the right people' was also an important pre-condition for becoming invited to become a cooperative member. On the positive side, having the 'right' social connections open doors to other components such as seed and fertiliser, markets and knowledge about other new innovations. But the reverse also holds true: those who lack those connections find their access to these components blocked, or at least more difficult. Being connected to the right people facilitated direct and indirect access to cooperative membership and markets.

6. Analysis of the underlying mechanisms

Farmers' experiences with accessing material and social components of the MBT, notably cooperative membership, credit, seed and fertiliser, were largely governed by their social relationships and their positions in the community. We identified three types of mechanisms that explain the dynamic process of accessing the material and social components of the MBT package: clan-based loyalty, vertical accountability and reciprocity. These mechanisms are related and partially overlap, and as we argue below, self-reinforcing.

6.1. Clan-based loyalty

While other in-depth case studies of agronomic extension in Ethiopia do not emphasise ethnic and/or clan based factors (Emmenegger, 2016; Segers et al., 2009; Teferi, 2012), we found that clan-based loyalty strongly influenced access to 'project membership' in our study areas. With clan we do not necessarily refer to ethnic groups, but rather to extended family clans within certain ethnic groups, which have existed in the study kebeles. Most respondents said that clan was the most important criterion for receiving information from the DAs on agronomic novelties. *"Unless you have relatives from your clan in influential positions, there is no way that you can advance the situation of your family. We have tried many times to get involved in new initiatives. But our papers were not even considered" (Respondent 26, Female, Guguma, September 3, 2017)*. In some cases, the clan-relation also affects the access to seed, as affirmed by this farmer who said: *"I never get seed directly from DAs, but mostly* via *my own friends or relatives. (Respondent 5, Male, Guguma, July 22, 2016)*.

While clan-based loyalty was frequently mentioned by respondents who felt excluded by the extension system, this topic was not perceived as significant among those respondents who were in power (the Kebele administrators, DAs, etc.) or respondents from the dominant clan. Rather, this group referred to 'being serious' and 'hard working' as criteria for being invited to become a cooperative member, or for being selected as a host farmer for on-farm trials. This difference seems to indicate that clan-based loyalty is a mechanism which – covertly– influences access, although it is not accepted to talk openly about this topic - as it does not fit the extension narrative, which is based on the ethos of being hard-working and leading by example. Farmers spoke of several strategies that are used by others to improve their connection to clans that are considered to have substantial power: *"It is very common in this area to marry with the purpose of getting closer ties with those in power (mengist) to improve your livelihood. I don't want to give examples, but believe me, it is very well known." (Respondent 22, Male, Gomeshe-Tulu, September 7, 2017)*.

6.2. Vertical accountability

The second mechanism can be characterised as vertical accountability, from community members to DAs, and from DAs to their superiors. Local authorities perceive themselves to be under pressure to demonstrate positive results (in terms of the volume of cereals produced with use of modern seed, chemical fertilisers and modern agronomic practices, such as row planting). This leads DAs to select farmers who have a reputation for producing these results. For instance, all respondents mentioned that the farmers who were the first to access the MBT package were farmers with a reputation of being serious farmers, who were wealthy enough to invest and assure a good harvest. The Kebele manager of Guguma confirmed this: *"I was responsible for the farmer selection. We informed only 21 farmers, whom we were certain would be able to pay the fee and who would be interested. We guessed that most farmers would not be ready to take the bet and pay 250 Birr in advance for something they were not sure about. The 21 are well-known from other experiences." (Kebele manager, Guguma, September 9, 2017)*.

The following quote shows the other side of the coin whereby farmers who cannot (or do not) comply with the government's expectations are disrespected: *"If poor farmers don't show they adopt the row planting methods, they will be disregarded by the whole community. They will not be respected. They will never be selected for any kind of other support. So they have no choice but to struggle! Social exclusion is not the way you want to go." (Respondent 27, Male, Guguma, September 4, 2017)*.

Many farmers experienced pressure to follow the recommendations from the extension agents, partly as a pre-condition for accessing seed and fertiliser: *"The condition to receive fertiliser is that you have to prepare your land well." (Kebele administration, Guguma, July 2017)*. But even when these inputs are accessed, the pressure to follow the DA's recommendations continued. At one point during the field work in 2016 some model farmers were mobilised because there was a rumour that an official delegation of regional administrators would visit Guguma. The DA visited several model farmers and instructed them what to say and what to do if this delegation visited their farm. Some farmers protested as they were not willing to exaggerate the amounts of seed and fertiliser that they planted on their land or were not willing to praise the local authorities. Others were more willing to comply with this request.

