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WORLDVIEWS APART: AGRICULTURAL EXTENSION AND ETHIOPIAN SMALLHOLDER FARMERS

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ABSTRACT

This paper presents an inquiry-based learning assessment into why farmers in the highlands of Ethiopia were not adopting a new planting methodology promoted by the government and non-governmental organizations. It offers a process of reflexivity whereby assumptions emerge as the key barriers to misunderstanding, and focuses on the concept of divergent worldviews as an important consideration for understanding (non)adoption. The learning process offers insight for policy, programming and research, emphasizing learning instead of definitive conclusions.

We were standing in smallholder fields well off the beaten track, several hours down a bumpy dirt road followed by half a day of walking along muddy trails. It was the rainy season in the cereal breadbasket of the Ethiopian highlands. The fields had been planted several weeks before our arrival and were now covered with sprouts. We could see farmers meticulously removing unwanted growth as their fingers combed through the fields of several-inch high growth. I had joined a non-governmental team that was out to assess the impact of their organization's work, which aimed to encourage smallholder farmers to adopt a new planting methodology. Research indicated that the new methodology could raise yields by 25%. Government agricultural extension workers and the staff of this international non-governmental organization had been actively promoting the new practice with training, demonstrations and advocacy.

Standing with our feet half sunk into the thick black soil, the team was confused. In most fields farmers had evidently not adopted the new methodology. Yet, in some fields, we noticed a small portion of land planted using the newly introduced technique. The team struggled to understand what was happening. Maybe farmers were not convinced by the potential yield increase? Were the odd sections using the new techniques the result of farmers feeling pressured by government staff presence at the time of planting? Could it be that farmers did not understand the new planting methodology? Or maybe farmers judged that the additional workload required was not worth the gain? Viable explanations, all. I believe that it was not a lack of knowledge or clarity, nor was it external pressure, that best explains the puzzle that confronted us. The farmers and the agricultural advocates were worldviews apart.

This paper analyzes agricultural extension work, and its relative low adoption by farmers, in the Gojjam area of Amhara Regional State in the highlands of

Ethiopia, and specifically focuses upon the most important cereal of the area: teff. The unfolding exploration of why farmers were not adopting practices that could significantly increase yield guides the following sections. After assessing the viability of proposed explanations, the paper draws upon the concept of worldview, and the differences between farmers and agricultural extension workers. A concluding section offers reflections on questions relating to evaluating what extension services are effective and how different approaches to making such assessments result in a range of different conclusions. Furthermore, this specific example provides insight into why adoption of agricultural extension services may be low throughout most of Ethiopia.

Researcher positionality and reflexivity are important, yet often under-explored, components of research (England 1994; Rose 1997). This paper does not present the results of a research project on agricultural extension. It offers the findings of a practice-based experiential process. I joined a team on an organizational learning assessment. As someone who had lived and worked in Ethiopia for several years – most of my time being spent with non-governmental organizations – and having an intermediate spoken level of Amharic, I attempted to convey meaning across linguistic and cultural divides. The experiences described in this paper were ones I specifically sought, as I was in the planning stage of a research project that would take place in southern Ethiopia to explore the reasons for low levels of farmer adoption of a range of services and programs.

The approach was guided by the organizational question of assessing adoption of the advocated practices, and was iterative in process. Interactions included individual discussions, focus group sessions and conversations at training events, with farmers, community-level extension workers and organizational personnel. The farmers with whom I spoke were not prearranged and the areas within the communities where data was collected were unplanned, and therefore the interviews, discussions and sample household surveys were random, but not systematically randomized. The organization, and therefore the team members, was associated with the government, and was actively promoting practices the government was also promoting.

From the perspective of farmers, we would therefore, be considered as a part of the government, while cognizant that we were not governmental employees. Nonetheless, seen as acting on the government's behalf and in pursuit of their mandate. There were a range of power dynamics at play; urban, employed elites asking questions about activities the government advocates, within a context wherein agricultural choices such as these are highly politicized (Berhanu and Poulton 2014; Cochrane and Tamiru 2016). After the initial assessment, I remained in the communities without the international team members, when the more detailed analyses took place, which comprised most of the experiences described

below. This paper presents an iterative inquiry-driven learning approach meant to inform policy, programming and future research, rather than offer definitive finality.

