MOBILE PHONES FOR MOBILE PEOPLE: THE ROLE OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AMONG LIVESTOCK TRADERS AND BORANA PASTORALISTS OF SOUTHERN ETHIOPIA

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Abstract

The recent widespread use of mobile communication technologies has sparked considerable interest in their application to social and economic development in low-income countries. In this article we examine the different uses of mobile phones among livestock traders and Borana pastoralists of southern Ethiopia, where increased adoption of Information and Communication Technologies (ICTs) has been recent and shows potential for improvements in local livelihoods and marketing systems. We draw on an ongoing study of pastoralists and livestock traders who, in the past five years, have increased their reliance on mobile phones. They increasingly employ them to access information on grazing, weather and market conditions despite local differences in adoption rates. The article argues that differential rates of ICT adoption among groups of herders and traders relate to unequal access to the technology and infrastructure, as well as differences in local practices of information gathering. We show that the high-level of sharing of mobile technologies between owners and non-owners, however, dampens some of the negative effects of unequal ownership and infrastructure deficiencies. In the conclusion, we address the program and policy implications of the study's findings and point to the need for additional research on mobile phone use among pastoralists.

KEYWORDS: Mobile Phone, Pastoralism, Development, Ethiopia, Livestock Trade.

'A trader without a mobile phone is like a blind person without a walking stick' (interview with Ethiopian livestock trader, October 2013).

Introduction

The social and economic effects of increased use of mobile communication technologies have sparked considerable interest among researchers and development

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practitioners. Recent topical studies of mobile phone use range from analyses of political factions and violence (Verclas 2007), to long-distance friendships and marriages (Horst and Miller 2006; Hannaford, 2015) and to innovations in financial services and health care delivery (Boadi et al. 2007, Morawczynski 2009). In this paper, we address the effects of mobile phone use among a mobile pastoralist population (Borana) of southern Ethiopia, where increased adoption rates hold the potential to have an impact upon local livelihoods and marketing systems. We suggest that the recent use of mobile phones among pastoralists plays a pivotal but not substitutive role for local practices of communication and information gathering. The new technology, it will be shown, supplements rather than replaces customary practices of information gathering. It also complements the mobile lifestyles of both pastoralists and livestock traders, but to date it has mainly benefitted traders for reasons that we will present in the paper.

To examine these changes, we draw on an ongoing study of livestock traders and pastoralists of southern Ethiopia who have increased their use of mobile phones. We examine how traders and pastoralists utilise mobile phones in their social and economic activities, including in searches for climate and market information, and then explore the problems surrounding mobile phone use and its adoption, including uncertainties in phone coverage and electricity supply. Through analyses of household- and individual-level data, we suggest that differential rates of local ICT adoption relate to wealth discrepancies and differences in local infrastructure and practices of information gathering.

The article begins with a general discussion of the development potential of mobile phone use in Africa and is followed by an assessment of mobile phone use among pastoralists. In the next two sections, we describe the study area and population of Borana,[1] southern Ethiopia, as well as analysing the social and economic effects of ICT use among Borana. We address the following questions: (1) what percentage of pastoral households own a mobile phone in the study area; (2) is the technology potentially relevant to livestock marketing/trading and could it potentially facilitate livestock sales and purchases; and (3) can ICTs improve the bargaining position of pastoralists in market transactions? The article concludes with a discussion of the development and policy implications of our study findings and suggestions for additional research.

The empirical basis of the article relies on a study of pastoralist households and livestock traders that was conducted during 2012–2014. The household data are from two Pastoral Associations (PA)[2] in Borana, Ethiopia: (1) Qancaro,

1. Borana is one of the two large administrative units (called Zones) where the Borana people reside in southern Ethiopia. In the paper both the people and the area are referred to as Borana.
2. A PA (Pastoral Association) or *kebele* is an administrative unit below the Zone and *Woreda* and equivalent to about 8–10 rural villages. Local PA officials report to the *Woreda* administration.

Dillo *Woreda* (district) and (2) Dikale, Yabello *Woreda.* The research locations were selected to reflect differences in dependence on mobile pastoralism, ecology and access to markets (for details on locations, see the Background section). Through random selection of households from registries in each of the two Pastoral Associations, seventy households were chosen per site for a total sample of 140.

A sample of 76 traders was selected for interviews from a membership list of the Ethiopian Livestock Traders Association and random selection of traders at key weekly markets. For the latter group, a 'snowball' approach to sampling was employed which asked randomly selected traders to identify other traders in their networks with whom they worked. These merchants were then also interviewed. Traders included in the study ranged from small 'bush' traders and middlemen working in Borana, to large-scale exporters and feedlot operators based outside the region.

In addition to household and trader information, data were gathered through unstructured interviews with approximately twenty key informants, including government and non-government officials and local leaders. These narratives supplemented the structured interview data and allowed for a nuanced and personal understanding of mobile phone use. Finally, useful information was obtained through participant-observation at markets and rural settlements, where each of the co-authors spent time observing and participating in different economic activities of herders and traders.

The development potential of mobile phone technology

To begin, the recent expansion of mobile phone use is a major technological change in Africa, including southern Ethiopia. Initially, the technology was limited to urban areas, but recently has expanded even to relatively remote areas, such as pastoralist rangelands. Indeed, the change in mobile phone use has been dramatic on the continent, jumping from two per cent of the total population in 2000, to approximately 33 per cent in 2008 (de Bruijn et al. 2009, cited in Boin et al., 2012: 24). This represents an increase in mobile phone use of more than 1,600 per cent in only eight years and we suspect that the number of users has also grown substantially since 2008. As the article will show, the use of ICTs has greatly increased connectivity and compressed the time-space continuum in rural Africa, including southern Ethiopia. The technology's contributions to local development have mostly been viewed as positive or mixed, although careful empirical studies, especially in pastoralist communities, are very few (see Butt 2015, Msuya and Annake 2013, de Bruijn and Van Dijk 2012).

Current research in Africa suggests that mobile phones are considerably

more cost effective when compared to other communication technologies, such as land-line telephone networks and internet connectivity (Furuholt and Matotay 2011). Mobile phone technology does not require large investments in physical infrastructure or in costly installations of land lines and heavy transmission wires, allowing rural communities to 'leap frog' the costly land-line era. It also has made it easier for governments and private companies to extend phone services and networks to rural areas in a relatively short period of time and at reasonable costs for users.