> *"We have to give up our time for these visitors. They come and order us to do things. Why? I was standing next to my husband when he repeated exactly what he was supposed to say, without blinking. I was laughing at him a lot!" (Respondent 28, Guguma, July 2016)*.

We also observed that farmers actively engage in relationship-building with the local authorities. This became visible through three related strategies: public praising the local authorities, public compliance with the government's recommendations and 'being around'. One farmer clearly described how he considers praising the local authorities as a gateway to become part of the group of farmers who 'get given chances': *"I was not selected. But the barley package is amazing! If I show my good will and if I am able to convince the DA that I am a serious farmer, I will hopefully get a chance soon." (Respondent 17, Gomeshe-Tulu, September 6, 2017)*. Even though this farmer was excluded by the extension system in the beginning, he refuses to speak badly about them. During the interview it became clear that he was convinced that being positive and building a good relationship with agents of the local authorities will be beneficial in the future. In line with this, respondents also mentioned that having the reputation of being a serious and hard-working farmer is advantageous because it increases the likelihood of accessing benefits from the local authorities in the future. This analysis is closely in line with the findings of Planel (2017) who mentions that farmers are consciously busy with 'keeping up appearances' when being among local government officials (or their representatives). While farmers who already have good connections, continue to demonstrate their good will through complying with the requirements of the government, as is shown in the following quote:

> *"To become a member of the cooperative, you have to show that you prepare your land very well (i.e. plough your land many times, and not work on other farmers' land); you have to participate in many governmental meetings; you have to convince others that this technology is very good; you have to be able to pay the membership fee; you have to have a large land size (2 ha) so that you can produce a lot of malt barley. If you want to become a member you have to ask the DAs to visit your farm." (Respondent 24, Male, Guguma, September 2, 2017)*.

This shows the vertical accountability whereby both farmers and DAs need each other to perform in certain ways to be able to remain (or improve) their situation.

'Being around' is a social connotation for showing up to meetings, showing your face on market days, and for making yourself seen by the kebele administrators and DAs.

> *"You have to spend much time with DAs, invite them for coffee, tea, lunch, you have to talk to them. You have to participate in many of the*

meetings so that they start to know you. If you spend a lot of time in 'the centre of the road', there is a chance that they will see you. Then you can talk to them and they might tell you [about new opportunities]." (Respondent 22, Male, Gomeshe-Tulu, September 9, 2017).

Being around does not guarantee direct access to inputs, but being known by DAs, the kebele manager and the cooperative management, gives one a privileged position when seed and fertiliser are distributed. Implicitly most interviewees mentioned that a 'serious farmer' is able to build relationships with the authorities. Conversely, farmers who are not able to do this, mention that they are, or cannot, 'be around'.

"In the beginning I was not around. I only realised later how important it was to become a member [of the cooperative]. I regret that I did not work harder back then, to get involved. They put a hold on membership so it is not possible to join anymore." (Respondent 27, Male, Guguma, September 4, 2017).

While 'being around' is possible for households with enough resources to hire manpower for the daily work, it is harder for poor families who rely on selling their manpower to be present at such meetings and on market days.

"You have to spend much time with them. But if you are sick or you work on other people's farm, you don't have time for all these social events. People do not regard me as important because I don't show up." (Respondent 28, Male, Gomeshe-Tulu, September 4, 2017).

These findings on vertical accountability fit other recent studies on the Ethiopian extension system, which point to an Ethiopian state that mobilises local authorities and rural elites through the extension system by enforcing accountability and reward systems that extend to the lowest possible administrative level. The active and continuous engagement of farmers in social-relation building is a mechanism of access maintenance.