CONTEXT

Located in eastern Africa, Ethiopia is a landlocked nation home to more than 90 million people (UN 2011) and covers a land area as large as France and Spain combined (Pankhurst 1990). Although urbanization is growing, most of the population, 84%, are rural (CSA 2011). Beyond the urban-rural divide, the country is also split between highland and non-highland, with 88% of the population living in the highland areas at 1,500-3,500 meters above sea level; this is also where 75% of all livestock and 95% of all cultivated land is found (Dalelo and Stellmacher 2012). The agricultural sector in Ethiopia accounts for more than 40% of the gross domestic product and 90% of exports, and provides the basic needs and income for more than 90% of the poor (Diao 2010). The vast majority (97%) of agricultural land is cultivated by smallholders, 60% of whom are doing so on less than 0.9 hectares (Taffesse, Dorosh, and Gemessa 2012). Nearly all cultivated land is reliant on rainfall (CSA 2009).

The diverse agroecological environments found within Ethiopia result in equally diverse forms of agricultural livelihoods (Pankhurst 1990). In the highlands, cereal cultivation predominates (primarily: teff, maize, sorghum and wheat) and many of these crops have been cultivated for millennia. It is thought that the Ethiopian highlands were the original places of domestication of teff (*Eragrostis teff*), nug (*Guizotia abyssinica*), which is also called Niger seed and blackseed, as well as dagusa, or finger-millet (*Eleusine corocana*) (Pankhurst 2001). Beyond the indigenous cereals, other domestic crops that are essential to the economy include coffee and khat (*Catha edulis*) (Cochrane and O'Regan 2016). In the lowlands, root crops predominate, including sweet potato, taro and enset (*Ensete ventricosum*), which are not commonly grown in the highlands, the geographic focus of this paper, and are therefore not covered.

The two main planting seasons are determined by seasonal rainfall, due to the lack of irrigation. The first, the 'small rains' of the belg season, typically begin in February and last until May, with harvests being taken June through August. The main rainy season, called meher, begins in June and lasts until October, with harvests from October until the onset of the next belg season. The highlands, which are the area explored in this article, are generally rain-secure, whereas other parts of Ethiopia have much more variable rainfall or are rain insecure.

Due to the central place of agriculture in the economy and as a primary livelihood practice throughout the country, the Government of Ethiopia actively seeks to improve agricultural production through research and agricultural extension. This process began in the 1930s and has existed in a range of

manifestations since (Belay 2003). In plans such as the Agricultural Development Led Industrialization and in the agricultural extension program, agriculture is viewed both as a vehicle for macroeconomic growth, largely through exports, and as a means to improve household food security and reduce malnutrition. A few examples demonstrate the gravity of the latter concerns: one in every eleven children in the country die before the age of five, 51% of children suffer from moderate stunting, 28% from severe stunting, and two-thirds of the population earns less than US$ 2 per day (CSA 2011; Evans 2012). Due to population growth, land size per capita has decreased significantly over the last five decades (Spielman, Mekonnen, and Alemu 2012), and as a result, agricultural productivity per household has also declined (ACCRA 2011). Yet, the rural governmental programs are also political, and serve political objectives beyond income via exports, they also act as mechanisms of rural control (Berhanu and Poulton 2014; Cochrane and Tamiru 2016).

To meet its agricultural output growth objectives, the government is promoting techniques to improve yields. The most extensive form of direct support is an army of agricultural extension workers, numbering more than 45,000, in almost every subdistrict throughout the nation (Berhanu and Poulton 2014). These workers offer training and support for farmers in the utilization of new crops and inputs. Many subdistricts also have Farmer Training Centers, where agricultural extension workers can demonstrate new methods and promote new crops. Within many regions Agricultural Research Centers also are working to identify and propagate improved seeds through non-genetic modification plant breeding techniques. The government subsidizes the cost of inputs, such as improved seeds and fertilizers, either directly through cost or indirectly through access, promotion and support. To support the development of markets and standardize product quality, the government commissioned the establishment of the Ethiopian Commodities Exchange (ECX) in 2008. Besides facilitating sales, standardizing quality, and establishing regional warehouses, the ECX also seeks to make information readily available to smallholder farmers, by establishing price boards in trading centers and making market prices available through cell phone text messaging.

Despite significant effort by the government, the adoption of the new planting methodologies and inputs being promoted is mixed. Certain crops, such as wheat, have high adoption rates of improved seed (71%), whereas only 20% of cultivated maize is improved seed, and for other crops improved seed use is lower still (Spielman et al. 2012). Chemical fertilizers are used by approximately a third of smallholder farmers, however, that use is specific to certain crops, such as teff, wheat, and maize (Spielman et al. 2012). Low adoption levels also exist for new planting techniques (Bonger, Ayele, and Kuma 2004). The low adoption rates of agricultural extension services are not specific to Ethiopia, and the questions about

why low adoption exists are common (Uvin 1999). The practice being promoted in 2014, when I was part of the confused team standing in smallholder fields, was the planting of teff in rows.