The critical question is no longer whether or not mobile phone technology is cost-effective, but how and to what extent it contributes to development and human welfare improvement? Some estimates put its impact on Gross Domestic Product (GDP) growth at 0.6 per cent for every additional ten phones per hundred people that are added in developing countries (Waverman et al. 2005). Another estimate is that mobile phones contribute 3.5 per cent of the continent's total Gross Domestic Production (GDP) (AfricaFocus 2011, cited in Butt 2015). The impact of increasing access to mobile phones in Africa, thus goes beyond issues of increased connectivity to assume an important role in rural economies. As Kyem and Lemaire cogently argue, 'a mobile phone is not simply a connection between people, but a link in the chain of the economic development process itself' (2006: 5). The contributions of mobile phone technology to economic development have both direct and indirect impacts. For example, different studies highlight the ways that mobile phone technology extend financial services to largely 'unbanked' segments in rural and urban Africa (Morawczynski 2009: 510), create possibilities for improved delivery of public health services (Wesolowski et al. 2012), and facilitate long-distance commerce (Boadi et al. 2007). As innovative uses of mobile phone technology grow in Africa, phones are likely to transition from instruments of basic communication to platforms for providing various services and products (Aker and Mbiti 2010).

Ethiopia joined the world's mobile phone community relatively late, in 1999, when the service was first introduced in the country. Initially its coverage was limited to the main urban centres and, in contrast to other eastern African countries (for example, Kenya), it only began to expand in rural areas after 2006. The pastoral areas were among the last in the country to receive coverage, with many parts of Borana Zone having almost no coverage until after 2010. Despite having one of the lowest rates of telecommunication use on the continent, Ethiopia's current rate of growth in mobile phone use is among the highest in Africa (Reda et al. 2010). This increase has important ramifications for a number of different sectors and economic activities. Its implications for improved public health services were noted earlier, and ICTs have been shown to help Ethiopian farmers adopt new forms of agricultural technology, such as improved seeds, and to enhance agricultural extension generally (Asfaw et al.

2011). Other recent research on the use of mobile phones for Ethiopian agriculture is less positive. It suggests that their use has not uniformly improved farmer access to price information and, therefore, beneficial impacts on rural marketing have been mixed (Tadesse and Bahigwa 2015).

Pastoralism and mobile phone use

Pastoralists in East Africa face particularly daunting challenges related to climate risk, market volatility and access, conflict and water and feed (pasture) shortages. These problems call for innovative responses, where no single technology or policy can be expected to be the sole solution. In some cases, significant investments in infrastructural development and local capacity building may be required to address important constraints, but in others improved access to market and climate information may be needed. A key means of improving access to information is through innovative uses of mobile phones for service delivery and information dissemination.

In the case of pastoralism, the use of ICTs by herders increasingly counters common perceptions that they are marginal participants in national and global networks and poorly connected with the rest of the world (de Bruijn and Van Dijk 2012). In pastoralist areas the contribution of mobile phone networks to livestock trade has been acknowledged and research suggests that greater benefits accrue to traders rather than herders (see de Jode 2010, Mahmoud 2009). We have not yet witnessed in Borana the pattern that de Jode describes for pastoralists in some parts of Africa, where 'today's pastoralists download the latest market prices for cattle on their mobile phones' (de Jode 2010: 7). However, in principle, both producers and traders should benefit from more efficient and timely market data, as well as weather information. Livestock traders of northern Kenya, for instance, use mobile phones to communicate about market conditions with their counterparts in Nairobi, which is eastern Africa's largest urban market.

Transmissions of market information allow merchants in pastoralist areas to improve the timing of their purchases and deliveries (Barrett et al. 2003, Mahmoud 2009). For instance, traders in Ethiopia communicate with each other and their agents using mobile phones to obtain price and sales information. Large-scale export traders based in the central Ethiopian town of Adama, a distance of about 520 kilometres north of Borana Zone, also frequently rely on mobile phones to schedule deliveries of export-quality animals to Middle Eastern markets, as well as to discuss and receive orders from Arab importers (Little et al. 2014). In addition, traders and pastoralists have access to a mobile phone-based (SMS, text-based) market information system in both

Ethiopia and Kenya, although our data show that traders, not herders, mainly utilise the system (Little et al. 2012). Because these market data are also presented in a highly aggregate form, both in spatial and price terms, and averaged across different types and quality of animals, it is questionable how useful they would be to pastoral producers even if they had access to a Livestock Market Information System (LMIS).

The marketing of milk from pastoralist areas has also benefited from mobile phone and SMS technologies. For example, associations of camel milk traders in eastern Ethiopia depend on mobile phones to organise the collection of milk supplies from pastoral producers for export to neighboring Somaliland. In a few exceptional cases, camel milk from eastern Ethiopia is actually exported via air transport to Dubai and other Gulf communities (Catley et al. 2012). Similarly, pastoralist producers and traders of northern and northeastern Kenya are assisted by mobile phones in marketing camel milk to supermarkets in cities, such as Nanyuki and Nairobi (ibid).

Despite advances in the geographic coverage of mobile phone networks, recent studies show that mobile phone services are not nearly as extensive in pastoralist areas as in crop agriculture regions, particularly in Ethiopia. Aklilu and Catley (2010), for example, argue that if improvements could be made to communications infrastructure, mobile phones would allow pastoralists to more effectively participate in markets than currently is possible. They suggest that the development of mobile phone networks in pastoral areas, as well as secondary roads would assist poor households to negotiate fairer prices from traders. Where these communication services and infrastructures are available, the impacts on herders and livestock trade are generally positive: 'Communications infrastructure, especially the expansion of cell phone networks, has positively affected livestock trade in the lowlands and it remains a sector where benefit–cost ratios are likely to remain favourable in the future.' (Aklilu et al. 2013: 12.)