6.3. Reciprocity between farmers

Reciprocal arrangements between farmers are the third type of mechanism that influence access to certain components of the MBT package. While reciprocity is often depicted as something positive for everyone, this case study shows that reciprocal arrangements between farmers can work out differently for farmers from different socio-economic and gender categories. This was most strongly visible in the case of oxen sharing. While used by the extension agents as 'social asset' in farming communities, in reality oxen sharing practices are socially-bounded. In other words, the reciprocity is not on equal terms and not everyone equally benefits from these practices. Only a small portion of the households (8%) own 2 oxen and can these always plough their land when they want. 12% of households have 1 ox. If they have neighbours with another ox and they have a good relationship, it is common for them to share their oxen and plough their land together. However, families with no oxen (80% of the community) have to wait until the others are done with ploughing before they can request to use oxen in return for their manpower. Hence, wealth causes a differentiation between those who can plough when they want, and those who depend on others to plough their land. Additionally, women are not seen as 'real' farmers, and are not considered to be in need of oxen. Women who do not have oxen and want to cultivate their land face serious constraints in accessing oxen.

Besides oxen sharing, another reciprocal system is labour sharing during planting and harvesting time. When probing further on this topic, it became clear that labour sharing is less common than oxen sharing. Most households in the study areas, poor as well as wealthier, prefer to pay for manpower rather than to exchange labour. Selling manpower is an accepted strategy for poor households to acquire an income. However, on the other hand, working (for payment) on other people's farm is seen by wealthier farmers as a sign of poverty, which decreases one's status in the community. Furthermore, being poor is associated with being lazy, pathetic, and other negative associations. *"Farmers who work on others' land, are not regarded as good farmers by the community. The community does not accept these kind of farmers as serious because they don't farm their own land..." (Elderly, Male, Guguma, September 2, 2017).* It is socially unacceptable to ask directly for support, without returning either labour, oxen, or something else. Farmers who do so, demonstrate their poverty. This is generally considered as something bad in the community, as the following quote demonstrates: *"I don't ask others for help. Nobody would do that here. It brings shame on you when you have to beg [for seed]. People will not respect you, they will know you are very poor." (Respondent 18, Male, Gomeshe-Tulu, September 6, 2017).*

So, while reciprocal arrangements are mentioned publicly as a commonly accepted mechanism for accessing oxen and labour, there are barely disguised social factors that influence who gets to access and offer manpower and oxen and who is excluded. A similar pattern was found in a study on seed exchange mechanisms in Ethiopia conducted by McGuire (2008), which brought to the fore that local community support mechanisms are not as generous or unconditional as they might appear to outsiders (McGuire, 2008). For instance, asking for help without providing anything in return stands for poverty, which in turn is associated with being lazy and not serious. Farmers who are unable to farm their own land are also considered to be 'bad' farmers. These examples are in line with the findings of Segers (2009) on the political dimensions of development in Tigray with signs of non-adoption of modern technologies often being interpreted by the government and elite farmers as acts of rebellion against the ruling political party. Although in this case study no such remarks were made by local authorities, the underlying thinking is that you have to – at least publicly – praise the efforts of the government and play along with the rhetoric that technologies are good and farmers who cannot adopt those technologies are either lazy or rebellious. While accessing manpower and oxen are not as straightforward as one might expect, the effects of non-access are that certain farmers are excluded from the community because they are regarded as lazy or rebellious (or both).

6.4. Mutually reinforcing mechanisms of inclusion and exclusion

In Guguma and Gomeshe-Tulu, clan-based loyalism, vertical accountability and reciprocity seem to be self-reinforcing mechanisms of inclusion and exclusion. On the one hand, 'insider' farmers have better access to components of the technology, as well as other new opportunities, which reinforces their social and economic status in the community, which further reinforces their attractiveness to be targeted by the extension system as model farmers. *"If you perform well, you are asked to take on more and more responsibilities. I accept these because it is an honour to do these kind of things for the community." (Respondent 1, Male, Guguma, July 18, 2016).* However, there is also a lot of envy and jealousy among households who are not part of this small group of 'chosen ones':

"Model farmers keep the benefits to themselves. They might tell you about row planting, but that's it. These days they seem to have become more self-centred. I think it is because they have got richer and want to protect what they have" (Respondent 28, Male, Gomeshe-Tulu, September 4, 2017).

The other side of the coin is that once you are perceived by the community as being poor or lazy (often mentioned in the same breathe), it is difficult to change this reputation. DAs are not interested in visiting farmers with a 'bad' reputation, thus they get ignored by the extension system, which in turn increases the difficulties in accessing the necessary components to apply a new and promising technology.