Food security is also a matter of political stability. In recent history, severe food insecurity has been intimately tied to the overthrow of governments. The 1973 famine in Wollo, which may have taken the lives of up to 300,000 people (Graham, Rashid, and Malek 2012), was followed by the removal of the Imperial government of Haile Selassie in 1974. Similarly, the 1984–1985 famine, which may have resulted in the deaths of 400,000 to 1.2 million people (De Waal 1991; Wolde Giorgis 1989), set the stage for the downfall of the Derg government, which technically was abolished in 1987, but was practically overthrown in 1991. The current government, which is the one that overthrew the Derg, had the support of external relief agencies that acted as "the relief wings of the rebel movements, and no realistic distinction could be made between the food that fed guerrillas and food that fed civilians" (Gill 2010:68). The role of food in enabling the rebel movement to gain strength and support was embedded within the Cold War of that historical moment. Circumstances have changed, but the power and politics of food continue to today. The current government "understood the role that famine had played in its victory" (Graham et al. 2012:263) and it is upon this foundation that agricultural development activity ought to be understood.

Teff

Teff, the crop focused on in this paper, is the most widely planted crop in the highlands, accounting for at least a quarter of all cultivated land (Chamberlin and Schmidt 2011). For smallholder farmers, teff is the most valuable market cereal crop, one cultivated for approximately 2,000 years and is the staple food crop throughout much of the country (Pankhurst 2001). Teff has been intensively cultivated for centuries in the highlands, and is done using a traditional plow called a *marasha* and a pair of cattle (Nyssen et al. 2011). The traditional plow breaks the soil, but does not turn it, enhancing soil conservation (Ciampalini et al. 2012). One trait that makes teff suitable for the rain-fed agricultural system is its resistance to extreme weather conditions, being able to grow in both waterlogged and drought situations, as well as its low vulnerability to pest and disease (Vandercasteelen et al. 2013).

Teff is only planted during the main (meher) rainy season, but since it is the most economically valuable crop grown by smallholder farmers, it is prepared for throughout the year. Farmers in the Gojjam highlands area where this learning initiative took place described their typical teff growing cycle as follows: The land is prepared by plowing, usually once per week over a four-week period before the expected teff planting period. Usually, it takes a full day to plow one-quarter of a

hectare using the traditional marasha plow and a pair of oxen. Depending upon the timing of the meher rains, approximately in July, teff is planted within a two- to three-week window, when the soil is moist from rain but no longer threatened by flooding. Farmers in this region commonly have several small plots in different locations and each must be plowed before being planted. Seed is applied by hand in a broadcasting motion, and if chemical fertilizer is used, it is also applied at this time.

In August the fields are weeded, which is a labor intensive process of working through the growth by manually removing the plants other than teff that have started to grow. Pesticides are available, but less commonly used than other inputs. This process continues for about a month. In October and November the harvests begin. The first step is cutting, which is done by hand and is the most time consuming of the harvesting processes, taking up to three weeks. After cutting the teff, it is collected in the field and is threshed with cattle, a process that usually takes two or three days. For this process, community members often share their labor and cattle, taking turns threshing each other's yields. The teff is then taken to individual homes in sacks. Within the home, some teff might be stored in large pots, or kept in the sacks in which it was collected. Following the teff harvest, beans or peas are planted.

Most farmers do not sell their teff immediately after harvesting due to lower market prices. However, once the market price returns to its normal level, approximately a month later, farmers sell their crop. Since teff has the highest market value of all cereals grown, most of it is sold. Farmers prefer to sell in bulk to grain traders, rather than in smaller quantities at a slightly higher price because the profit gained for time invested in selling small portions is marginal. Unlike other cash crops, the price of teff does not fluctuate drastically, and farmers feel they get a fair sale price from the grain traders.

Is the New Practice Beneficial?

Farmers throughout the communities, within individual discussions, in focus group sessions and at training events, explained that on average, expect a yield of 20-24 quantal (100 kgs) of harvested and sellable teff per hectare. The average landholding size and average amount of land planted with teff varies by location. Some areas are far more land-constrained than others, resulting in smaller landholdings and therefore less teff being planted. In this area, farmers suggested that the average landholding ranged from 0.75 to 1.5 hectares; for the sake of simplicity, the following analysis is based on an average planted area of teff of one hectare and an average yield of 22 quantal.