Several development initiatives have been undertaken to improve pastoralists' access to information, including the introduction of ICT-based services. Notable among these are the USAID-funded Livestock Early Warning System (LEWS), which is no longer operable, and the LMIS projects. The latter initiative continues as of 2015 and provides text-based information on livestock markets in Ethiopia and Kenya. Institutions involved in managing the impact of climate variability also benefit from ICT-based weather forecasts that allow them to mobilise resources, both nationally and internationally, if a disaster is forecast. Outside of formal project interventions, pastoralists and traders have widely adapted ICTs for their own use in a range of social and economic activities, including increased communications with family relations and associates throughout the region. Moreover, while pastoralists have made minimal use

of the text-based market information system offered by the LMIS project, its availability has widened the general range of information exchange in pastoralist areas. For the most part, herders prefer to rely on friends and associates for market updates rather than the government-operated system where, as noted earlier, data are presented in highly aggregate form that may not be of immediate use to pastoralists.

The availability of mobile phones can help pastoralists make more informed decisions in their daily activities and reduce market and climate risks. One of the most important contributions is in helping to locate scarce pasture and water during periods of shortage. For example, it is not unusual for Borana herders of southern Ethiopia to phone ahead to friends and/or relatives for information on potential grazing and water conditions before moving to seasonal pastures. Note that many of the key deep wells and motorised boreholes are located near to settlements where network coverage is relatively good. Thus, mobile phones improve on the existing Borana information exchange system by reducing travel costs and the time it takes to receive information.

As we have shown so far, a range of possibilities for pastoralist areas has emerged as a result of the introduction of mobile phone technology, but only a limited number have been fully utilised to date. In the next section, we turn to a discussion of our study area and the case of Borana pastoralists, their use of mobile phone technology and its impact upon them.

Background: Borana people and study area

Borana are a branch of the Oromo people who are Ethiopia's largest ethnic cluster. Borana mainly live in the current administrative zones of Borana and Guji, Oromia Regional State, Ethiopia, and in northern Kenya. They engage in mobile pastoralism, but farming is increasingly an important part of their livelihood, especially in mid-highland districts. In the drier parts of Borana Zone, specialised pastoralism is the predominant livelihood.

Mobility is a key component of pastoralism in the region. Herders seasonally move their animals to mobile grazing camps (called *foora*), which can be more than fifty kilometres from their main residences. Before moving their animals to *foora*, herders will gather information about grazing, weather, water points and security issues in the potential grazing zone(s). Borana obtain information through several different informal methods. Random encounters between individuals are one such way in which opportunities for obtaining information take place. Two strangers can approach each other to exchange information about grazing and other issues, especially when one of them is from a distant grazing area where information about local conditions may be

limited. In such encounters communication always begins with greetings and inquiries about the wellbeing of families and the herd. They also will discuss whether or not there is *nagaa* (peace)[3] in their areas and about new events and local grazing and water conditions pertinent to pastoralism.

When new information is acquired that could be important for the community, a Borana has the responsibility to share it with *olla* (village) residents. In these cases, he reports, '*Imeeltu arge*', meaning, 'I met a traveller.' Then the information, including news about grazing and other issues, is often shared with others at the *olla* or nearby market towns. In the past the community may have collectively decided to gather additional information, but today it is often a subset of interested parties who initiate the activity. If rumours of conflict were heard, messengers would also be sent by the community to gather additional information. This customary method of information gathering was intensively used to make mobility decisions when pasture and water were no longer adequate to support livestock at *warra* (settlement) areas due to excessive use and/or prolonged dryness and drought.

The information on conditions in *foora* grazing areas is collected by a knowledgeable individual referred to as *abuurtuu* (resource scout). The information-gathering journey could take one to four days, depending on distance and mode of transport. It often required travelling on mules over dirt trails to potential grazing areas, but today motorised transport might be used. In most areas the practice is less formal and collective in nature than in the past, although *abuurtuu* use is still practiced. Decisions about whether or not to migrate are made by an individual or subset of interested elders based on the information supplied by *abuurtuu*.

Some of this information about seasonal grazing conditions, water availability and security is now reported using mobile phones. Often trusted individuals at *foora* areas are phoned to inquire about local conditions for livestock. Although mobile phone use has not replaced the customary practice of travelling to *foora* as described above, it reduces the initial costs of obtaining information and allows pastoralists to obtain good information before initiating *abuuraa*. A physical visit to a *foora* area is still required before migration of animals, in order to obtain permission from the community there and identify specific grazing areas. However, ICTs facilitate the process by reducing the amount of time required to examine specific grazing areas and water points at *foora*. We do not have data that confirm the exact impacts on labour use

3. In the glossary to an important book on the Borana (Baxter et al. 1996: 6), *nagaa* is defined as 'peace with God and people; a key political and ritual concept'. Dewo, in turn, describes *nagaa* as being 'key to all cosmic and human order, possessing the highest and most central value for humanity to pursue' (2013: 159). According to Dewo, this concept is highlighted in Oromo songs, prayers, rituals, speeches, legal actions, proverbs and folktales.

during migrations of animals, nor data on the effects of mobile phone use on livestock productivity and incomes. However, unstructured and structured interviews with herders and field observations suggest that ICT has improved the timing of migrations to *foora*.

In a region like Borana, characterised by poor road networks, absence of alternative communication technology and high illiteracy rates, mobile phones improve information exchange. With the exception of a few key administrative centres, such as Yabello town, the area never received land-line based telephone services and thus, for most residents, mobile phones are their first exposure to a modern communication technology. Similar to other pastoralist areas of Ethiopia, Borana also ranks very low in terms of education achievement and literacy, with more than 85 per cent of Borana adults being illiterate (see Little et al. 2010). When using phones, therefore, many Borana have learned to assign symbols available on their phones to identify personal contacts, such as family members or friends. When they phone or receive a call from a close contact, the symbol allows them to identify the individual. In the case of a text message, an illiterate adult may ask one of their educated children or a literate friend or neighbour to assist them.

