PARTICIPATORY COMMUNICATION AND ADOPTION OF SOIL FERTILITY MANAGEMENT PRACTICES: EVIDENCE FROM TWO AGRO-ECOLOGICAL ZONES IN GHANA

BY

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DECLARATION

I hereby certify this thesis as original and my own and that neither part nor the whole has ever been presented to this University or any other institution for the award of any academic degree.

All references of others made to the work have duly been acknowledged.

..... 19th January, 2023

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We, the undersigned supervisors, certify that we supervised the candidate to produce this original work. We are convinced that the thesis meets all required standards set by the University of Ghana for an award of a Doctor of Philosophy Degree.

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DEDICATION

This thesis is dedicated to my family- you matter most at the end of the day.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

AEA	Agriculture Extension Agents
CTA	Technical Centre for Agricultural and Rural Cooperation
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
FPR	Farmer Participatory Research
GDP	Gross Domestic Product
ISFM	Integrated Soil Fertility Management
ISSER	Institute of Statistical, Social and Economic Research
MoFA	Ministry of Food and Agriculture
NWICO	New World Information and Communication Order
ORM4SOIL	Organic Resource Management for Improving Soil Fertility
POME	Palm Oil Mill Effluence
PRA	Participatory Rural Appraisal
SFM	Soil Fertility Management
SOM	Soil Organic Matter
SSA	Sub Saharan Africa
TSP	Triple Super Phosphate
UNESCO	United Nations Educational, Scientific and Cultural Organisation

ABSTRACT

Communication is widely recognised as essential to the development of rural communities located in African countries like Ghana. While the practice of development communication has widely been informed by either an instrumentalist/diffusion or participatory perspective, there is an argument for the study of development communication from a constructivist perspective. Such a perspective focuses less on exploring the outcomes of development communication efforts and allows for a closer examination of contextual issues affecting communication. Given that the existing theoretical recommendation of participatory communication for sharing soil fertility management messages is not complemented with enough evidence of its practical application, this study examined participatory communication as it was applied in a project implemented in two agro-ecological zones in Ghana. Using a grounded theory approach and collecting data through interviews, focus group discussions, observations and reviews of transcripts of a radio programme, the study examined the dialogic tactics used by farmers and scientists involved in the interaction, scientists' and farmers' perceptions of participatory communication, the contextual conditions which informed successful participatory communication and how participatory communication facilitated farmers' adoption of soil fertility management. Findings of this study showed that participatory communication leads to scientists' awareness of indigenous knowledge forms which improves communication competence when those knowledge forms are made to inform messaging. This is done through the appropriation of local metaphors, analogies, examples, testimonies, etc. Moreover, the outcomes of participatory communication are not inevitably positive; but dependent on the salience of a number of factors in the reckoning of scientists and farmers. Lastly, participation and transmission are not necessarily incompatible or mutually exclusive especially in the case of addressing scientific topics such as soil fertility management.

CHAPTER ONE

INTRODUCTION

1.0 Background

Until the mid-1980s the scholarship and practice of communication as a vector of development had been characterised by an epistemic dual about the comparative usefulness and utility of the modernisation/transmission versus participation/transaction paradigms. However, the last 40 years have witnessed a gradual but decisive, and often uncritical, shift towards participation as the preferred path to delivering the dividends of development. This contemporary valorisation of the participatory approach to communication has inspired a raft of assumptions and applications of the concept (Jacobson & Kolluri, 1999); often with insufficient attention to the imperatives of context. This study responds to the implications of this dynamic to praxis; by examining the nature and use of participatory processes in communicating the science of soil fertility. Before demonstrating the scholarly bona fides of the study by way of the problem statement, however, it is useful to first lay out the normative and pragmatic conditions that have accounted for the recent partiality towards the participatory communication paradigm. This is followed by a brief engagement with the conceptual nexus between agricultural extension and communication; including the prevailing notions of participatory communication within which the scientific evidence and field experience about soil fertility are presumed to ensue.

The practical application of participatory communication is founded on specific guiding principles such as free and open dialogue, the inclusion of multiple "voices" and action (Tufte & Mefalopulos, 2009). Free and open dialogue is the primary and the most fundamental principle of participatory communication. Such dialogue according to Tufte and Mefalopulos (2009), facilitates message exchange, problem identification, development of communication strategies and the implementation of identified solutions to problems. In terms of allowing voices to be heard, participatory communication provides the opportunity

for different people involved in the dialogue, regardless of their status or power, to share their opinions fearlessly (Tufte & Mefalopulos, 2009). Lastly, participatory communication should be action oriented by empowering participants to act collectively to solve the identified problem (Sackey, Clark & Lin, 2017).

Participatory communication and its principles have been applied or implemented in various development related interventions or projects. According to Dagron (2001), implementing participatory communication in development interventions contributes to the sustainability of such interventions or projects. Moreover, the application of the principles of participatory communication to development projects allows community members to develop a sense of ownership for such projects (Waisbord, 2008). It also enables the empowerment of community members especially when the decisions and actions taken are based on local knowledge or expertise (Sackey et al., 2017).

However, Mefaopulos (2008) argues that though participatory communication is highly praised in development efforts, it is often a poorly applied concept. While its principles appear to address the inequalities present in the "top-down" communication model, most participatory communication projects seem to stress a perfunctory involvement of community members who are mostly engaged with the sole aim of realising goals which have already been set by external agencies. In such cases, the focus of communication in development projects is on the achievement of tangible, observable, evidence of well spent donor funding (Tietaah, 2016).