The ECX would be the ideal place to sell cereals, as they have warehouses throughout the country and facilitate sales. However, individual farmers do not

have sufficient yield to reach the minimum contribution weight (initially set at 10 tons, reduced to 5 tons; Alemu and Meijerink 2010; van der Mheen-Sluijer 2010), thus making local cooperatives and regional unions potentially a key resource for farmers as these could enable them to collectively sell to the ECX, as opposed to via traders. In some parts of the country these function well and help farmers acquire a greater share of the market price of their crops, although the benefit is debated and not equally distributed to all (Bernard, Taffesse and Gabre-Madhin 2009; Bernard and Spielman 2009). In this part of Gojjam, at the time of this learning activity, the cooperatives were not functioning and farmers sold their yields individually to grain traders.

Not all teff is sold. Approximately 3–5 quantal of teff is kept for household consumption. Due to the relative value of teff, households prioritize teff for sale, while consuming maize and sorghum. The market value of teff is at least twice as high as maize and sorghum; this difference varies season to season and within the season, however teff consistently earns a higher price. The market price of teff fluctuates between a low of 1,050 ETB (US$ 48) and a high of 1,350 ETB (US$ 61 per quantal.[1] Traders often take 50 ETB (US$ 2) per quantal as profit and to cover the costs of transporting the product to larger markets. Farmers generally felt this was fair. Excluding the amount kept for household consumption, the average smallholder household will sell approximately 18 quantal of teff. Taking an average market price of 1,200 ETB (US$ 55), and subtracting 50 ETB (US$ 2) as selling costs, the average sale price is 1,150 ETB (US$ 48), resulting in an income of 20,700 ETB (US$ 941) from teff sales.

The government and its non-governmental partners are keenly advocating planting teff in rows. Field research has shown that a switch to row planting can significantly increase teff yields, with average yields using row planting being 28 quantal, a 27% increase (Fufa et al. 2011; Vandercasteelen et al. 2014). However, studies controlling for conditions that may have produced these high rates found more moderate increases of 22% (Vandercasteelen et al. 2013). All three studies, however, relied on optimal conditions, such as inputs being available quickly and in sufficient quantity and without labor constraints. Planting teff in rows also has benefits beyond yield: the seed required when planting is vastly reduced, lowering costs of production, and the labor-intensive field management and weeding activities require less time and labor.

Assuming an average of four quantals is kept for home consumption, an average sale price of 1,150 ETB (US$ 48), a generous yield increase of 20% (lower than what the studies indicate, but higher than actual farmer results), the economics of row-planted teff shows a significant potential increase in income. The average yield rises

[1] 1 USD = 22 ETB throughout.

to 26.4 quantal, resulting in 22.4 being sold on the market. The income, therefore, rises to 25,760 ETB (~US$ 1171), an additional 5060 ETB (US$ 230). Considering that these figures are based on average landholding size, average yields, average household consumption, and average market prices – all information provided by farmers – this yield and income increase is potentially a means by which all smallholders in the community could increase their income. Having said this, farmers do not experience averages in their lived experiences (Cochrane and Gecho 2016). In addition, financial costs have not been factored in into this process, however it is noteworthy that the shift in methodology could potentially lower costs by reducing the seed required. The exact seed application difference, and thus cost savings, was unknown.

The potential benefits appeared attractive. However, despite several years of advocacy, extension worker-provided training, and demonstration fields at Farmer Training Centers, adoption levels remained low. Additionally puzzling, was that the farmers in this community agreed that yield increases were attainable by implementing this new methodology. This knowledge seemed widespread and not specific to this location. However, adoption remains low in Gojjam and throughout much of the country (Vandercasteelen et al. 2014).

Searching for Answers

In my discussions with farmers, agricultural extension workers and non-governmental staff, I attempted to identify the barriers that prevented the adoption of row planting, despite the recognition of potential yield increases (although the extent of that increase was debated). To do this, five different focus group discussions were held with farmers, which covered aspects of teff planting methods and the training provided. I also conducted thirty individual interviews with farmers, organizational staff and government personnel working in the agricultural extension program, which were supported with many more informal conversations in farmers' fields. I also attended training sessions held for farmers and joined organizational surveyors as they tested a data collection tool they planned to use to evaluate their programming. These interactions provided unique insight into what types of information were sought, shared and prioritized where, and by whom.

One study suggested that the main barrier to adoption was the increased labor required in row planting, a lack of knowledge, and insufficient experience with the methodology (Vandercasteelen et al. 2014). I first focused my inquiry on the question of increased labor requirements, and this was significant. Broadcasting seed on a quarter hectare might take 30–60 minutes, whereas row planting required a full working day. While this is a significant time and labor burden, this explanation did not fully answer the question, because farmers regularly planted maize in rows due to its improved yield, often with similar amounts of land.