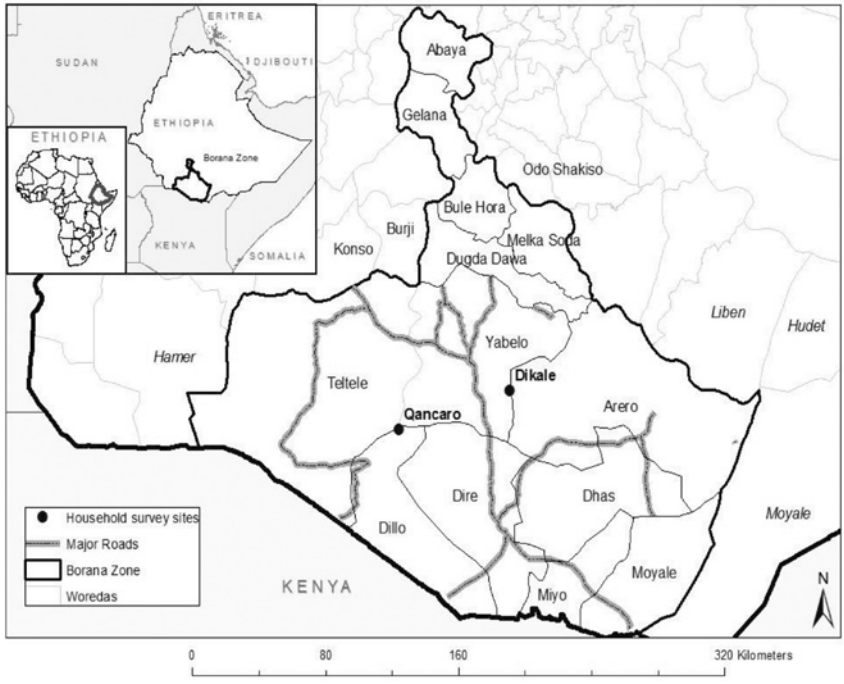
Research sites

Let us now turn to the results of the household study which, as noted earlier, is based on two different sites in Borana. Background information for each location is provided below.

Dikale, Yabello Woreda (District)

Dikale has an elevation of about 1,700 metres above sea level (a.s.l.) and annual rainfall of 600–700 mm per annum. Along with livestock rearing, crop production is an important part of livelihoods and has grown in importance in the area since the late 1990s. Among the seventy Dikale households which participated in the study, 87 per cent practice crop agriculture, especially production of maize. Dikale has reasonably good access to infrastructure and major markets in terms of proximity, road and telecommunication networks and transport facilities, especially when compared to the other study site, Qancaro. Major livestock markets in Yabello district include Haro Bakke, Elwaya, Surupha and Yabello town. Yablelo is the administrative capital both of Yabello *Woreda* and the considerably larger Borana Zone.

Despite the rapid growth in cultivation during the past fifteen years, there are still large numbers of livestock in Yabello district. According to a recent



Map 1. Study Area. Source: Map made by Sarah Anne Guagliardo.

report by the non-governmental organisation (CARE), Yabello has 200,000 cattle, 77,000 goats, 21,000 sheep and 11,200 camels (CARE 2009: 5). According to the most recent published data, the *Woreda* has a human population of 118, 860 (Ethiopia 2012: 18). In addition to herding, local residents are engaged in other livestock-based occupations, including work as traders, butchers, brokers and trekkers (i.e., individuals who move animals on foot for traders).

Qancaro, Dillo Woreda (District)

Qancaro is located in Dillo district about 650 kilometres south of Addis Ababa and about 140 kilometres southwest of Dikale. Most parts of Dillo have an elevation ranging between 700–1,100 metres above sea level (a.s.l.) and annual rainfall of 400–450 mm. In Qancaro most households specialise in pastoralism with only twenty per cent attempting to grow crops due to the aridity of the area. Most Borana in the area will not bother to cultivate unless it is a very good rainfall year.

In Dillo district the livestock population is estimated at 80,000 cattle, 100,000 goats, 30,000 sheep and 20,000 camels (CARE, 2009: 5). Human population, in turn, is difficult to estimate for Dillo since at the time of the most recent population census (2011–2012), it was part of Dirre *Woreda*. Its population, however, is considerably smaller than Yabello district, since Dire *Woreda* (including Dillo) had only 84,854 in the last available census (Ethiopia 2012: 18). Not surprisingly, the area's limited rainfall, high temperatures and general aridity necessitate a stronger reliance on mobile pastoralism in Qancaro than in Dikale.

Qancaro has poor access to markets and communication networks, including ICT networks with much spottier coverage than in Dikale. Constraints to livestock marketing include long distances from major markets and a lack of all-weather roads and transport. There are only a few small livestock markets in the district, with the exception of Goraye, which is an important market for small stock (goats and sheep) close to the Kenya border. Goraye market has grown rapidly in recent years as a conduit for informal animal imports from Kenya, which are then transported to abattoirs (meat factories) outside the region for processing and export as chilled meat to the Middle East. Dillo town is another local market for both cattle and small stock, but is considerably smaller than most markets in Yabello district. On its weekly market day there usually are no more than six to eight traders buying animals at Dillo, a stark contrast to the hundred or more who regularly attend the markets of Haro Bakke and Dubuluk. Consequently, many Qancaro herders trek their animals up to 75 kilometres over two to three days to sell at these two larger markets, as well as at Elwaya market which is a middle-sized market (forty to fifty traders operate at this weekly market). Pastoralists often sell at these centres prior to obtaining reliable price information, in part because of the poor quality of mobile phone coverage. They must endure high transaction costs and hardships by travelling outside the district to fetch higher prices than in Dillo town, even though the government recently (2013) upgraded the centre from a primary to a secondary livestock market.[4]

4. Secondary markets are supposed to have infrastructure, such as fences, water sources, loading and unloading facilities, veterinary drug vendors, weighing scales and tax collection offices. Primary markets, in turn, do not usually have these facilities and most transactions are conducted in open areas. Although Dillo market is now classified as a secondary market, it still lacks many of the necessary facilities of a secondary market centre and does not attract large groups of buyers and sellers.

Table 1. Average monthly expenses by Borana pastoralists and traders for mobile phone use (in Ethiopian Birr).[a]
Source: Data is from the CHAINS Household study, 2013.

Mobile Phone Owners	Monthly Expense Item	N	Minimum	Maximum	Mean	Std
Pastoralists	On mobile card purchase	72	15	200	65.54	43
	Mobile battery recharge	72	9	80	25.44	14.66
Traders	On mobile card purchase	71	11	10000	604	1410
	Mobile battery recharge	9	12	40	27	10.58

[a] At the time of data collection one US$= 18.5 Ethiopian (ET) Birr.