In most developing countries in Sub Saharan Africa (SSA) such as Ghana, efforts at attaining development have highlighted the need to transform and facilitate growth in specific areas such as governance and accountability, unemployment, infrastructure deficits, private sector development, agriculture and food security, and gender equity and affirmative empowerment (African Development Bank, 2013). Agriculture and food security is

considered as one of the most critical sectors for growth and development in Africa (African Development Bank, 2020).

In Ghana, the agricultural sector contributes to the growth of the economy by providing employment opportunities, raising revenue from export earnings and providing inputs or raw materials for the manufacturing sector (World Bank, 2018). Yet, statistics suggest a recent decline in the sector's real contribution to Gross Domestic Product (GDP) growth (Ghana Statistical Service, 2019; World Bank, 2018). For instance, agriculture's contribution to GDP declined from 22.7 percent in 2016 to 18.5 percent in 2019 (Institute of Statistical, Social and Economic Research [ISSER], 2020). Reasons often cited for the decline in agricultural output range from challenges arising from the continuous use of unsustainable farming practices (World Bank, 2018; Djurfeldt, 2015) to urbanisation (Ayerakwa, 2017; Bationo & Waswa, 2011). These challenges threaten the ability of Africa to feed its population which is estimated to account for nearly half of the global population figures by 2035[1]. The food security threat in Africa has informed the call for more sustainable agricultural practices (Conceição, Levine, Lipton & Warren-Rodriguez, 2016).

It has been argued that soil fertility management and maintenance is critical in the quest for sustainable agriculture in Sub Saharan African (SSA) countries such as Ghana (Singh, Pandey, & Singh, 2011). This is because soils in SSA are experiencing high rates of soil nutrient depletion (White, Crawford, Alvarez & Moreno, 2012; Montgomery, 2007) caused by soil erosion (Veihe, 2000) and loss of soil fertility (Manlay, Feller & Swift, 2007). According to Donovan and Casey (1998, p.3), measures ought to be taken to address soil fertility decline because "without restoration of soil fertility, the countries of Sub-Saharan

[1] Information obtained from the Institute for Security Studies at https://www.Issafrica.org/amp/iss-today/africas-population-boom-burden-or-opportunity

Africa cannot solve their problems of serious food imbalances and widespread malnutrition."

Soil fertility management refers to all the "attributes, aspects and activities that maintain, enhance and sustain the ability and capacity of the soil to supply adequate quantities of nutrient elements for optimal plant growth" (Soil-Water Management Group, 2005, p.9). Soil fertility management practices include the application of inorganic fertilizers (Food Security Policy Report, 2015) and the use of Integrated Soil Fertility Management (ISFM) practices which advocate a combined use of both inorganic and organic fertilizers (Tittonell & Giller, 2013).

Ajayi, Akinnifesi, Sileshi and Chakeredza (2007) suggest that in most of Africa, despite the introduction of various soil fertility management interventions by various actors, the rate of their adoption by farmers is low. Low adoption rates are often attributed to factors such as the characteristics of the soil fertility management practices (Tadesse & Belay, 2004), land tenure, household characteristics, access to credit and varying farming conditions in different agro-ecological zones (Ajayi et al., 2007).

According to Kombiok, Buah and Sogbedji (2012), low adoption of soil fertility management practices in SSA can also be attributed to inadequate and/or poor communication about the subject (Kombiok, Buah & Sogbedji, 2012). This view is shared by Sanginga and Woomer (2009), Gowing and Plamer (2008) and Norrish, Morgan and Myers (2001). Where communication is inadequate or poor, farmers fail in the first place to even perceive soil fertility decline as a major threat to sustainable agriculture (Spurk et al., 2020). Ineffective communication also fosters the spread of inaccurate knowledge and understanding about soil fertility management practices among farmers (Spurk et al., 2020). There is therefore an urgent need to re-think communication about soil fertility management to the African or Ghanaian farmer.

1.1 Agricultural Communication/Extension

A general examination of agricultural communication efforts particularly by agricultural extension agents (AEAs) reveals a predominant use of top-down, linear communication strategies which are largely informed by the diffusion of innovations theory (Rogers, 1962). The main features of top-down communication with farmers are the absence of interaction in communication efforts and the non-inclusion of farmers' suggestions and feedback in decision making (Melkote & Krishnatray, 2010). Top-down communication strategies focus on disseminating information to farmers. Unfortunately, in such instances, the originators of information do not incorporate farmers' local knowledge in their communication efforts (Aminah, 2016).

In the context of soil fertility management, it has been found that top-down communication approaches dictate or prescribe wholesale solutions to farmers, without regard for the context or agro-ecological zones in which farmers work. The result of such communication is the creation of farmer apathy and disinterest in the advocated soil fertility management practices (Yahaya, 2003; Onasanya, Adedoyina & Onasanya, 2006).

Therefore, participatory communication has been recommended as an alternative to top-down communication of soil fertility management. Coldevin (2001) suggests that the use of participatory, audience-centred communication strategies has the potential to accelerate the rate of technology adoption among farmers. Additionally, participatory communication is credited with the possibility of facilitating the creation of hybrid knowledge as farmers and scientists jointly engage and dialogue to develop new agricultural technologies. Such joint collaboration influences farmers' attitudes and increases their confidence and willingness to adopt newly developed technologies (Apata, Samuel & Adeola, 2009; Okoba & De Graff, 2005; Farouque & Takeya, 2009).

Although conceptualised differently by various scholars and thereby resulting in varying definitions, participatory communication is understood as promoting dialogue and being community based in its approach (Jacob & Storey, 2004). Bordenave (1999) explains that participatory communication is a type of communication which provides an opportunity for all speakers to freely express their opinions, experiences and perspectives on issues with the aim of finding mutually beneficial solutions to the problems they encounter in their society. Khadka (2000, p.4) defines participatory communication as a "two-way process involving active, transactional dialogue". Other definitions of participatory communication also highlight its focus on open dialogue which stimulates continuous interaction for the purpose of identifying problems, making decisions about how those problems can be addressed and taking action to solve the identified problems (Nair & White, 2004; Singhal & Devi, 2003).

