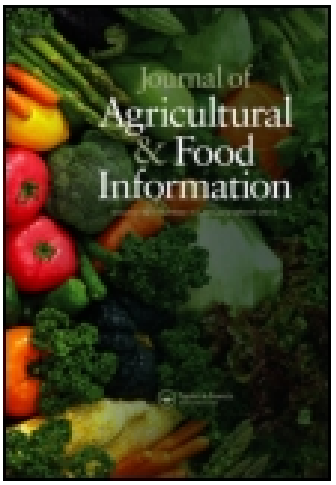

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The Case for a Two-Step Approach to Agricultural Campaign Design

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Development campaigns designed to scale up effective agricultural solutions often rely on media. Information and communication technologies for development (ICT4D) proponents argue that increased media penetration is necessary for such campaigns to succeed. Interviews of 63 extension agents and 200 farmers in Burkina Faso about their disparities in media ownership, access, skills, and preferences suggest that agricultural development campaigns should account for the different media environments and preferences of target populations within countries. This research presents such an alternative approach, a two-step campaign design intended to address digital divides within countries and target population preferences.

KEYTERMS agricultural development campaign, agricultural information, digital divide, ICT4D, media access, two-step flow model

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INTRODUCTION

Scholars have proposed information and communication technologies (ICTs) as a solution for disseminating agricultural information (Ajani, 2014; Fawole & Olajide, 2012; Gakuru, Winters, & Stepman, 2009; Oladele, 2011; Patel, Chittamuru, Jain, Dave, & Parikh, 2010), since they can be more efficient than extension agents in terms of costs, reachability, and time (Ajani, 2014; Fawole & Olajide, 2012). For example, transferring crop protection information in the form of short animations via cell phones or the Internet can be effective when farmers are isolated from local, indigenous knowledge or lack the literacy to learn from scientific research (Bello-Bravo et al., 2013).

However, agricultural development initiatives that rely on ICTs cannot ignore the sociocultural, economic, and institutional systems in which the targeted populations (i.e., farmers) are embedded (see Hornik, 2002; Waisbord, 2005 for the importance of these systems). Specifically, "the persistent problems of access, connectivity, literacy, content, and costs" (Fawole & Olajide, 2012, p. 327) of ICTs suggest that different media environments of development campaign targets—such as disparities in media access, use patterns, or attitudes toward media—might determine the success of agricultural development initiatives. Further, targeted populations' perceptions of various information sources and their preferences for them may have important effects that counterbalance the impact of ICT penetration. Thus, our purpose in this article is to examine the differences in the media environments of two stakeholder groups traditionally involved in agricultural development campaigns—agricultural extension agents and farmers. Through this examination, we discuss the implications of such differences for communication strategies in the agricultural field.

This article proceeds as follows. First, we explain the importance of taking into account the environments in which the agricultural stakeholder groups are embedded. Second, we examine why the integration of multimedia channels is necessary to account for the different media environments or profiles of the stakeholders through the concept of the digital divide. Third, survey results from Burkina Faso illustrate differences in media, demographic, and socioeconomic profiles of two agricultural stakeholder groups. Finally, we discuss the implications for communication strategies in the agricultural sector that can effectively account for those differences.

UNDERSTANDING THE ROLE OF MEDIA ENVIRONMENTS IN THE AGRICULTURAL SECTOR

Agricultural change agencies' development initiatives should account for actors' embeddedness in sociocultural networks and institutional environments

(Hornik, 2002; Waisbord, 2005). Because both agencies and farmers are embedded in different social relations and environments (Ihm et al., 2014), change agencies need to develop design solutions that are both viable for the extension agents as well as the targeted population (Backer, Rogers, & Sopory, 1992; Waisbord, 2005).