Although the planting of rows for maize and not for teff, arguably for the same reasons, perplexed me, it was not a contradiction to the farmers, who appeared fully confident in their current choices. An important difference was seed size: teff is a tiny seed, difficult to place individually, while maize seed is larger and easier to place in rows by hand. While this posed a question of viability, an innovation developed by farmers has reduced this challenge, as discussed below.

Increased time and labor required is linked to a second potential barrier: a lack of labor availability, necessitating the less labor-intensive method. Households might be small, children might be occupied at school, youth might have relocated to towns for work or higher education, or those primarily responsible for agricultural activities might be elderly. Additionally, practicing labor exchange at this specific time of the year is difficult, due to the short planting window. For some families, labor shortages were, indeed, serious challenges. However, this was not the norm among the farmers I spoke with, and they explained that this affected no more than one in ten households, and therefore does not explain the widespread non-adoption of row planting. A lack of cattle for plowing is an additional potential barrier. Due to the short planting window, everyone who has cattle is utilizing them and opportunities for sharing cattle are limited. For a household that is waiting to borrow cattle, the planting window may be impossibly short to allow for row planting. Some families do not have cattle, but farmers suggested the number of households in this situation are no more than 5% of their community, which contributes to our understanding of the complex environment but does not explain widespread non-adoption.

While some literature suggests that agricultural extension work promotes national objectives, such as in export crops, at the expense of those crops that are of most interest to farmers (Uvin 1999), this was not so within these communities. The highlands of Ethiopia have been centers of cereal crop production for centuries, and, according to farmers, are the most suited to their soils. Root crops, such as potatoes or enset, do not grow well. Concerns over imposed crop choices, such as shifting from root crops to cereals and other export crops that are less suited to the agroecology, are voiced within Ethiopia (Rahmato 2007), but not within these highlands. It is noteworthy that these three potential explanations do not enter the historical and theoretical discourses about risk (e.g., Popkin 1978; Scott 1976; Watts 1983). These barriers suggest that the costs may not outweigh the benefits or not be possible.

Another reason farmers may not adopt row planting could be strict adherence to tradition. One farmer remarked "my father did it, his father did it, and I will do it." This explanation is common when speaking with non-farmers in informal settings; the "poor" decision making is placed upon the "stubborn" farmers who are "unable" to know what is best for them. One agricultural extension worker said that

"the farmers are like children, you just have to force them; like making your children get vaccines, even when they don't like them." Although commonly voiced by agricultural extension workers, and an expression of outsider bias (Chambers 1983), agricultural extension workers themselves have experienced that this is not so. Farmers in this region have both adopted new varieties of existing crops and introduced entirely new crops. Maize is not native to Ethiopia, being introduced to Ethiopia in the 16th or 17th century (Beyene, Botha, and Myburg 2005) and is not a key cereal grown. Furthermore, maize was not commonly planted in rows until the early 2000s, but is now planted in rows by most of farmers. Agricultural extension workers have witnessed these recent planting changes, and are therefore aware that farmers are not opposed to change in principle. The low adoption rates thus remained unexplained.

Yet another barrier suggested by agricultural extension workers was that the 'technology' being advocated was not familiar to farmers and this was why adoption was low. Maize seeds are large enough to plant rows by hand. However, teff seeds are very small, posing a challenge for row planting. Several mechanical planting apparatuses have been developed, but their high cost prohibits adoption. The tool that is now widely adopted by those planting in rows was developed by farmers themselves: put the teff seed inside a plastic water bottle, poke a hole in the cap, and insert an empty pen case in the hole. With a slight squeeze of the bottle, a spurt of seed comes out, and is directed to the correct location by the hollow pen case. Agricultural extension workers now promote this tool. However, it was farmers themselves who created it using locally available materials, and thus it appears unlikely that a lack of familiarity would restrict adoption. That development agencies and the government were testing high-cost machinery to address this challenge reflects their cognitive distance from farmer realities (Scott 1998).

Several government staff suggested that some farmers may reject the methodology simply because it is a government-driven initiative. Although interesting, and supported by experiences elsewhere (Scott 1985), I did not encounter any anecdotal evidence to support this idea, though it is true that there are people in Ethiopia who strongly oppose their government. Alternatively, governmental pressure could have resulted in higher adoption than farmers actually wanted, due to pressure and repercussions, as has been experienced in Ethiopia (Cochrane and Tamiru 2016) and elsewhere (Uvin 1999). Thus, the role of government pressure does not always have a consistent impact, positive or negative.