Mobile phone ownership and use in Borana

In Borana Zone both pastoralists and traders use mobile phones for livestock marketing, but there are significant differences in ownership and use patterns between the two groups. The geography of network coverage and costs of operating a mobile phone partially explain differences in ownership, access to and/or use of mobile phones between pastoralists and traders (Table 1). Many traders, for example, live and/or work part of the time in towns where phone coverage is considerably better than in rural areas where most herders reside. Another factor is that traders generally have more cash to spend on minutes/airtime than do pastoralists. The stark differences between the two groups show up in cash expenditure patterns. Thus, traders expend on average 604 Ethiopian birr (US$ 32.65) for minutes per month, but pastoralists spend only 65 birr per month on minutes or about ten per cent of the amount of traders. Because of significant differences in scale and incomes, traders' average monthly purchases of minutes vary from 11 birr (US$ 0.59) for small 'bush' operators, to 10,000 birr (US$ 540.54) for large-scale livestock exporters. Surprisingly, pastoralists expend on average more per month on phone battery recharge costs than traders: 25 birr (US$ 1.35) versus 27 birr (US$ 1.46). Unlike traders, herders have only minimal access to the country's electricity grid and must pay local entrepreneurs using small diesel-operated generators[5]

5. A few local entrepreneurs have actually purchased small, portable solar packs that can recharge about 6 phones at a time. They charge customers about 15 per cent higher rates than operators using diesel generators, but they are able to move the small solar packs deep the


Figure 1. Mobile phones recharging, Bakke Market, Borana, Ethiopia. Photograph by Dejene N. Debsu.

to recharge their phones at a relatively high rate of 5–8 birr per phone (Figure 1). Only twelve per cent of traders report recharging their phones using this method, an indication that most of them have access to electricity in their houses and/or town-based facilities.

Not surprisingly, our findings overall show that traders incur considerably higher operating costs for mobile phones than pastoralists. However, they also benefit more from their use and earn considerably higher incomes than pastoralists. Through their trading networks and use of phones, merchants can obtain market information at several levels in the market chain. Herders, in turn, are rarely connected to higher ends of the value chain and their information is usually limited to local markets where prices are lowest. By having access to price and other market information 'up and down' the market chain, traders are in a good position to know what prices to pay herders for animals and still accrue a reasonable profit. Mobile phones also allow local traders in Borana to confirm deliveries of purchased animals to outside markets, as well as communicate with Adama exporters about transport, credit and other marketing services. During one interview a trader stated, 'A trader without a mobile phone is like a blind person without a walking stick. Previously, you go and step in, without any information; the market may be good or bad for you. Now you go if the market favors you' (interview with Ethiopian livestock trader, October 2013). Another merchant describes the arrival of the mobile phone as 'moving from darkness to light' (fieldnotes, October 2013).

interior of the rangelands. Retailers using the much heavier 4 horsepower generators are unable to make these moves without great difficulty. The solar packs are purchased from Kenya and are likely to grow in importance once purchase prices come down, because of their low operating costs and high portability.

Almost all traders interviewed own a mobile phone (> 98 per cent), with the one exception being a woman trader in Moyale, Ethiopia who trades only a few goats per day within the town. In addition to gathering market information, traders use mobile phones in other ways that assist their businesses. First, they help merchants who own a feedlot for fattening animals, to regularly communicate with their employees about the condition of animals and the operation of the feedlot without being there. Second, mobile phones facilitate searches for and purchases of critical trading inputs, such as credit and veterinary drugs. Traders can easily arrange for these transactions via mobile phone communications. Third, traders can maintain contact with truck drivers and obtain updates on the welfare of animals during the transport of livestock. Fourth, mobile phones play an important role in networking among traders, allowing them to share information with trading partners about sales and deliveries of animals and general market conditions. Along these lines, traders from one region of the country can use a phone to send animals to an associate in Adama or arrange for cash transfers to a business associate from another region. Finally, because most traders who engage in the export business are linked to an agent(s) in Addis Ababa or Adama and often travel long distances, they can phone the agent(s) when travelling to arrange accommodation for overnight stays.

Some traders also indicate that they use mobiles to communicate with government officials, especially those whom they personally know, about policies and regulations. For instance, if the government plans to restrict certain categories of animals from export, such as young bulls below three years of age, traders will phone an official to confirm the law and then adjust their market behaviour accordingly. They also use the phone to inquire about changes in government tax structures and incentives, which frequently change as the government attempts increasingly to regulate trade and promote livestock exports. Elimination of the fifteen per cent value added tax (VAT) on livestock destined for export is one important incentive enacted by the state to encourage international trade. Furthermore, exporters often deal with custom offices and ministries of agriculture and trade about different requirements and policies for trade, especially regarding exports from neighboring Djibouti, Ethiopia's main official outlet to Middle Eastern markets. The use of mobile phones facilitates these different tasks.

Despite the potential negative effects of asymmetric market information between traders and herders due to their differential access to phones and networks, the intense use of mobile phones by traders based in Borana can have a positive effect on pastoralists. While trying to maximise their profit and meet the external demand for livestock, traders have widened their geographic areas of operation through the use of mobile phones. They have begun to source

animals from more remote pastoral areas of Borana and by doing so they connect herders to high-value markets, such as the export trade where prices for Borana bulls have almost doubled since 2009 (Little et al. 2014). This trend – albeit limited at present – has increased competition among traders who are using mobile phones to connect with Borana intermediaries, who buy animals from pastoralists deep in rural areas. The result has been a general increase in producer prices and an expansion of market alternatives for some herders. Until recently these pastoralists were limited to selling animals on low-priced local markets or across the border in Kenya.

Preliminary regression analyses show that in our Borana sample of 140 households the best predictors of livestock prices received by herders were herd size, volume of animals sold and mobile phone ownership (Thompson 2015). Although it is still a work in progress, a model was constructed using location, herd size, volume of animals sold, cash income, herd management (measured as the purchase of inputs [fodder and veterinary inputs] and use of *foora*) and mobile phone ownership as independent variables to predict livestock prices received by herders (ibid.).[6] A dummy variable was created to account for ownership of mobile phones. The model suggests that mobile phone ownership is statically significant at a 0.05 confidence level ($p<0.05$) for the site, Dikale, where mobile phone ownership is most prevalent in the study area, but not in Qancaro where ownership of mobile phones is less important (ibid.). As noted above, additional data analysis is needed to confirm the statistical relationship, but preliminary work suggests that ownership of mobile phones might have a positive impact on producers' prices for pastoralists.