One of the factors that affect the nature, implementation, and outcome of an agricultural development initiative is the media environment in which the stakeholders are embedded. Specifically, because a campaign can become more effective when adapted to context (Lazarsfeld, Berelson, & Gaudet, 1968; Rogers, 2003), both researchers and practitioners suggest using multiple communication channels to disseminate interventions (Morris, 2005; Rogers, 2003; Waisbord, 2005). For example, the two-step flow of communication model (Lazarsfeld et al., 1968) identifies two distinct steps of information dissemination, in which messages are conveyed through different channels. In the first step, campaign leaders disseminate messages through mass media to opinion leaders, who are also likely early media adopters. Early adopters generally rely less on interpersonal networks (Rogers, 2003) and instead take advantage of mass media to gain "awareness and knowledge about a given problem" (Waisbord, 2013, p. 81). In the second step, opinion leaders share information with the public. The public is more likely to depend on their interpersonal networks to obtain information (Rogers, 2003).

The preferred communication channel of opinion leaders and the public, including late media adopters, suggests that both media adoption and preferences are important for the dissemination of agricultural information. Indeed, various attributes of the stakeholders' media environments—such as differences in access to, use of, proficiency with, and preferences for using different types of media—are important exigencies for campaign designers.

DISPARITIES IN THE MEDIA ENVIRONMENTS OF CHANGE TARGETS: THE DIGITAL DIVIDE

The digital divide describes the different media environments of stakeholders of agricultural development initiatives. In general terms, the digital divide refers to the inequalities between different social groups with respect to their media environments, such as differences in access to media and technologies (i.e., first-level digital divide; National Telecommunications and Information Administration [NTIA], 1995) or differences in skills with media (i.e., second-level digital divide; Dewan & Riggins, 2005; DiMaggio, Hargittai, Celeste, & Shafer, 2004; Hargittai, 2002).

To a great extent, the digital divides are explained by individual attributes; these attributes can be used to classify stakeholders into different groups for agricultural development campaigns. Sociodemographic variables

are the most widely studied sources of the digital divide. The results are mixed with respect to the effect of gender and age. Zickuhr and Smith (2012) found that males were more likely to have access to and use digital media, but others have found that gender did not differentiate one's media access (Bimber, 2000) and digital skill level (Bunz, 2009), but that gender explained differences in the users' perceptions of their skills in using media (Hargittai & Shafer, 2006). Additionally, some research found no relationship between age and the breadth of media use (Helsper & Eynon, 2009; Jones, Johnson-Yale, Millermaier, & Pérez, 2009), whereas other studies found both negative (Bunz, 2009; Hargittai, 2002; Selwyn, 2004; Zickuhr & Smith, 2012) and positive (Livingstone & Helsper, 2007; van Deursen & van Dijk, 2011) relationships between age and media access, skills, and diverse uses. In contrast, income is consistently related to a greater level of digital skills (Rothbaum, Martland, & Jannsen, 2008; van Deursen & van Dijk, 2011) and variation in media uses (Pearce & Rice, 2013; Zillien & Hargittai, 2009).

Compared to demographic variables, less attention has been given to the digital divide between different stakeholders of development initiatives, even though the literature in the area (Dearing, 2009; Lazarsfeld et al., 1968; Rogers, 2003) suggests that different roles or vocations are an additional factor differentiating media environments in such contexts. For example, opinion leaders in a group are more likely to be early media adopters (Lazarsfeld et al., 1968) and extension agents are likely champions for innovations, which may include new communication technologies (Dearing, 2009). Despite this potential link between roles/vocations and digital divide, most ICT research in the agricultural sector has focused on revealing the media environments and inequalities among farmers (Fawole & Olajide, 2012) without addressing those of extension agents and how the two stakeholder groups might reflect the digital divides. Thus, we examine how agricultural extension agents and farmers are embedded in different media environments. In particular, we ask:

Research Question 1a (RQ1a): How are farmers and extension agents embedded in different media environments (i.e., first-level divide: access to and ownership of media)?

Research Question 1b (RQ1b): How do the two stakeholder groups differ in terms of their proficiency and comfort with information and communication technology (i.e., second-level divide)?

Effective agricultural development initiatives should not only account for different media environments of stakeholder groups, but the targeted populations' trust of and preference for specific information sources. The credibility of a source determines the recipients' responses to and acceptance of messages beyond the influence of message content design (Hovland & Weiss, 1951), such as farmers' decisions to grow particular crops (see Peters, 1998).