7. Discussion

7.1. Adoption as a negotiated and layered process of accessing

This paper contributes to academic endeavours to find more nuanced ways to conceptualise the processes of adoption and scaling. The findings of our study are in line with earlier refinements of these concepts, which suggest that it is useful to look at the scaling of practices and use of artefacts in relation to other (technical and social) practices and components, including those that form part of the 'enabling environment'. Such practices and components are clearly visible in the case of MBT, but they also stretch well beyond the technology package provided by the project (see Section 4.1). Our case study of MBT underlines (once more) that scaling and adoption are not simply the result of individual farmers' decisions, but arise from a web of interactions that exist within and beyond farming communities. The findings highlight an oft-ignored aspect of such interactions, related to how people access the components of an innovation package, including knowledge, inputs and connections. In doing so, we have applied insights on access developed in the domain of natural resource management. The frameworks that we have discussed earlier (Berry, 1989; Milgroom, 2012; Ribot and Peluso, 2003) proved highly relevant to our analysis of AR4D initiatives and helped us to broaden our understanding of how the uptake of technology is affected by socio-political dynamics.

In our case study the distinction between access control and access maintenance developed by Ribot and Peluso (2003) proved very useful in terms of material resources, such as land, oxen, seed, fertiliser and manpower. On the surface, it seemed possible to distinguish between controlling the resource (e.g. who decides over the use of land or manpower) and accessing the resource through others (access maintenance) via reciprocal arrangements such as oxen and labour sharing. However, when analysing the social components, such as agronomic knowledge, markets, and cooperative membership, the distinction between access control and maintenance was less obvious, since these components are relational by nature, implying that access to social components is always negotiated and never controlled just by one actor.

7.2. Scaling the technology or scaling exclusion?

We identified three underlying mechanisms that played an important role in shaping access to the MBT: clan-based loyalty, vertical accountability and reciprocity. These mechanisms are often invisible but still very important in governing the terms of access to material and social resources and technology in rural communities. The external AR4D project in this case study (CASCAPE) was not able to eliminate these mechanisms and their effects. Indeed, the project did not attempt to change the existing 'social rules of the game' that govern access but accepted them for what they were. As a result it actually reinforced the adverse effects of these mechanisms. Our case shows that chronically poor people were severely frustrated in their capacity to exercise agency. Because of their constraints in accessing land and oxen, they worked on other farmers' farms and could not invest the time required to show up at meetings and bonding with more influential farmers and DAs. In return, because they don't farm their own farm (or it is very small), these poor farmers are disregarded by the community as being not serious, excluding them from new opportunities and thus widening the gap with their wealthier peers. This confirms the findings of Cleaver (2005) that the social conventions that communities have established over time, i.e. the "right ways' of socialising, associating, and participating in public life, tend to reinforce existing relations of authority, which channel everyday actions to reproduce such social structures. While the mechanisms of exclusion were most apparent for the poorest of the poor, these mechanisms also caused exclusion of other categories of farmers (women in particular, but also farmers who were historically disadvantaged by their original clan and, lastly, farmers who simply did not have the right connections to become invited to the cooperative from the start).

The findings from this case study of two highland villages in the south of Ethiopia support earlier studies with respect to the observation that the current Ethiopian extension system works to expand state control to rural communities (Emmenegger, 2016; Lefort, 2012; Planel, 2017; Segers et al., 2009; Teferi, 2012). As such, this case study does not stand in isolation but is a confirmation of the picture of a strong entanglement of politics, power, and agricultural development in which development money is used to maintain or expand the authorities control over rural households. Our findings add to earlier studies by showing how socially constructed mechanisms of accessing modern agricultural technologies can reinforce existing poverty dynamics. By ignoring this socio-political context, the malt barley intervention has probably resulted in an unintended 'negative scaling' effect: a widening of the social and economic gap between a few better off farmers and a larger group of poor farmers. It thus seems that instead of scaling the technology the project unintentionally scaled a process of social exclusion.