1.2 Research problem

Current literature on soil fertility management communication in SSA reveals a focus on communication approaches, channels, farmer participatory research and the communication related factors influencing adoption (Baah-Ofori & Amoakohene, 2021). Specifically, the literature demonstrates that both the transmission and transactional definitions of communication inform soil fertility management communication efforts (Adero, 2015; Adolwa, Schwarze & Buerket, 2018). Also, the literature suggests that a number of soil fertility management options are currently being communicated to farmers through a plethora of channels which have been classified as either interpersonal (Sanginga & Woomer, 2009), community based (Adolwa et al., 2012) or mass media (Muchai et al., 2014). The suggestion is that even though each channel has its own strength, not all of them guarantee farmers' understanding of soil fertility management and generate their interest in adopting soil fertility management practices (Munthali, 2017). Thus, the recommendation for soil fertility management to be communicated through channels which are interactive,

allow for demonstrations, accessible and participatory (Gwandu et al., 2014; Agyekum, 2016).

To this end, the literature further identifies the importance of Farmer Participatory Research (FPR) (Rusike, Twomlow, Freeman & Hienrich, 2006; Mubiru et al., 2004) and how its use of local knowledge (Ramisch et al., 2006) and interactive channels such as field-based learning centres (Giller et al., 2011) stimulate farmers' interest in and understanding of various soil fertility management practices. Even though the literature recognises participatory communication as a key component of FPR (De Jager et al., 2004) and generally touts it as effective for enhancing farmers' understanding (Odendo et al., 2003), there is a dearth of evidence regarding the use of participatory communication in soil fertility management communication efforts in SSA (Kolawole, 2013). As such, this thesis is in response to calls for more studies participatory communication of soil fertility management (Baah-Ofori & Amoakohene, 2021; Jayne et al. 2015).

Tietaah (2016) suggests that current development communication efforts, whether they subscribe to the instrumentalist (transmission) paradigm or to a participatory (transactional) paradigm, tend to put extreme emphasis on examining the role communication plays in achieving development objectives/outputs using a range of international communication tools and tactics. He argues for a need to re-think communication's role in development by exploring the distinct sociology of communication media and modes in Africa and how these can be incorporated into development communication initiatives by proposing a constructivist perspective of development communication which argues for attention to be paid to participants' realties and communication ecologies to ensure equity and inclusiveness.

This thesis draws on the arguments of the constructivist perspective of participatory communication by shifting attention away from the sole investigation of participatory

channels used to communicate about soil fertility management towards the examination of the nature of participatory communication (dialogue), perceptions of participatory communication, the socio-cultural conditions facilitating participatory communication and the extent to which all these traits of participatory communication contribute to farmers' adoption of soil fertility management practices.

The contention is that if dialogue is a major principle or element of participatory communication, then there remains to be captured in the literature, how this dialogue unfolds between scientists and farmers to inform how scientists exchange soil fertility management information with farmers and how farmers make meaning of such exchanges and respond by adopting or adapting soil fertility management practices. One of the arguments of the constructivist paradigm is for development communication to be cognisant of local realities within which communication occurs. In line with this, Gawali and Rawat (2018, p.190) argue that participatory communication should create a favourable "ambiance" which stimulates interaction and facilitates understanding among all participants. This supposes that the dialogue in participatory communication should occur under certain conditions or in a particular atmosphere. Since the literature is unclear about what conditions facilitate effective participatory communication or dialogue about soil fertility management, this thesis sought to explore this gap in literature. Lastly, although participatory communication is touted as improving scientist-farmer interaction and ultimately contributing to farmers' adoption of soil fertility management practices, there is a lack of empirical evidence of how participatory communication unfolds between both parties. Hence, this thesis explored how scientists and farmers used participatory communication to improve communication competence; thereby facilitating meaning creation between both parties and ultimately informing farmers' soil fertility management decision making.

1.3 Research objectives

Using a case study of a soil fertility management project called Farmer-driven Organic Resource Management to build Soil Fertility (ORM4Soil)[2], this thesis had the main research objective of exploring how participatory communication enables farmers and scientists to reach a shared understanding of soil fertility management and how this facilitates farmers' adoption of soil fertility management practices. The findings of the research were used to generate a theory explaining the studied aspects of participatory communication and their contribution to farmers' adoption of soil fertility management practices.

The specific research objectives were to:

1. Identify the dialogic tactics used by scientists and farmers during participatory communication about soil fertility management;
2. Investigate farmers' and scientists' perceptions of participatory communication about soil fertility management;
3. Explore the conditions that supported successful participatory communication about soil fertility management;
4. Describe how participatory communication enabled farmers and scientists to reach a shared understanding of soil fertility management and how this facilitated farmers' adoption of soil fertility management practices

1.4 Research questions

Based on the objectives outlined above, the following research questions were proposed:

1. What dialogic tactics informed farmers' and scientists' participatory communication about soil fertility management?

[2] More information about this project can be found at https://www.fibl.org/en/themes/soil-fertiity.html#pdb

2. How did scientists' and farmers' perceptions about participatory communication affect their involvement in participatory communication of soil fertility management efforts?
3. What conditions were identified by farmers and scientists as essential for successful participatory communication of soil fertility management?
4. How did participatory communication enable farmers and scientists to reach a shared understanding of soil fertility management and facilitate farmers' adoption of soil fertility management practices?