The way in which government staff convey information and provide training could also negatively affect adoption. For example, some farmers view extension workers as less experienced or knowledgeable than themselves when it comes to farming, particularly when these workers are new graduates from urban centers. Additionally, training may be provided at inappropriate times, or places too distant

to attend. These practical challenges certainly did exist, and farmers explicitly mentioned challenges of this nature. However, these same farmers knew about row planting, practiced it for maize, and understood the potential benefits of row-planting teff. Although this barrier sheds light on the effectiveness of advocacy and education programming, the low adoption rate question remained unresolved.

Farmers across different communities estimated that 60–100% of farmers know about row planting for teff, but remain slow to implement the change widely. Some agricultural extension workers and non-governmental organization staff suggested this meant that farmers were not fully convinced, which is something also mentioned by other researchers (e.g., Vandercasteelen et al. 2014). My experiences with farmers suggested that a lack of conviction was not the crux of the matter. The study mentioned above, which suggested that additional labor, a lack of knowledge, or inexperience were the reason for low adoption, also mentioned that farmers "put a relatively small part of their plots aside for row planting" (Vandercasteelen et al. 2014:3). This was something we also noticed as we walked from field to field, and consistently noticed in different communities that we visited. These small sections of rows suggested that the list of barriers insufficiently explained what we heard from farmers and saw in their fields. I needed to move beyond the readily apparent, and better understand the ways in which farmers understood their livelihoods, their engagement with agriculture, and how decision making occurs regarding change of this nature. Such an endeavor required assessing multiple knowledges and the relativeness of what is considered most suitable, based on different objectives and priorities. Scientific insights are not always universally applicable (Dea and Scoones 2003).

Worldviews Apart

A worldview is "a way of describing the universe and life within it" informed by "a set of beliefs including limiting statements and assumptions regarding what exists and what does not (either in actuality, or in principle), what objects or experiences are good or bad, and what objectives, behaviors, and relationships are desirable or undesirable" (Koltko-Rivera 2004:4). The composition of one's worldview, of which there are diverse manifestations, influences the way potential change is engaged with. Development planners and practitioners do not normally consider beliefs, perceptions and alternative ways of knowing in development activities, nor the assumptions embedded within them (World Bank 2014). It appears, however, that worldviews should garner far more attention, and may help explain why the adoption of row planting for teff is low in this Ethiopian context, and why agricultural extension services experience low adoption generally.

A worldview may be best understood as a collection of perspectives and ideas, which may not be shared by all people within a particular community but

predominate and influence the way many see and engage with the world. It would be incorrect to generalize a single worldview upon all people of a particular time and place and ignore the uniqueness within and between communities. It would also be incorrect to discount the socio-cultural, political and relational aspects of life that shape the ways in which choices about ideas and perspectives are made. This section focuses on two worldviews. However, this ought not to be understood as a means of simplifying diversities into opposing singularities.

The worldview concept is one that I have drawn upon in this work, however in doing so I recognize an array of literature and range of concepts that could be similarly employed. Fleck (1979) used the concept of 'thought collectives,' when analyzing the reasons why natural scientists and farmers were unable to communicate or understand each other. Pohl et al. (2010) pointed out the related concept of 'paradigms', which Kuhn (1996) utilized, building upon Fleck's work. Anthropologist Elizabeth Colson (1971) wrote about 'logic systems,' while others in the anthropological field have developed the 'cultural models' (D'Andrade and Strauss 1992; Holland and Quinn 1987) and 'cultural categories' concepts (Hall 1976). Although the concept of worldviews has its critics, it continues to be widely used (Beine 2010). I utilize this term as a common means to convey an idea, rather than an endorsement of this concept being superior to the others.

A primary anthropological critique applicable to all these concepts is the inherent limitations of anthropologists' attempts to create, populate or analyze these broad concepts, for which great diversity exists. In contributing to the worldview literature, I do not attempt to present an authoritative voice representing smallholders or agricultural extension workers. As Uvin (1999) notes, any such attempt will undoubtedly result in generalizations and simplifications that exclude, neglect and over generalize. This research focuses upon the ideas that predominate among the two groups; are often repeated, emphasized and taught, while also cognizant of differences and cautious of making claims that are too broad.

The team of development and extension workers explained that the new methodology would be adopted because maximizing their potential benefits was logical for individuals. There was little reflection on how benefits were assessed: seasonal, annual, generational, sustained? Similarly, there was no consideration of alternatives, such as decision making based on familial or communal grounds. The maximization of short-term, individual benefit, which is manifested at the societal level through ongoing competition between individuals, is what was therefore considered rational. Standing amid the early sprouts of teff, we failed to recognize and reflect upon the fact that this belief was only rational according to one, of many potential, worldviews.