Mobile phones are also effecting important changes in the daily lives of pastoralists. As discussed earlier, herders use phones to receive updates from friends and relatives on weather and grazing conditions, as well as incidences of conflict and insecurity. A livestock owner, for example, now can stay in contact with his/her family both at base settlements (*warra*) and mobile herd camps (*foora*), allowing the individual to make herd management and/or marketing decisions without having to be present. Herders also can use phones to inquire about the welfare of family members and friends who reside outside the area and make arrangements to provide for and/or receive economic or other assistance from them. Information about the timing of cash remittances from family members, for example, can be made via mobile phones. Mobile phones also are used by a limited number of pastoralists to acquire livestock market information. Although only five per cent of the mobile phone owners currently indicate that the primary use of mobile phones is to discuss market

6. To account for sales and prices of different animal species, Thompson converted all sales and prices into Tropical Livestock Units (TLUs). 1 TLU = 1 head of cattle = 0.7 camels = 10 sheep or goats (2015).

information, we expect this percentage will grow as more pastoralists become familiar with and appreciate the advantages of reliable market information.

Several businesses have emerged in pastoralist areas because of the expansion of mobile phone technology. New enterprises cover services, such as phone recharging, phone repair, sales of SIM (subscriber identity module) cards and other phone-related equipment. Without reliable access to electricity, several entrepreneurs have purchased portable diesel-powered generators and power cords and have opened phone-recharging businesses (see Figure 1). At weekly livestock markets in southern Ethiopia it is not unusual to observe ten or more small businesses recharging phones for customers, including pastoralists. Most Dikale residents can now recharge their phones within ten kilometres of their homes and there are different businesses that service the area. However, as noted earlier, this service is limited at our second study site, Qancaro. Pastoralists there must travel more than forty kilometres to Dillo town to recharge their phones at one of the few phone recharging businesses. They, of course, combine this activity with other reasons to visit the centre, such as purchasing foods or selling animals. The relatively low mobile phone ownership in Qancaro discourages many private entrepreneurs from establishing local businesses, such as phone and SIM card sales or phone recharging businesses, but we expect this will change as network coverage improves.

Ownership of mobile phones in Borana is also unevenly distributed between different locations and between households within a single location. There is a so-called 'ICT divide' between places with good network coverage and those without adequate network connections, and between better-off and poor households within sites. To examine the effects of location and wealth differences on phone ownership in Borana, we use a standard wealth (asset) indicator (Tropical Livestock Units [TLUs], see footnote 6) for pastoralist communities. Ownership of mobile phones based on TLU wealth categories and location are examined in Table 2. As the data demonstrate, there are important differences in phone ownership between poor households – those with TLUs of five or less – and better-off households –those with 25+ TLUs. The findings show that only seventeen and 29 per cent of households in Dikale and Qancaro, respectively, with TLUs of five or less had a member owning a mobile phone. In contrast, more than eighty per cent of better-off households in both locations had one or more members with a phone, a good indication that inequalities in phone ownership are prevalent. This pattern is especially problematic because it is the poorest households who often are socially, economically and politically isolated, and who would benefit considerably from ownership of a mobile phone. Even more alarming is that these very poor households with five TLUs or less, represent 28 per cent of total households in the study area. By contrast, better-off households comprise only

Table 2. Livestock and mobile phone ownership in Dikale and Qancaro locations, Borana, Ethiopia. Source: Data from the CHAINS Household study, 2013.

Livestock Ownership Category (TLU)[a]	Dikale			Qancaro		
	# of households (hh)	# of Phone Owners within hh	% of Phone Owners	# of households (hh)	# of Phone Owners within hh	% of Phone Owners
0–5	18	3	17	21	6	29
5.1–10	18	14	78	15	5	33
10.1–15	11	15	136	14	8	57
15.1–20	12	17	142	3	1	33
20.1–25	4	4	100	6	5	83
25.1–30	1	2	200	2	4	200
30.1–35	1	2	200	3	3	100
35.1–40	1	1	100	2	2	100
>40	4	7	175	4	3	75

[a] Tropical Livestock Unit (TLU) is calculated based on 1 TLU= 1 cattle or 0.7 camel, or 10 Goat/ sheep.

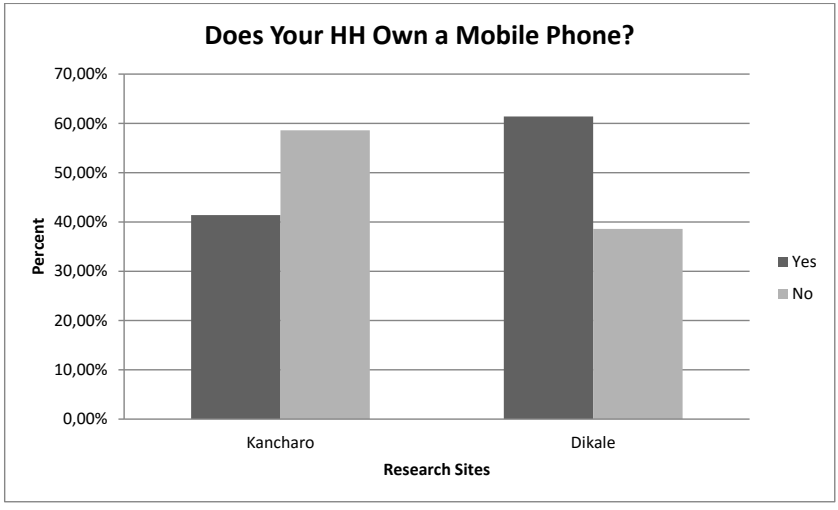


Figure 2. Mobile phone ownership in Qancaro and Dikale locations, Borana, Ethiopia. Source: Data from the CHAINS Household study, 2013.