1.5 Justification

The Institute of Statistical, Social and Economic Research, (ISSER) in its report on the state of the Ghanaian economy in 2019 noted that between 2016 and 2019, Agriculture's contribution to GDP witnessed a decline from 22.7% in 2016 to 18.5% in 2019. The decline was attributed to high volumes of food importation compared to the volumes of local food production. Concerning the decline in food production in Ghana, Jayne et al. (2015), identified declining soil fertility levels as one of the major reasons and suggested a need for holistic programmes which, among others, invest in research and communication, to address the problem.

There is enough evidence which suggests a correlation between agricultural communication via extension and continuous food security (Pan, Smith & Sulaiman, 2018; Aidoo & Freeman, 2016). However, it has been suggested that not every kind of communication is useful for engaging farmers; rather, useful agricultural communication is the kind that is participatory and is likely to increase farmers' adoption of sustainable farming practices (Mefalopulos, 2005). Unfortunately, in Ghana, agricultural communication efforts generally remain largely top-down and prescriptive in nature with extension agents purporting to be more knowledgeable than farmers especially in terms of sharing technical knowledge and disseminating information to farmers without including the latter's perspectives (Abukari,

Bawa & Awuni, 2021). As such, communication efforts often fail to achieve the necessary results in terms of getting farmers to adopt the recommendations to their agricultural problems (Al-hassan, 2007).

Despite the argument for more national investment into research and communication to address soil fertility management (Jayne et al., 2015) and the widely reported farmer preference for participatory communication about soil fertility management (Rusike, Twomlow, Freeman & Hienrich, 2006; Mubiru et al., 2004; Mugwe et al., 2009), the suggestion is that the application of participatory principles in soil fertility management communication remains largely theoretical and not supported by enough practical evidence of the successful implementation or application of participatory communication.

Again, given the call for the application of the constructivist perspective in development communication (Tietaah, 2016), this study drew from the constructivist paradigm to study participatory communication as it unfolded in a project called Farmer-driven Organic Resource Management to build Soil Fertility (ORM4Soil). By examining specific aspects of participatory communication such as dialogue, context/conditions of interaction, perceptions of those engaged in the interaction and the extent to which participatory communication influenced farmers' adoption of soil fertility management practices, the study aimed to fill the identified gaps in literature and provided insights for informing and guiding future designs of participatory communication about soil fertility management in Ghana.

1.6 Study Limitations

This study explored participatory communication as understood and experienced by participants in a soil fertility management project in Ghana. As such, the study participants were limited to a small sample. It is possible that the specific project being explored in this study resulted in some "participants/informers" being easily identified. However, as much as possible, efforts were made to hide their identities.

In addition, the use of the grounded theory design sought to develop a substantive theory, which is a theoretical model that provides a working theory of action for a specific context, rather than a formal theory. A substantive theory is considered transferable, rather than generalizable, in the sense that elements of the context can be transferred to contexts of action with similar characteristics to the context under study. This contrasts with formal theory which is based on validated, generalizable conclusions across multiple studies that represent the research population as a whole or upon deductive logic that uses validated empirical theories as its basic axioms.[3] According to Birk and Mills (2011, p. 156), a substantive theory is concerned with "a specific phenomenon in the context of a clearly identified group of individuals". Glaser and Strauss (1967) also suggest that substantive theories are only developed for an applicable or practical area. Since, the focus of this thesis was to generate a substantive theory, the level of abstraction and conceptualisation in this study was adequate only for such.

1.7 Conceptual definitions

This section defines the study's key concepts. These are participatory communication, soil fertility, adoption and sustainable soil fertility management practices.

1.7.1 Soil fertility

This study refers to soil fertility as the property of soils that enables it to provide the plants with the needed plant nutrients and have adequate amounts of soil organic matter and soil carbon to support plant growth. Thus, a fertile soil should have high amounts of nutrients, organic matter, have an active presence of soil micro-organisms and make plant nutrients easily available to plants.

[3] This distinction between substantive and formal theories was obtained from https://www.igi-global.com/dictionary/employing-grounded-theory-approach-mis/28672 accessed on 17th September, 2020

1.7.2 Sustainable soil fertility management practices

This study conceptualises sustainable soil fertility management practices as a combination of locally available organic and inorganic fertilizers together with farming practices which build up soil nutrients in order to preserve the environment, boost productivity and increase crop yields and household incomes in the long term.

1.7.3 Participatory communication

Attempting to provide a neat definition of participatory communication is a difficult, if not impossible task. However, evidence suggests that participatory communication encourages dialogue, incorporates local knowledge in communication efforts, recognises and improves local capacity, by granting marginalised groups the opportunity to freely express themselves (Tufte & Mefalopolus, 2009) and uses accessible and convenient channels. Thus, in this study, participatory communication referred to communication which adhered to the above listed elements. Any such communication with the above-listed elements which led to meaning creation and mutual understanding between stakeholders was also characterised as successful participatory communication.

1.7.4 Adoption

The concept of adoption, as applied in agriculture, is defined variously (Glover, Sumberg & Andersson, 2016). For instance, Bonabana-Wabbi (2002, p. 24) defines adoption as "the outcome of a decision to accept a given innovation." Abrea (2008) also suggests that adoption is a decision to utilize a new technology or practice on a regular basis. Rogers (1983) also indicates that adoption is the use of a technology by a farmer over a given period of time. Others suggest that adoption is how a new technology is integrated into an existing practice and is usually preceded by a period of trying and some degree of adaptation (Loevinsohn, Sumberg & Diagne, 2013). This means that adoption of a practice or technique refers to a long-term decision to use an innovation after an initial trial period.