7.3. Implications for policy and practice

Based on our work in Guguma and Gomeshe-Tulu, we reiterate the conclusion of Cleaver (2005) that to avoid social exclusion of the poor we need to consider their structural disadvantages and constrained agency. AR4D projects intervening in areas where poverty prevails can basically choose between two directions: 1) acknowledging that they may not be able to serve the poorest-of-the-poor directly and target their efforts and resources to the 'economically viable poor', or 2) consciously addressing poverty in its wider socio-political context. This second option requires moving away from a narrow frame of a technical fix in assumedly static communities, towards acknowledging that agricultural innovations are always socio-technical/material in nature. Practically, this implies that AR4RD should pay more attention to how different categories of households can overcome the obstacles to accessing new technologies. This involves understanding the social mechanisms that affect access control and maintenance in the communities where technologies are being introduced or scaled. If the socio-economic context had been taken into account from the start, issues such as land shortage, limited availability of oxen and financial capital might have given rise to innovations in which access to land or other forms of capital were less of a pre-condition (e.g. small ruminants or beekeeping, processing and small scale mechanisation). Concretely, in the case of Guguma and Gomeshe-Tulu, more attention could have been paid to 1) experimenting with alternative labour and oxen exchange mechanisms to make these accessible for a wider group of households; 2) providing micro-credit facilities to poor households; 3) introducing new technologies for land constrained households. Furthermore, awareness of the exclusive character of the fertiliser union and seed/grain cooperative could have helped to increase the widespread application of the MBT package.

The finding that knowledge was not a limiting factor in accessing the new technology was remarkable: all members of the community to whom we spoke were aware of the different agronomic practices of the MBT package and their benefits. The limiting factor was socially constructed, namely 'being connected to the right people' to benefit from this knowledge. Here, our case study contradicts the commonly held assumption that the diffusion of agronomic knowledge drives adoption of modern agricultural technologies (Feder and Savastano, 2006; Rogers, 1995). Our findings are more in line with those of Cheesman et al. (2017) who reported that the closure of knowledge gaps in Zimbabwe did not automatically result in the adoption of conservation agriculture technologies (Cheesman et al., 2017).

The findings of this case study are also relevant for agricultural extension policy makers and practitioners who predominantly focus their attention and efforts on disseminating technical knowledge.

Access to other material and social components of agricultural technologies, such as improving linkages to input and output markets or credit facilities, or the political system, are often considered as contextual factors that are beyond their responsibility. Hence, our study supports earlier calls for rethinking extension and extension policy (Dormon et al., 2007; van den Ban, 2007). Taking the different (and often invisible) social aspects of 'access' into account within AR4D will entail a reorganisation of the research – extension – continuum. In this case study the introduction of the MTB package involved considerable social engineering: the establishment of two cooperatives which resulted in access control for 'included' farmers, while creating obstacles to access for those not included. Some of these obstacles that this created could have been overcome by establishing access maintenance mechanisms (relationship building with influential persons), but even this requires access to resources which not all farmers have access to. Hence, scaling of a technology package also requires scaling of socially engineered mechanisms to enable farmers of different socio-economic categories to access components of the technology package. This could mean the creation and scaling of credit institutions or scaling the reconfiguring of reciprocal arrangements between farmers. Engagement in social engineering may seem beyond the remit of organisations involved in AR4D (although in this case study there was social engineering, the consequences of which were not perhaps fully thought through). However if they, and their donors, aim to improve livelihoods of the poorest of the poor, it is crucial to acknowledge the underlying social and political causes of persistent poverty in poor rural areas. Ignoring this context only results in perpetuating and perhaps even reinforcing the status quo. Alternatively, AR4D could more honestly or explicitly acknowledge its limited capacity to help all types of farmers and that the poorest of the poor may not be a feasible target group.

7.4. Concluding remarks

Our case-study demonstrates how an external intervention aiming to provide access to a modern agricultural technology of malt barley was affected by the social-political dynamics of access. These dynamics effectively turned the attempt to scale modern technologies to the scaling of exclusion of some community members. This suggests that attempts to create an enabling environment for technology uptake through the provision of access to agronomic knowledge and inputs is simplistic since it ignores the deeply entrenched dynamics within, and around, the communities of prospective beneficiaries. At the same time it demonstrates, at the conceptual level, that the processes of accessing profoundly influence scaling, which adds to the difficulty AR4D achieving its intended impacts. One could argue that this case study has limited external validity as it is based on a single case study at the interface between an external AR4D intervention and two rural communities in southern Ethiopia. However, the findings of the study show that technologies and the way that external agencies seek to introduce and to scale them are far from neutral. We encourage other researchers to critically assess the validity of this case study by applying it to other domains (such as agriculture-nutrition linkages) and/or other geographic areas.

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