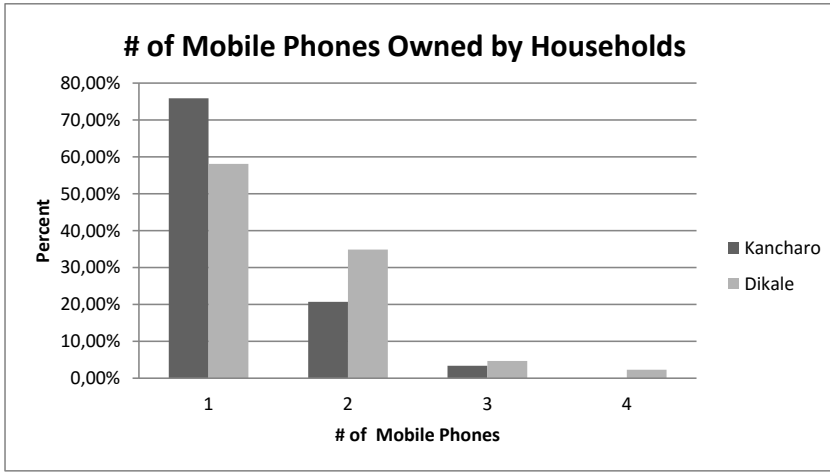


Figure 3. Mobile phone ownership in Qancaro and Dikale locations, Borana, Ethiopia. Source: Data from the CHAINS Household study, 2013.

12.8 per cent of total households, but own the vast majority of the area's livestock and mobile phones.

The discrepancy in phone ownership is not only between the poor and better-off households, but also between the two study locations (Figure 2). For example, sixty per cent of households from Dikale, which is the better connected of the two sites, own phones, but only forty per cent of Qancaro households have a mobile phone, even though it is the wealthier of the two communities in terms of livestock. Moreover, 25 per cent of Dikale and only ten percent of Qancaro households have two or more mobile phones (Figure 3). The findings, once again, confirm the importance of location in explaining differences in mobile phone ownership.

To compensate for the lack of phone ownership, phone sharing is widely practiced among Borana. We found a large number of household heads without a phone share with another household or individual: 29 and 43 per cent of those without phones in Dikale and Qancaro, respectively, report sharing a phone with an owner. Many non-owners, especially the poor, indicate that they often are able to access a phone in the case of emergencies or other extreme cases. Studies from elsewhere in Africa also demonstrate the popularity of phone sharing and, unsurprisingly, most of those who borrow are poor (Burrell 2010, Butt 2015). Kyem and Lemaire, for instance, note that in many areas of Africa 'even the absence of electricity does not present an insurmountable barrier to

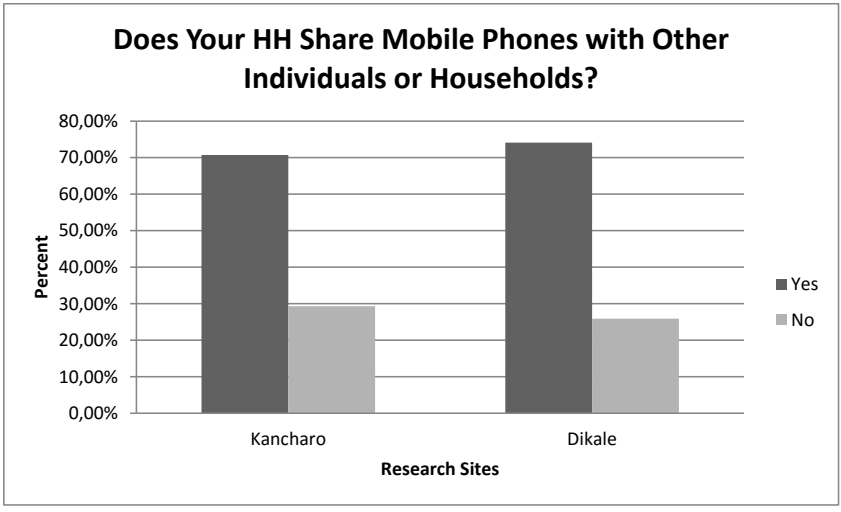


Figure 4. Sharing of mobile phones in Dikale and Qancaro locations, Borana, Ethiopia. Source: Data from the CHAINS Household study, 2013.

mobile phone usage, thanks to the sharing of mobiles and recharging batteries in the immediate urban centers or recharging locally by a generator or car battery' (2006: 6). Consequently, when mobile phone sharing is considered rather than only phone ownership, the number of users is considerably higher than previously noted (Figure 4).[7] In short, studies in Africa, including Ethiopia, that rely mainly on information about phone ownership and registered subscribers often greatly underestimate the total number of mobile phone users (Furuholt and Matotay 2011: 3).

To add a comparative perspective, we look at a recent study of mobile phone use among Maasai herders in Narok District, Kenya (Butt 2015). In this study 'almost all (96.7 %) herders reported that they had access to a mobile phone', and eighty per cent of herders owned their own phone (ibid: 5–6). Moreover, more than 93 per cent of Maasai herders in the Kenya study relied on mobile phones for some aspect of their herding activity. Although our research did not yield statistical data on the different uses of mobile phones in the herding process, interviews with key informants and observations from the field suggest a

7. Studies from other areas of Ethiopia report that individuals who own a SIM (subscriber identity module) card but not a mobile phone, may borrow or rent a person's phone and insert their own SIM card in it. This practice allows a non-phone owner to use a mobile phone (Adam, cited in Carmody 2009).

considerably smaller percentage of Borana herders use mobile phones at all in the herding process. The information on phone ownership is indicative of this difference. Phone ownership among Maasai is about thirty and fifty per cent higher, respectively, than among Dikale and Qancaro Borana. In fact, the data on mobile phone access and ownership among Kenyan Maasai more closely resembles the pattern among livestock traders in our study area than for herders.

Similar to other cultures around the world, there also is an important generational (age) factor in mobile phone adoption in Borana. Young men and women are more likely to own and use mobile phones than elderly individuals. For instance, Borana households headed by an elderly person sixty years of age or older, are less likely than others to have mobile phones, regardless of location or wealth. For example, elderly heads of households in Qancaro with more than forty TLUs often do not have mobile phones in spite of their wealth, because they may not perceive value in their use and/or are unfamiliar with the new technology. In discussions with groups of elderly Borana, questions were raised about the quality and value of information obtained via mobile phones. One elderly man explains that, rather than rely on phones to learn about water and pasture conditions, he prefers to travel or send other community members to assess conditions first-hand even if it means travelling to distant locales. He notes that:

> I do pasture assessment the traditional way by going to *foora*, because mobile phones are liars. I don't have a mobile phone, but my children do. If you make a call to learn about pasture and water in *foora*, they tell you there is plenty of water and pasture when in fact there isn't any. If you depend on their information and migrate, cattle will die (interview with Borana herder, August 2013).