However, in information and communication technologies for development (ICT4D) scholarship, the role of source credibility is underexplored. More attention is necessary to address the targeted group's openness to and trust of information sources, both mediated and interpersonal. Thus, we ask:

Research Question 2 (RQ2): How does the final targeted group (i.e., farmers) prefer to receive agricultural information?

OVERVIEW OF BURKINA FASO

This study was conducted among farmers and extension agents of a government and nongovernmental organizational (NGO)-based agricultural development field in Burkina Faso. Burkina Faso is a country situated in sub-Saharan Africa with an estimated population of about 17 million (Central Intelligence Agency [CIA], 2012). Its "high population density and limited natural resources result in poor economic prospects for the majority of its citizens" (CIA, 2012, para. 1). The country's gross domestic product (GDP) per capita is $1,500 (CIA, 2013). Almost half of the population (46.7%) in Burkina Faso are living below the international poverty line of $1.25 (in purchasing power parity terms) a day. In this context of poverty, access to media in Burkina Faso is very limited, with the country ranking 164th for the number of Internet hosts and 144th for Internet users in comparison to the world (CIA, 2013). The literacy ratio is low as well; only 28.7% of people over 15 years of age can read and write, which is lower than the average ratio in Africa more generally (63%; CIA, 2012).

Farmers make up the majority of the population in Burkina Faso. Approximately 90% of the population participate in subsistence agriculture (International Fertilizer Development Center [IFDC], 2013). Because the population depends on agriculture, access to agricultural information and technologies is crucial. Agricultural extension agents play an important role in the country as channels of agricultural development initiatives aimed at farmers.

This study was conducted as part of a larger project whose aim was to inform farmers in Burkina Faso of novel techniques to avoid cowpea diseases. This project consisted of the diffusion of a series of videos, which could be downloaded from a website to a computer or a cell phone. The videos provided information about the techniques to prevent diseases and advice on how to implement said techniques. The goal of this exploratory study was to determine whether the farmers had access to the media necessary to obtain the available agricultural information. Additionally, this study explored the role of extension agents and their access to media, as extension agents were tasked with dispensing agricultural advice to the farmers (Bello-Bravo et al., 2013).

METHOD

Sample and Procedures

The sample for this study was obtained from a formative evaluation for the described intervention. Interviews with 200 farmers and 63 extension agents were conducted in June and July of 2011. In order to have a comprehensive picture of the digital divide in Burkina Faso, the farmers and the extension agents were selected from diverse locations across the country.

A researcher involved in the current project went to Burkina Faso and trained three local interviewers for a week in June 2011. Local interviewers conducted the structured interviews for this study. They could communicate with the interviewees in their own language. The interviews were conducted wherever the interviewees felt comfortable—including their homes, offices, or a cafeteria. Each interview took approximately 40 minutes and was conducted in French—the official language of Burkina Faso—or other local languages, such as Mòoré and Dioula, with which the interviewers and the interviewees felt comfortable.

Measures

Demographics and Socioeconomic Attributes

In order to account for variation based upon demographic differences, gender, age, and education were recorded. The highest level of education was measured on a 7-point scale.

Media and Communication Technology Environments

The first-level digital divide was measured in two ways: ownership of and access to media and communication technologies. Both groups of participants (farmers and extension agents) were asked whether the interviewee or anyone in the household owned media devices including computer, smartphone, cell phone, radio, and television. They were also asked whether they had access to each of these devices, regardless of whether they owned them or not. Any cell phones that can call or text messages (whether they have video capacity and Bluetooth or not) were classified as cell phones in comparison to smartphones. A question about access to the Internet was included in the access measure, since one cannot own the Internet. Only one participant owned and only four participants had access to a smartphone. All of these participants were extension agents. The small number of participants who owned/had access led us to exclude smartphone ownership and access from further analysis.