The literature also distinguishes between two categories of adoption: the rate of adoption and intensity of adoption (Mwangi & Kariuki, 2015). The rate of adoption refers to the speed with which a new practice is adopted by a group of people over a given period of time. Intensity of adoption however deals with the level or extent to which a group of people, in this case farmers, use a given technology or practice on a given portion of their farmlands at a given point in time (Bonabana-Wabbi, 2002). One of the aims of the ORM4Soil project was to assess the intensity of adoption of soil fertility management practices by farmers.

Based on the above, adoption in this thesis was not in reference to farmers' wholesale replication of the soil fertility management amendments explored in the project. Rather, it referred to farmers' ability to use or implement the soil fertility practices with or without some degree of adaptation depending on their specific farming conditions. In other words, this thesis was interested in examining the intensity of adoption and consequently, conceptualised adoption as the extent to which farmers either incorporate the entire or aspects of the ORM4Soil soil fertility management practices which are empty fruit bunch, palm oil mill effluent (POME), composted cocoa pod husks, rice husk biochar, mature cow dung and composted cow dung.

1.7.5 Adoption influences

These refer to factors emanating from either individual farmers, the social and agro-ecological environment which inform farmers' decisions to adopt/adapt or not adopt/adapt soil fertility management practices.

1.7.6 Contextual influences

This study conceptualises contextual influences as factors arising from the socio-cultural environment which have an ability to impact successful participatory communication.

1.7.7 Dialogic tactics

In this study, dialogic tactics were operationalized as communication techniques or devices employed in participatory communication to make messages appeal to all parties in a conversation and ensure mutual understanding.

1.7.8 Grass roots communication

Grass roots communication is that which addresses how people in local communities communicate among themselves to solve their local problems or how they articulate their views, needs and interests from their local communities to officers at the district, regional and national levels (White, 2008). This study expands upon this definition to by also referring to grass roots communication as how actors external to a particular local community capitalise on local communication forms and modes to exchange information on pertinent community matters to local communities.

1.7.9 Local knowledge

Local knowledge refers to indigenous knowledge derived from a specific locality, practiced by a well-defined group of people and informed by local expertise and experiences concerning specific practices or traditions.

1.7.10 Scientific knowledge

Scientific knowledge is operationalized as expert advice or knowledge derived from sources with technical agricultural know how based on research and experimentation. Such sources include agricultural extension officers, agricultural research scientists and lab technicians.

1.7.11 Relationship

The purpose of qualitative research is to gain an in-depth understanding of a phenomenon of interest. Being cognisant of this, relationship is used in this study to refer to how various factors or variables interconnect to provide a holistic appreciation or understanding of the phenomena investigated in this thesis.

1.8 Organisation of study

This thesis is organised into seven chapters. Chapter one sets the tone for the entire work by providing relevant background information, which highlights the need for a study of this nature. Chapter two situates this work in development communication scholarship and discusses how the participatory perspective, in particular, is studied using arguments from the constructivist perspective of development communication. Chapter three reviews pertinent literature on participatory communication and adoption of soil fertility management practices. In Chapter four, the philosophical orientations of this thesis are discussed prior to the description of the methodology of this study. Chapter five presents the findings and chapter six and discusses them in relation to existing literature. Chapter seven summarises the main research findings with a view to drawing conclusions and providing recommendations for development communications practice and future research.

CHAPTER TWO

FRAMEWORKS FOR GRASSROOTS COMMUNICATION RESEARCH

2.0 Introduction

Although this thesis did not set out to verify or contest any specific theoretical viewpoint, with its grounded theory approach, it was considered worthwhile to discuss some viewpoints from which communication involving grassroots have been examined. For one, the introduction could provide a perspective for the outcome of the research. Among grassroots communication frameworks may be counted the diffusion and participatory approaches which form part of the omnibus paradigm of communication for development. This chapter discusses the dimensions or perspectives of communication for development and their contribution to grassroots communication. The chapter then discusses the usefulness of applying Tietaah's (2016) constructivist perspective of development communication to investigating participatory communication of soil fertility management in this thesis.

2.1 Communicating for Development

Communication for development communication encompasses the use of communication to address diverse development related issues especially in the developing world (Melkote, 1991). Colle (2002) assumes an instrumentalist view, suggesting that communication for development involves the use of both mediated and non-mediated forms of communication for resolving development issues. On her part, Servaes (2002, p.1) defines communication for development in more relational terms as "the sharing of knowledge aimed at reaching a consensus for action that takes into account the interests, needs and capacities" of all concerned stakeholders. Quebral (2006), taking a rather macroscopic perspective, refers to communication for development as the application of human communication to transform a country by moving its people from poverty to economic growth in order to ensure greater social equality. In essence, communicating for development entails productive interaction

which aims at improving the lives of all stakeholders in a given circumstance. Historically, communication for development emerged in response to different conceptualisations of what development is and sought to define the role communication played in attaining development.

2.2 Diffusion/ instrumentalist perspective

The instrumentalist or diffusion perspective of communication for development is associated with the modernisation and dependency paradigm of development (Tietaah, 2016). Communication, according to this perspective, is equated with information or knowledge transfer with the media, in particular, being used to disseminate Western scientific knowledge/content to local people with the aim of replacing their non-Western knowledge (Ansu-Kyeremeh, 1997). This disseminative view of communication encouraged a linear, top-down, unidirectional, two-step and impersonal flow of knowledge. Development communication during this period was also understood as a tool for development, a means to an end (Rogers, 1995; Ansu-Kyeremeh, 2007). Thus, the focus of using communication to catalyse development initiatives was to transfer information from senders to "passive" receivers with the aim of achieving particular effects or outcomes such as behaviour or attitudinal change (Tietaah, 2016).