The worldview shared by many smallholder farmers in the Ethiopian context, and around the world (Henrich and McElreath 2002; Netting 1993; Wolgin 1975),

is one that seeks to minimize risk, or reduce the number of variables of uncertainty within a context where variability is the norm. It is a livelihood approach informed by generations of farmers who have experienced how even minor changes can disrupt entire lives. Crops may be lost; disease may be introduced; market prices may drop; rainfall may be irregular; new varieties may be less adapted to their soils or have less drought tolerance. As households that are reliant upon their own agricultural production to meet their consumption needs, these disruptions can cause severe food insecurity beyond their lost income. Thus, the impacts also include: a decreased ability to pay for school-related costs for their children, fewer opportunities to pay for healthcare related costs, which can result in the sale of essential assets, such as livestock, to cover immediate needs because they have low or no capitalization to draw upon and have no or limited support from social protection programs. Manifestations of risk management and risk reduction are common components of worldviews that exist within diverse traditional agricultural settings throughout Ethiopia (e.g., Gebre Mariam 1991; Rettberg 2010; Yosef et al. 2013). This case study enhances our understanding of why and how such an orientation might develop. From such a perspective, potential benefits can be fully recognized, but avoided or approached with caution because of associated risk (unknown, potential or actual). Based upon this worldview, being cautious of change is natural, rational and logical, until both the short- and long-term risks and the benefits are understood. In returning to the historical debates about risk raised by Scott (1976) and Popkin (1979), I do not believe this is simply a matter of risk aversion or eagerness to seek benefits. It is not a psychological trait, but a logic that exists within a particular worldview.

While we were observing fields, some farmers had apparently implemented the row planting technique, but only on a small portion of their land. This was something we noticed in multiple communities. When viewed from the perspective of a farmer's worldview, this should have been the expected and logical outcome. Rather than implement a new methodology with unknown short- and long-term impacts on an entire yield, farmers systematically and strategically set about to evaluate the new approach by planting small sections of their fields in this manner. This process enables farmers to assess the benefits and the risks and determine if more land should be planted with the new method in the following season.

Farmers explained that maize followed a similar pattern, and row planting of that crop gradually expanded to cover most of the fields. It was similarly not done because a development actor or extension worker told them to change how maize was planted, but that they assessed the new planting methodology and adopted the practice over a period of about a decade. The commonness of small portions of land being set aside for the new teff planting methodology (Vandercasteelen et al. 2014), of only parts of extension packages being adopted (Limenih and Tefera 2014), and

of farmers recognizing the potential economic gain but not adopting (our own observations in 2014), can all be understood as natural and rational manifestations of a different perspective. The outcome of different processes, logic and priorities.

When we held discussions with farmers who were busy weeding their fields, there seemed to be a misunderstanding. What was not being communicated clearly enough, and why were farmers not fully convinced? Analyzing those conversations from the respective worldviews in retrospect, everything was, in fact, understandable. Assumptions of rational benefit-maximization suggested that farmers would logically adopt the new methodology (and fully trust the provider of that information to share their priorities and objectives), while an approach of rational risk-minimization resulted in farmers logically being cautious of changes to their agricultural livelihoods. Thus, they set out to methodologically test the change being advocated to understand its unknown risks, and adopt, modify or reject accordingly. Viewing agricultural development from different worldviews provides answers to our original questions: it was not a lack of knowledge, inexperience with the methodology, pressure from the government or aversion to additional labor that were the cause of low adoption rates; instead, these were the expected outcomes of a different set of beliefs, experiences, objectives and relationships. While this inquiry-driven learning process does not provide conclusive results on the question of adoption, it suggests that at least part of the answer lies in the framing of our own questions.

Reflections

There are innumerable instances of development practices being opposed by the people they are supposed to benefit (e.g., Escobar 1994; Li 2007; Scott 1985). In many of these cases, the debate focuses upon who was right and who was wrong. Far less often, is there critical reflection on the parameters of those questions, the assumptions that lie underneath and the different priorities that exist. This paper builds upon the works of scholars who have identified ideas and perceptions as key in the decision making process, and highlights the important role of the exchange and interaction of ideas between development actors and the individuals those activities are planned to benefit.