Media and Communication Technology Usage

The second-level digital divide between the stakeholder groups was assessed by asking participants about their frequency of and comfort with media use. First, for each of the technologies examined, they were asked whether they used them daily, weekly, monthly, less than yearly, or never. Second, interviewees were asked about their comfort using media technologies. They were asked whether they felt comfortable performing several tasks related to computer and Internet use and to cell phone or smartphone use. The computer-related tasks that were assessed included sending an e-mail, using an Internet search engine, downloading online videos, burning V/CDs, and playing V/CDs. Talking with someone on the phone, receiving or sending text messages, watching videos, and using Bluetooth technology to share information with other people were included as diverse types of cell phone- or smartphone-related tasks.

Media Preferences for Agricultural Information

Only the farmers were asked two questions about where they went for agricultural information and their preferred means of obtaining agricultural information. The options provided were: (a) radio, (b) television, (c) agricultural assistance office, and (d) other farmers.

Analysis

Regression models were used to answer RQ1a and RQ1b. In all cases, known predictors of the digital divide—such as age, gender, and educational attainment—were entered as control variables, and role (i.e., farmer or extension agent) was entered as the focal independent variable. For RQ1a we used logistic regressions to predict ownership and access to computer, Internet (only access), cell phone, radio, and television using the aforementioned control variables and role. Tables 1 and 2 show all parameter estimates for ownership of and access to media and technologies.

In order to answer RQ1b, we used multiple regression to predict frequency of use and comfort using each of the examined media and technologies with the same control variables mentioned above and role as the focal predictor. Tables 3 and 4 show all parameter estimates for frequency of and comfort in using media technologies.

RQ2 asked the farmers' preferred means and sources for receiving agricultural information. Simple descriptive statistics were used to determine what farmers perceive as the most credible sources. In addition, we investigated differences among farmers based upon their age, gender, and education level, using chi-square tests.

TABLE 1 Ownership of Media and Technologies

	Computer ($n = 24$)		Cell phone ($n = 243$)		Radio ($n = 221$)		TV ($n = 79$)	
	b	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Age	0.001	0.001	−0.001	0.001	0.001	0.002	0.01*	0.002
Education	0.03	0.02	−0.004	0.02	−0.03	0.04	0.17**	0.04
Gender (male)	−0.01	0.03	0.09**	0.04	0.09	0.05	−0.11*	0.05
Role (farmer)	−0.32**	0.07	−0.06	0.07	−0.10	0.10	−0.25	0.10

*$p < .05$. **$p < .01$.

RESULTS

Two hundred sixty-three people were interviewed, 76% of which were farmers ($n = 200$) and 24% were extension agents ($n = 63$). Although most interviewees were men (farmers: $n = 119$, 60%; extension agents: $n = 58$, 92%), extension agents were more likely to be male, $\chi^2(1) = 23.08$, $N = 263$, $p < .01$. Farmers were significantly older ($M = 45.69$, $SD = 12.14$) than extension agents ($M = 37.19$, $SD = 10.55$), $t(256) = 4.83$, $p < .01$. Farmers and extension agents differed in educational attainment. Farmers were more likely to have no education or only primary education ($M = 0.31$, $SD = 0.55$) and extension agents were more likely to have secondary or vocational/technical education ($M = 2.52$, $SD = 0.90$), $t(260) = -23.40$, $p < .01$.

Ownership and Access Results

RQ1a focused on the first-level digital divide, specifically ownership and access (see Tables 1 and 2 for details). Role was the only variable that was associated with ownership of computers in this model, with farmers less likely to own computers than extension agents, $b = -0.32$, Wald $\chi^2(1) = 24.01$, $p < .01$. Age, $b = 0.01$, Wald $\chi^2(1) = 0.52$, $p > .05$; gender, $b = -0.01$, Wald $\chi^2(1) = 0.05$, $p > .05$; and education, $b = 0.03$, Wald $\chi^2(1) = 1.2$, $p > .05$ were not associated with owning computers.