The communication theories associated with this paradigm include the diffusion of innovations theory, two-step flow or the extension approaches. Everett Rogers, a leading proponent of the diffusion of innovations theory, suggests the role of communication as transferring innovations from development agencies to their clients and creating an appetite for change (Servaes, 1995). To a large extent, the top-down nature of communication for development based on the modernisation and dependency models of development is criticized for failing to make any long-lasting impact in developing countries because they

were unresponsive to the local conditions and grassroots practices (Obregon & Mosquera, 2005).

2.3 Participatory communication

The multiplicity/another development era birthed the participatory perspective of development communication (Tietaah, 2016). Since its emergence, participatory communication has been subject to various interpretations (Arnst, 1996) leading to a plurality of perspectives and points of emphasis about its meaning and essence. Coldevin (2001), for instance, assumes a technophilic orientation, explaining participatory communication as audience-oriented communication strategies that can play a critical role in accelerating the rate of technology transfer by providing relevant information, changing negative attitudes and providing skills training. Like Servaes (1995), Tufte and Mefalopulos (2009) define participatory communication in more relational terms as an approach which is based on dialogue and allows information, perceptions and opinions to be shared among various stakeholders in order to guarantee their empowerment. Singhal and Devi (2003, p. 2) similarly define participatory communication as "a dynamic, interactional and transformative process of dialogue between people, groups and institutions that enables people, both individually and collectively, to realise their full potential and be engaged in their own welfare."

Notwithstanding the different points of view, however, the common denominator in these definitions is the idea that participatory communication should involve the beneficiaries of a project or initiative right from its beginning to its implementation by creating an atmosphere that facilitates genuine, open conversation about what needs to be achieved and how it can be achieved. Participatory communication is therefore not a matter of simply exchanging information but one of generating new knowledge from the bottom-up to address situations that need improvement (Dragon, 2012). Participatory communication is

also expected to champion grassroots level actions, ensure the recognition and incorporation of local knowledge in development efforts and recognise the role of development specialists and scientists as facilitators, not decision makers (Servaes, 2007; Waisbord, 2008).

Paulo Freire (1970) is often cited as the originator of participatory communication for affirmative action and grassroots development. Based on his work on traditional pedagogy, Freire opposed the linear nature of normative teaching methods, referring to them as "mechanical transfer, cultural invasion and manipulation" (Freire, 1981, p. 95). Instead, he insisted on the use of more inclusive teaching methods based on communication and dialogue to allow for people's conscientization and liberation through co-learning based on a dual theoretical strategy (Huesca, 2002). In the context of the current study, this would suggest a need for scientists and farmers to engage in bi-directional communication for purposes of co-orientation and mutual learning outcomes.

This dual nature of Freire's argument suggested that first, human beings (subjugated people) had a right to name the world in dialogic encounters. Freire (1973, p.46) suggested that "being dialogic is not invading, not manipulating [and] not imposing orders. Being dialogic is pledging oneself to the constant transformation of reality." This implies that the basis of participatory communication is interaction or dialogue which is not imposing but allows stakeholders to learn from each other. Secondly, Freire insisted that communicators should be allowed to reflect, think critically and decide to plan for social change. Such opportunities of reflection, according to Freire, were to lead to a raising of consciousness levels on a given subject matter to enable beneficiaries make their own informed decisions. The Freirean argument about participatory communication emphasises group, rather than individual, solutions to general situations of poverty and cultural subjugation. Thus, group dialogue is valued above mass media forms such as radio, television and print (Servaes, 1995). Little

attention is given to the language or form of communication. Rather, most attention is paid to the intentions of communication actions (Huesca, 2002).

Aside Freire's arguments about participatory communication, there has been the emergence of another school known as the UNESCO discourse about participatory communication which suggests that communication should result in self-management, access and participation (Huesca, 2002). UNESCO advocates the use of mass media for participatory communication activities provided that such media are made accessible for public service through the provision of a diversity of relevant programmes and the enablement of feedback mechanisms to transmit audience reactions to production organisations. The suggestion is that local media can be used by all citizens to voice their concerns and find mutual solutions to local problems (Pragya & Kashyap, 2018).

It is noteworthy that while both the Freirean and UNESCO discussions about participatory communication emphasize greater public involvement in communication activities, the main difference is that Freire insists on an organic and operative respect for culture in all participatory communication efforts and suggests that group media is the most effective for participation. UNESCO, on the other hand, argues that participation need not be immediate or limited to group media. Instead, it should be possible to use mass media forms and ensure a gradual progression of stakeholders from partial to absolute self-management or participation (Huesca, 2002). Nevertheless, essentially, both arguments agree that participatory communication should provide opportunities for people to dialogue, participate and contribute ideas based on their realities for their mutual freedom, access and empowerment (Diaz Bordenave, 1994; Nair & White, 1994; Dervin & Huesca, 1997). The grounded theory orientation of this study entertained the possibility of observing the relative salience of the Freirean and UNESCO approaches (including the option of a hybridisation of applications) to participatory communication of soil science information and knowledge.

2.4 Participation as a means/tool versus participation as an end/goal

Discussions about participatory communication have sought to operationalize participation either as a means/tool to development or as an end/goal of development in itself (Melkote & Steeves, 2001). It has been argued that participation as a means is a reflection of the dominant paradigm while participation as an end is a reflection of context-based communication which results in the empowerment of local communities (Dervin & Huesca, 1997). The arguments for participation as a means suggests that development communication actors place individuals at the receiving end of various levels of information and typically allow a level of participation limited to mobilising people to co-operate in development activities which have predetermined outcomes. Such views of participation leave very little room for individuals to consider all their options and make decisions which will best suit them (Melkote & Steeves, 2001).