Escobar (1994) criticized development ideologies and the ways the policies development actors create can act as mechanisms of control. The problematic nature of imposed, top-down development activities, and the neglect of beneficiary participation, has been identified by Chambers (1983, 1997). Building upon the refocusing of agency, and whose agency is prioritized, this paper builds upon a tradition of inquiry largely set in motion with the works of Scott (1976, 1985). However, rather than framing smallholder responses as resistance to oppressors or being subject to mechanisms of control, it is suggested that individuals navigate and

negotiate change based upon how the externally developed activities are perceived and engaged with. Newly introduced ideas that seem logical from one worldview, may be irrational from another. The integration of the idea of worldviews provides a means through which diverse and divergent understandings and responses can be understood as rational choices within their respective perspectives and priorities.

A series of potential explanations, in barriers to adoption, were explored from the perspective of a particular worldview. These barriers provided some insight, but did not provide a narrative that brought the factors together to provide a coherent picture. Examining these questions from the perspective of a different worldview provided an overarching narrative that links the answers together, and offers one potential means whereby the actions of experienced and knowledgeable farmers can be understood within their own logic system. The responses of farmers, which appeared irrational and childlike from the worldview of agricultural extension workers, were in fact perfectly rational from their own.

Moving away from the specific activity of promoting row planting for teff, divergent worldviews could also provide explanatory narratives for several other responses to livelihood development activities in Ethiopia, such as: the purposeful maintenance of diverse crop types and crop varieties (Beyene et al. 2005; Samberg, Fishman, and Allendorf 2013), low adoption of fertilizers and pesticides (Spielman et al. 2012), slow or limited adoption of new agricultural methodologies (Bonger et al. 2004), diversification of livestock (Yosef et al. 2013) and choice of livelihood adaptations (Tsegaye, Vedeld, and Moe 2013). Unlike the specific barriers suggested by researchers and outsiders, the analysis of worldviews provided a narrative that has the potential to explain these diverse choices. In doing so, the question is reframed from one about why farmers are not adopting, to one about the strategies, beliefs and objectives that farmers consider when evaluating any potential change to their livelihood practice.

A recent World Development Report focused upon divergent beliefs and resulting behaviors, and stated that "World Bank staff have a different worldview from others" (World Bank 2014:180). Other than notes such as that, worldviews did not feature prominently in that report (except for a section on perceptions of climate change). It is nonetheless noteworthy that the consideration of worldviews, and their impact, is being discussed in this international and widely read report. It is also noteworthy that the World Bank itself has recognized divergent worldviews and that its staff holds different attitudes, beliefs, assumptions and objectives than those who interact with the programs that the World Bank funds. The acknowledgment of this challenge is important; however, what is more important is that organizations like the World Bank proactively seek to understand divergent worldviews, including those of its own staff, to integrate divergent worldviews into planning, design, implementation and assessment.

Within the Ethiopian context of smallholder teff planting methodologies, approaching the challenge of facilitating the improvement of production through new planting methodologies informed by diverse worldviews suggests that a more participatory approach, one that involves farmer-led piloting to enable co-learning, may be more suitable. This would result in mutual learning to answer the key questions involved (e.g., the actual benefits and costs for farmers) and, if warranted, support farmer-led changes to livelihood practices. Furthermore, as Dea and Scoones (2003:475) concluded in assessing different perspectives and knowledge of farmers, scientists and development actors in Ethiopia, such engagements ought to facilitate the emergence of diverse knowledges. In doing so, it must be recognized that scientific findings are not always universally appropriate.

In this paper I have attempted to show how the role of worldviews is commonly ignored, and more specifically the way in which ideas, perceptions and experiences influence development actors as well as beneficiaries of development action. Large amounts of research have been invested into understanding why change does not occur and what must be done to enhance the adoption of newly introduced practices in smallholder contexts. Research with a technical focus can identify valid barriers, but may miss important aspects of understanding change, such as the ideas, priorities and objectives informed by a worldview.

Using a concrete example of an agricultural development activity in Ethiopia, wherein worldviews have the potential to play a crucial role in the decision-making and change-adoption process, has demonstrated that these aspects deserve far more attention. Additionally, this case study demonstrates the importance of acknowledging, understanding and incorporating the ideas and perceptions of diverse worldviews into the understanding and assessment of development activity. Simultaneously, agricultural development efforts need to be willing to learn from diverse experiences and knowledges, not merely to analyze them to promote predetermined objectives. Agricultural extension services, as well as other aspects of life, have much to gain from understanding the knowledge held by those for whom it works; we only stand to lose by ignoring them. Suggesting that "their genius is integral to human potential, their skills are appropriate to their lands, and their rights are no less" (Brody 2000:7) is not novel. It nonetheless requires reiterating. For this knowledge to be appropriately respected, and for it to influence our engagement with others in transformative ways, it requires continuous revisiting and engagement in new ways and within diverse contexts.

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