TABLE 2 Access to Media and Technologies

	Internet ($n = 33$)		Computer ($n = 37$)		Cell phone ($n = 255$)		Radio ($n = 255$)		TV ($n = 175$)	
	b	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Age	0.002	0.001	0.001	0.001	−.0004	0.001	0.001	0.001	−0.001	0.002
Education	0.03	0.02	0.003	0.02	0.02	0.02	0.02	0.01	0.17**	0.04
Gender (male)	−0.01	0.03	0.001	0.03	0.03	0.02	0.01	0.02	−0.002	0.06
Role (farmer)	−0.52**	0.06	−0.63**	0.06	0.02	0.04	0.01	0.04	0.19	0.12

**$p < .01$.

TABLE 3 Frequency of Using Media and Technologies

	Internet 0.44 (1.17)		Computer 0.49 (1.29)		Cell phone 3.67 (0.85)		Radio 3.68 (0.86)		TV 2.13 (1.63)	
M (SD)	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*	*b*	*SE*
Access	−3.01**	0.13	−3.24**	0.14	−3.57**	0.25	−3.80**	0.31	−2.62**	0.12
Age	0.001	0.003	0.001	0.003	−0.01**	0.003	0.00	0.004	0.004	0.01
Education	0.04	0.05	0.11*	0.05	0.07	0.06	−0.10	0.07	0.16	0.09
Gender (male)	0.04	0.07	0.01	0.07	0.33**	0.09	0.14	0.10	0.02	0.12
Role (farmer)	−0.10	0.15	0.09	0.16	0.11	0.16	0.03	0.18	−0.54*	0.24

*$p < .05$. **$p < .01$.

Farmers and extension agents did not differ in their ownership of cell phones, $b = -0.06$, Wald $\chi^2(1) = 0.83$, $p > .05$. Instead, cell phone ownership was influenced by gender, with males being more likely to own cell phones than females, $b = 0.09$, Wald $\chi^2(1) = 7.16$, $p < .01$. Age, $b = -0.001$, Wald $\chi^2(1) = 0.68$, $p > .05$ and education, $b = -0.004$, Wald $\chi^2(1) = 0.03$, $p > .05$ were not associated with ownership of cell phones.

There were no differences in radio ownership between farmers and extension agents, $b = -0.10$, Wald $\chi^2(1) = 1.15$, $p > .05$. Education, $b = -0.03$, Wald $\chi^2(1) = 0.59$, $p > .05$; age, $b = 0.001$, Wald $\chi^2(1) = 0.4$, $p > .05$; and gender, $b = 0.09$, Wald $\chi^2(1) = 3.17$, $p > .05$ did not differentiate radio ownership. A closer examination of the data revealed that 84.67% of the interviewees owned a radio, suggesting a ceiling effect. Extension agents were more likely than farmers to own a television set, $b = -0.25$, Wald $\chi^2(1) = 6.21$, $p < .05$; as were older, $b = 0.005$, Wald $\chi^2(1) = 6.33$, $p < .05$; more educated, $b = 0.17$, Wald $\chi^2(1) = 20.3$, $p < .0001$; and female, $b = -0.11$, Wald $\chi^2(1) = 4.02$, $p < .05$ interviewees.

Role was the sole predictor of access to the Internet, such that extension agents were more likely than farmers to have access to the Internet, $b = -0.52$, Wald $\chi^2(1) = 70.6$, $p < .01$. Age, $b = 0.002$, Wald $\chi^2(1) = 1.98$, $p > .05$; gender, $b = -0.009$, Wald $\chi^2(1) = 0.08$, $p > .05$; and education,

TABLE 4 Comfort in Using Media and Technologies

	Computer-related tasks 0.33 (0.99)		Cell phone-related tasks 2.35 (1.56)	
M (SD)	*b*	*SE*	*b*	*SE*
Access	−1.96**	0.18	−0.80	0.44
Age	−0.003	0.004	−0.02**	0.01
Education	0.07	0.06	0.54**	0.10
Gender (male)	0.02	0.09	0.62**	0.15
Role (farmer)	−0.05	0.20	−0.76**	0.28

**$p < .01$.

$b = 0.03$, Wald $\chi^2(1) = 1.23$, $p > .05$ were not associated with access to the Internet.