The arguments for participation as an end on the other hand argue that communication and participation are a basic human right. The suggestion is that once stakeholders are able to think, speak out, stand up for themselves and take decisions in critical issues affecting their lives then the purpose of development communication has been achieved (Diaz-Bordenave, 1989). The ultimate goal of development communication according to this line of thought is for participatory communication efforts to empower individuals to take active parts in development programmes, contribute their ideas, take initiative and express their needs and problems as part of demonstrating their independence and fundamental right to communicate. This view has received massive support from scholars (Kothari, 1984; Diaz-Bordenave, 1989) and is the view promoted by Tietaah's (2006) constructivist perspective of development communication which serves as the framework for this study's exploration of participatory communication.

2.5 Grassroots communication in Africa

Both the Freirean and UNESCO models reflect some tenets of grassroots communication. Grassroots communication touches the core of communication concerns in Africa. It seeks to address how people in local communities communicate among themselves to solve their local problems or how they articulate their views, needs and interests from their local communities to officers at the district, regional and national levels (White, 2008). It has been argued that the focus of grassroots communication research should be to re-examine the structure of communication to change from the centrifugal structure (where communication flows from the centre to the periphery) to the centripetal one (from the grassroots to the centre) (Ansu-Kyeremeh, 1997).

Ansu-Kyeremeh (1997) suggests that a centrifugal communication structure mirrors the instrumentalist/diffusion perspective which is linear in its approach and fixated on transmitting messages through pre-determined channels with the aim of achieving specific responses from the receivers of the message. The centrifugal structure is criticised as ineffective because of the failure to account for local communication networks and communication modes. Thus, by proposing a centripetal structure, Ansu-Kyeremeh (1997) was suggesting that grassroots communication efforts should recognise traditional forms of communication, value local knowledge and appreciate that communication in rural contexts is highly oral, performative (Morrison, 2005) and encompasses the use of singing, dancing, speaking with rhetorical effect, proverbs and storytelling (White, 2008). Such communication is rooted in African culture, is dialogic and encourages conversations among all actors involved in the process. As such, development communication should build on existing patterns of communication in rural communities. Thus, it can be said that the arguments of participatory communication are preferred for informing grassroots communication activities or processes in Africa.

2.6 The application of participatory communication to development initiatives

A number of studies have investigated the use of participatory communication in various development initiatives such as health communication (Waisbord, 2010; Ramirez, Villarreal, Mcalister, Gallion, Suarez & Gomez, 1999), media and journalism training (Ryan, Anastario and DaCunha, 2006), Information and Communication Technology (ICT) systems development (Barakabitze, Fue & Sanga, 2017), nutrition communication (Khadka, 2000), local governance (Msibi & Penzhorn, 2010) and climate forecasts (Patt, Suarez & Gwata, 2005). In majority of the preceding instances, the focus was on assessing the outcomes of participatory communication. In majority of the instances, the outcomes of participatory communication stressed in such studies were message acceptance, understanding and behavioural change.

It is worth acknowledging however that the outcomes of participatory communication are not always positive. Arnstein (1969) for instance suggests a need to ensure real participation if the outcomes of participatory communication are to be positive. She proposes a laddoer of citizenship participation comprising eight rungs. According to her, the first two bottom rungs of the ladder are called the stages of manipulation and therapy. At these levels, people do not participate but powerholders tend to merely educate the powerless on what needs to be done.

The third, fourth and fifth rungs of the ladder are labelled as different levels of tokenism where the less privileged are given the opportunity to voice their concerns but there is no guarantee that their concerns will be addressed by the more powerful. Arnstein (1969) further suggests that the top most rungs of the ladder comprise the stages of partnership, delegated power and citizenship. At these levels, the less privileged are given more decision making power for their own benefit. The contention is that the further up the ladder a group

of people find themselves, the more genuine the level of participation and the better the outcomes of participation are.

Indeed, the suggestion that participatory communication does not always yield desirable results is documented in studies which addressed the factors which affect the implementation or the challenges of participatory communication in various development projects (Nujaya, Sarwoprasodjo, Hubes and Sugihen, 2013). Msibi & Penzhorn (2010) for instance, found that the absence or shortage of skilled development communication practitioners, poor communication and lack of leadership affected the successful execution of participatory communication in projects. Moreover, other scholars have identified poor messages, low morale or motivation for participation among stakeholders (Musakophas & Polnigongit, 2017), quality of information, respect for local culture, group leadership and cohesion (Nurjaya, 2013) as also affecting the successful application of participatory communication in projects. Furthermore, studies (Patt et al., 2005; Kadiyala, Morgan, Cyriac, et al., 2016) have also examined the effectiveness of various channels which enable participatory communication, such as workshops, seminars and participatory radio.

While all these studies call for a continuous application of participatory communication in development projects because of its advantages, scholars like Ramirez et al (1999) and Olorunnisola (2002) call for further study about the application of participatory communication in development issues under different contexts. This call is supported by Kigbu (2019) who suggests that even though the principles governing participatory communication are adequately discussed in literature, there is not enough evidence of its practical implementation. Reiterating this call, Tietaah (2016) suggests a constructivist perspective of development communication which de-emphasises an assessment of the impact of development communication and places more emphasis on examining how interlocutors negotiate meaning and understanding and how that understanding leads to

empowerment. Assuming an inductive epistemological orientation, this study sought to observe the manifestations of participatory communication from the grounds up.