This quote from an elderly herder stresses the importance of quality and accuracy of information for making decisions about whether or not to move his/her livestock. As Scott-Villiers et al. note, 'those who travel long distances for *abuuraa* … must return with correct information or herds will suffer and they will lose the confidence of their peers and elders' (2011: 12). Even among Maasai herders in Narok, Kenya where, as noted earlier, mobile phones are nearly ubiquitous, Butt (2015) found that about forty per cent of herders indicated that the grazing information they received via phones was inaccurate. However, the information was more reliable if received from a friend or family member, demonstrating the important role of social relations in the use of mobile phones for herding work (ibid.). Although mobile phones are utilised to obtain information about pasture and water conditions in Borana, personal visits remain important for verification of the information and obtaining necessary permissions from administration officials and/or community elders.

Despite these critical perceptions, mobile phones have become an important part of household economic activities and many members seek to purchase

them. For example, an increasingly important use of income from livestock sales is for local phone purchases and air time. As Table 2 shows, this is especially true for individuals from better-off households who are more likely to invest in diverse consumer items, including mobile phones, than poor pastoralists who mostly use cash to buy food items and other basic necessities.

Those non-elderly Borana who do not own mobile phones point to various constraints to ownership, including high price of phones and air time, poor connectivity and services in the area and difficulties and costs of battery recharging. Less than ten per cent of participants in our study point to a lack of knowledge about phones or the utility of phones as reasons for not owning one. By contrast, the vast majority of household heads and spouses (>75 per cent) who do not own a mobile phone allude to the expense of owning and operating a phone as the main reason for lack of ownership, including the lack of money for the initial purchase of a phone.

Borana phone owners who do not have money to purchase additional minutes often employ the 'beeping' technique, which is when a caller dials then quickly hangs up before talking to the person (this practice is called 'flashing' in Kenya). The recipient of the 'beep' is able to identify the caller and phone the individual back, thereby saving the initial caller the expense of the phone call. This tactic often is used by poor individuals who cannot afford regularly to buy minutes. This is an innovative way for individuals inexpensively to communicate with others as long as at least one of the parties has adequate air time.

Borana also employ different techniques to overcome problems of poor connectivity and network coverage. These actions include (1) hanging their mobile phones on high objects inside the house to pick up better reception and/or (2) calling from elevated areas outside the home where connectivity may be better. Locations in the community that are known to have better connectivity often attract numerous users who move about the community with their phones held to their ears attempting to make or receive a call. At certain times of the day, especially in late afternoon/early evening, one can find numerous phone users scrambling for a preferred elevated location in an effort to pick up a network connection.

Although our findings are preliminary, other patterns of phone ownership and use could relate to gender differences. Evidence from Rwanda documents disproportionately high phone ownership among males, with women more likely to use shared phones than males (Blumenstock and Eagle 2012). They point to wealth differences as a key factor: 'it is the privileged, male members of Rwandan society who disproportionately own and use mobile phones' (ibid.: 14). In Borana we suspect there may be a similar pattern occurring, although our data on phone sharing are not gender disaggregated. If there is a difference in gender-based ownership and use of mobile phones, it would not be unexpected, since male household heads control significantly more livestock and

income than female heads. They are also responsible for acquiring information about grazing conditions, insecurity and livestock markets, which increasingly depend on the use of mobile phones. Additional data on mobile phone ownership and use, however, are required to confirm these preliminary observations about gender differences.

Conclusion and policy implications

This article has presented preliminary research findings that highlight the different social and economic uses of mobile phones and their real and potential impacts in southern Ethiopia. By examining customary patterns of mobility and information exchange among pastoralist Borana, the article shows the complementary role of mobile phone technology for pastoralists in the context of their local oral communication system and mobility. In doing so, it argues that the rapid growth in the adoption of mobile phone technology in rural Ethiopia has contributed to the country's evolving and expanding livestock trade. The role of mobile phones in connecting key pastoralist production zones with important market channels is a significant part of this outcome. The mobile phone has also allowed pastoralist populations in relatively remote parts of Ethiopia and the Horn of Africa to connect with other parts of national and regional society and economy in novel and important ways. As this study has shown, mobile phones already play an increasing role in the marketing and trading of livestock in Ethiopia, but their role in production and herding is less well understood. Moreover, their full potential to contribute to the development of pastoralist areas remains unrealised.

The article's findings suggest that the coverage and utility of mobile phones in pastoralist areas is constrained by many factors, including poor network coverage, frequent power and network outages and inaccessibility of battery recharging services. Inefficient electricity distribution, poor networks and low incomes particularly affect mobile phone ownership and use in the Borana area. Comparative data from pastoral areas of neighboring Kenya show that Borana pastoralists lag in phone ownership and access. Within pastoral communities, widespread inequities in wealth also affect mobile phone ownership and use, which are partially overcome through the sharing of phones. Additional research is needed to understand the gender dynamics of mobile phone use, especially among women in herding households, and to understand whether or not access to and/or ownership of mobile phones improves the productivity of herds.

International development agencies, non-government organisations (NGOs), and governments are keenly interested in the transformative potential of ICTs for agricultural and livestock development, especially for improved dissemination

of market price and climate information (see Shah 2011). As this article has argued, the potential to improve pastoralist livelihoods and marketing systems through the use of mobile phones is there, but additional research is required to demonstrate significant positive impacts. In Ethiopia a mobile phone-based (SMS) market information system has been made partially accessible to both traders and pastoralists depending on network coverage, but it is mainly utilised by a limited number of traders. Moreover, information on climate through a similar system has not been utilised at all by herders in the study region.

The gap in terms of mobile phone subscribers between low- and high-income countries continues to diminish, but there still are major differences and deficiencies in poor countries, such as Ethiopia (Kyem and Lemaire 2006). As we have argued, the challenge associated with low incomes and illiteracy are greatly amplified by poor and erratic coverage. Government agencies and development organisations with goals to expand and improve mobile phone services and their development applications, should address underlying structural problems of infrastructure deficiencies and regional inequities in network coverage before embarking on ambitious ICT-based development activities. Without these structural changes, it will be difficult to optimise on the role of mobile phones in improving pastoralist livelihoods and welfare.

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