Similar to access to the Internet, access to computer was only predicted by role; extension agents were more likely than farmers to have access to computers, $b = -0.63$, Wald $\chi^2(1) = 107.65$, $p < .0001$. Age, $b = 0.00$, Wald $\chi^2(1) = 0.25$, $p > .05$; gender, $b = 0.00$, Wald $\chi^2(1) = 0.00$, $p > .05$; and education, $b = 0.00$, Wald $\chi^2(1) = 0.01$, $p > .05$ were not associated with access to computers. No significant predictors of access to cell phone were found. A closer examination of the data revealed that 97.7% of the sample had access to cell phones, suggesting a lack of variation as the cause.

There were no differences between farmers and extension agents in their access to television, $b = 0.191$, Wald $\chi^2(1) = 2.54$, $p > .05$. Only education was a significant predictor, with more educated participants more likely to have access, $b = 0.17$, Wald $\chi^2(1) = 15.61$, $p < .01$. Age, $b = -0.0005$, Wald $\chi^2(1) = 0.05$, $p > .05$ and gender, $b = -0.002$, Wald $\chi^2(1) = 0.00$, $p > .05$ were not associated with access to television. Finally, no significant predictors of access to radio were found.

Frequency of Use and Comfort Results

RQ1b focused on the second-level digital divide, specifically frequency of use and comfort with various media. After controlling for access to computers, extension agents and farmers did not differ in their frequency of use, $b = 0.09$, Wald $\chi^2(1) = 0.3$, $p > .05$, suggesting access already accounts for the differences between the groups. Only education was positively and significantly associated with frequency of computer use, $b = 0.11$, Wald $\chi^2(1) = 4.8$, $p < .05$. Gender, $b = 0.01$, Wald $\chi^2(1) = 0.04$, $p > .05$ and age, $b = 0.00$, Wald $\chi^2(1) = 0.11$, $p > .05$ were not associated with it. Similarly, access to the Internet was the only variable significantly related to frequency of Internet use, $b = -3.01$, Wald $\chi^2(1) = 535.29$, $p < .0001$; all other predictors were nonsignificant (see Table 3 for details).

After controlling for access to a cell phone, no differences were found between farmers and extension agents in their frequency of cell phone use. Gender and age were the only significant predictors; males used cell phones more frequently than females, $b = 0.33$, Wald $\chi^2(1) = 14.49$, $p < .01$, and younger participants were more likely to use cell phones more frequently than older participants, $b = -0.01$, Wald $\chi^2(1) = 7.71$, $p < .01$.

Besides access to radio, neither role nor any of the demographic variables examined were associated with frequency of radio use (see Table 3 for details). After controlling for access to television, only role was significantly associated with frequency of television use, with extension agents using television more frequently than farmers, $b = -0.54$, Wald $\chi^2(1) = 5.23$, $p < .05$. Age, $b = 0.004$, Wald $\chi^2(1) = 0.68$, $p > .05$; education, $b = 0.16$, Wald $\chi^2(1)$

= 3.05, $p > .05$; and gender, $b = 0.02$, Wald $\chi^2(1) = 0.02$, $p > .05$ were not related to frequency of television use.

Comfort in using media was the second indicator of the second-level digital divide. We found a significant difference between farmers and extension agents in their comfort using cell phones; extension agents, $b = -0.76$, Wald $\chi^2(1) = 7.23$, $p < .01$ felt more comfortable performing a greater number of tasks than their counterparts. Similarly, males, $b = 0.62$, Wald $\chi^2(1) = 17.21$, $p < .01$; younger interviewees, $b = -0.02$, Wald $\chi^2(1) = 11.74$, $p < .01$; and the more educated interviewees, $b = 0.54$, Wald $\chi^2(1) = 26.79$, $p < .01$ were more comfortable using cell phones. Access to cell phones was not significantly associated with comfort using them, $b = -0.80$, Wald $\chi^2(1) = 3.25$, $p > .05$. Only access to computers was associated with comfort using them, $b = -1.96$, Wald $\chi^2(1) = 124.77$, $p < .0001$ (see Table 4 for details).

Preferred Sources of Information for Farmers

RQ2 focused on the final targeted group's preferences for acquiring agricultural information. There were no significant differences among farmers with different genders, ages, or educational levels with respect to where they actually received agricultural information: gender, $\chi^2(3, N = 199) = 1.77$, $p > .05$; age, $\chi^2(4, N = 199) = 1.37$, $p > .05$; educational level, $\chi^2(4, N = 199) = 7.00$, $p > .05$ and where they would prefer to receive agricultural information: gender, $\chi^2(3, N = 198) = 1.71$, $p > .05$; age, $\chi^2(4, N = 198) = 2.46$, $p > .05$; educational level, $\chi^2(4, N = 198) = 6.32$, $p > .05$. Regardless of gender, age, and the highest educational level attained, most farmers went to extension agents for agricultural information (78%); a smaller percentage sought agricultural information via radio (15.5%), other farmers (4.5%), or the television (1.5%). Most farmers also indicated that their preferred sources for obtaining agricultural information were extension agents (91.96%), followed by other farmers (5.03%), the radio (2.01%), and television (0.5%).

DISCUSSION

The results of this study suggest that extension agents and farmers are distinct stakeholder groups embedded in different media environments. Role emerged as the dominant factor, explaining the first-level digital divide, with extension agents more likely to own and have access to a computer and more likely to have access to the Internet than farmers. The results newly suggest that role or occupation explain within-country, first-level digital divides, beyond other well-studied demographic variables (Bimber, 2000; Bucy, 2000; Loges & Jung, 2001; Ono, 2005; Ono & Zavodny, 2007; Zickuhr & Smith,

2012). This extends previous digital-divide scholarship by directing attention to understudied variables which might affect digital divides in different ways.

Additionally, despite the recent call in the digital-divide research for a shift from access divide to use divides (DiMaggio & Hargittai, 2001; DiMaggio et al., 2004; Hargittai, 2002; Livingstone & Helsper, 2007; Natriello, 2001; Reinhart, Thomas, & Toriskie, 2011; Wei, Teo, Chan, & Tan, 2011), the results suggest that considering gaps in terms of access to and ownership of media explains important aspects of the digital divide in contexts where digital penetration remains low. Access to media was the largest factor in determining the second-level digital divide. Those who had access to media were likely to use all media more frequently.

Regarding comfort using technologies, education—which neither influenced computer ownership nor access—was a strong predictor, being consistent with the second-level digital divide literature (DiMaggio & Hargittai, 2001; DiMaggio et al., 2004; Hargittai, 2002; Livingstone & Helsper, 2007; Natriello, 2001; Reinhart et al., 2011; Wei et al., 2011). This result suggests that socially constructed variables such as education plays a more crucial role in actual use of technology than access to technology. The varying influence of education on different levels of the digital divide indicates the significance of studying digital divides with a more nuanced approach (i.e., accounting for different levels of digital divides), even in a country like Burkina Faso where the first-level digital divide is still a severe problem.

Beyond these divides, farmers predominantly preferred to seek agricultural information from extension agents over any type of media. Farmers prefer not to take advantage of other media for agricultural information which may be beneficial and effective for learning about new practices (Gakuru et al., 2009; Patel et al., 2010). This implies that farmers trust agricultural information from extension agents more than that from other media, which might determine the success of campaigns (Hovland & Weiss, 1951). For the success of agricultural campaigns, accounting for source credibility might be more crucial than simply supporting ICT4D.

The results suggest that extension agents are more likely to be embedded in more diverse and complex media environments than farmers. Similar to the early adopters in the two-step flow model (Lazarsfeld et al., 1968), extension agents are likely than farmers to take advantage of media technologies to access and share agricultural information. In contrast, farmers are similar to the public in the two-step flow model (Lazarsfeld et al., 1968), as they are less likely than extension agents to have access to and use media technologies for agricultural information. Farmers are difficult to reach via new media technologies and prefer to receive agricultural information via particular organizational agents. We argue a two-step campaign design is required (see Table 5 for a detailed description and comparison between the implied ICT4D campaign design and the two-step flow campaign design model). In the two-step flow model, development materials and messages

TABLE 5 Comparison Between Implied ICT4D and Two-Step Campaign Design

	Implied ICT4D campaign design	Two-step campaign design
Conditions warranting the design		
Media environment	• Target population has access to media likely to be used in the campaign. • Target population has skills necessary to use media effectively. • Target population frequently uses the media for campaign.	• Target population lacks access, skills, or infrequently uses the media likely to be used in the campaign. • Opinion leaders or key institutional actors can be identified, mobilized, and they have access and skills to use media in the campaign.
Preferences of target population	Target population prefers to receive information directly from either mass media or peers.	Target population trusts and relies on identifiable opinion leaders/key institutional actors for advice.
Message design	Messages designed to influence the target population's attitudes, beliefs, and social norms directly. As such, attention is given to formative assessment, market segmentation, persuasive message design, message sources, volume of messages, prominence of message placement, and repetition (Atkin, 2001).	Messages designed to empower opinion leaders to persuade and educate target population. As such, messages and training should be designed to be given in group setting, incentives for message sharing must be included as part of the message, and special attention should be given to educate opinion leaders against counterarguments (Southwell, 2013).
Advantages	• Can directly control campaign messages • Success or failure of the campaign can be attributed directly to the messages or dissemination of messages.	• Can reach populations that would be difficult to reach otherwise. • Target population more likely to be cooperative as they trust the source (source credibility).
Disadvantages	• Interpersonal network effects unobserved. • May have lower source credibility.	• Effectiveness of campaign depends largely on the effectiveness of opinion leaders' dissemination of campaign messages (Durlak & DuPre, 2008; Payne, Gottfredson, & Gottfredson, 2006).

should be designed with the target audience of extension agents or identifiable opinion leaders (Backer et al., 1992) in mind. Such materials and messages should enable and empower extension agents to share information with farmers.

The success of the two-step campaign design depends largely on how effective extension agents are in disseminating the campaign messages (see Durlak & DuPre, 2008). Research from implementation science suggests that fidelity to campaign materials and sufficient training are more important than most other factors in the success of campaigns (see Payne et al., 2006). Therefore, campaign designers should pay particular attention to message features highlighted in Table 5. In doing so, campaign designers can reach otherwise difficult to reach populations. Further, campaign messages are likely to be more persuasive, since they come from sources that are seen by the target population as trustworthy (Hovland & Weiss, 1951).

CONCLUSION

This article illustrates the different media embeddedness of two stakeholder groups in an agricultural information dissemination effort and argues that extension agents should play significant roles in diffusing agricultural information to the target audiences, especially when technologies are part of the dissemination strategy. The current study makes two main contributions to research on agricultural information and communication. First, we extend the literature on agricultural development communication by focusing on the importance of the differences in the media environments in which different stakeholder groups are embedded and their preferences for receiving agricultural information. Rather than simply arguing for the strengths and potential of ICTs for agricultural development (Ajani, 2014; Fawole & Olajide, 2012; Gakuru et al., 2009; Oladele, 2011; Patel et al., 2010), this article introduces the two-step campaign design model that accounts for the existing sociocultural, economic, and institutional context. We explain how to use ICTs in agricultural campaigns when target populations lack access, do not frequently use, or do not trust newer media channels.

Second, we highlight how the organizational role explains digital divides and its import for agricultural development communication. Above and beyond the influence of previously studied demographic variables such as age, gender, and education, the occupational role explains first-level digital divides (Bimber, 2000; Bucy, 2000; Loges & Jung, 2001; Ono, 2005; Ono & Zavodny, 2007; Zickuhr & Smith, 2012). Moreover, situating the digital divide in the context of development communication advances the "implicit goals of closing outcome differences" (Wei et al., 2011, p. 171) in the research on digital divide.

The two-step campaign design highlighted here provides a valuable practical alternative for those waiting for increased media penetration to effectively reach populations that lack the access or skills to use new ICTs. By targeting organizational agents embedded in richer media environments, innovative agricultural solutions can be scaled up. In essence, rather than waiting for these populations to connect to the world through technologies, development solutions should use existing organizational infrastructures as intermediaries for agricultural development campaigns.

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