2.7 The constructivist perspective of communication for development

This perspective suggests that communication for development efforts should seek to situate global ideas in local realities. It suggests that communication for development should not be examined from an instrumental perspective but from an existential point of view where the essence of development in communication is examined (Tietaah, 2016). The argument is that meaning and understanding which result in empowerment are essential to the communication process.

However, empowerment within this framework is explained as a situation which allows people to make decisions based on their own social, economic, cultural and political experiences. To this end, this perspective of development communication recognises that the actions people take based on their understanding of messages, may not always be agreeable particularly because such decisions may be subject to many contextual factors. Hence, emphasis should be placed on how communication is taking place and not what the outcome of communication is.

According to Tietaah (2016), within this constructivist perspective, development communication should be based on three tenets: participants' realities, communication ecologies and affirmative action. Specifically, he suggests that development communication should encourage a sense of collective action, be appropriate to the communication needs and capacities of the individuals and groups, utilise the available indigenous media and linguistic modes of local communities, be sensitive to the underlying relationships and networks in specific communities, utilise indigenous knowledge for mutual learning and ensure equity and inclusiveness by directly addressing the differentiated hierarchies of communicative competencies and opportunities for all participants.

2.8 Applying the constructivist perspective to the study of participatory communication

Participatory communication is recognised as essential for connecting farmers, extension agents and researchers to enable them exchange critical agricultural information and knowledge in order to facilitate the successful planning and execution of agricultural development projects (Food and Agricultural Organisation [FAO], 2003). The current literature demonstrates that the application of participatory communication strategies and channels in Farmer Participatory Research (Snapp, DeDecker & Davis, 2019; Hall, Sulaiman, Clark & Yoganand, 2008) and extension programmes (Cahyono, 2018; Azizah, Hidayat, Sukeshi & Utami, 2014) empowers farmers and increases their commitment to implementing agricultural practices. Other studies have examined the usefulness of community radio as a participatory communication tool (Pragya & Kashyap, 2018), levels of farmers involvement in participatory communication activities and the factors affecting the implementation of participatory communication (Nurjaya et al., 2013).

Based on the arguments of the constructivist perspective, this thesis sought to explore specific aspects of participatory communication such as dialogic tactics, context/conditions affecting successful participatory communication, perceptions of scientists and farmers about participatory communication and how participatory communication influenced farmers' adoption of soil fertility management practices. By exploring these elements, the study aimed to provide insights into some of the elements that the constructivist perspective suggest should be of interest to development communication in African contexts.

2.9 Summary of chapter

The purpose of this chapter was not to find a theoretical framework for this thesis but to discuss some paradigms that set the tone for grassroots communication research. This was based on the fact that this study did not set out to either confirm or refute the effectiveness

of participatory communication. Rather, it was to examine the nature and context of participatory communication and provide evidence in relation to the topic of soil fertility management. Within the context of calls for more studies on the implementation of participatory communication, this chapter also discussed the tenets of the constructivist perspective of communication for development. The next chapter reviews pertinent literature related to this study.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

This chapter reviews literature on participatory communication and adoption of sustainable soil fertility management practices. The chapter begins with a discussion of sustainable agriculture and the need to address soil fertility management as part of agricultural sustainability efforts. This is followed by a discussion of sustainable soil fertility management practices especially in SSA and factors impeding their adoption among farmers. The chapter then discusses communication as a factor affecting the adoption of soil fertility management. This is followed by an examination of literature on current soil fertility management communication strategies and channels and the significance of participatory communication to farmers' adoption of soil fertility management. This is followed by a review of how participatory communication enables the merging of scientific and local knowledge about soil fertility management. After an examination of the challenges of implementing participatory communication, the chapter ends by highlighting the gaps in literature which this thesis investigated.

3.1 Sustainable agriculture

In most developing countries, the challenges hampering agricultural development include climate change, high cost of production, pollution, decreasing water supply, over-reliance on outdated farming methods, urbanisation, land degradation and loss of soil fertility (Ayerakwa, 2017; Djurfeldt, 2015). With rising population figures especially in Asia and Africa, there is an increasing pressure for sustainable agricultural practices that can meet the increasing food demands and preserve agricultural resources for future generations (Conceição et al., 2016).

The concept of sustainable agriculture is largely informed by the principles of sustainable development as espoused by the Brundtland Report (1987) and suggests that sustainable development should "meet the needs of the present without compromising the ability of future generations to meet their own needs". Consequently, agricultural sustainability has been defined variously by different scholars (Tait & Morris, 2000). Karami and Mansoorabadi (2008), for instance, describe sustainable agriculture as the successful management of agricultural resources to fulfil changing human needs and preserve the environment. Rao and Rogers (2006) define sustainable agriculture as consisting of practices that ensure that current and long-term needs for food and other related society necessities are met through resource conservation in order to maintain other ecosystem services and functions needed for long-term human development.

The United States Congress, 1990 (as cited in Velten, Leventon, Jager & Newig, 2015, p. 7834) describes sustainable agriculture as an integrated system of plant and animal production practices having a site specific application that will in the long term: (a) satisfy human food and fibre needs (b) enhance environmental quality (c) make efficient use of non-renewable resources and on-farm resources and integrate appropriate natural biological cycles and controls (d) sustain the economic viability of farm operations and (e) enhance the quality of life for farmers and society as a whole. This implies that in order to achieve sustainable agriculture, farming has to be done in a manner that preserves and protects the natural environment. However, the focus of sustainable agriculture goes beyond environmental protection to include an emphasis on implementing farming practices that improve human health, provide producers and consumers with economic and spiritual benefits and produce enough food for an ever increasing world population (Singh, Pandey & Singh, 2011). Such a system, according to Ikerd (1993), should have five main characteristics: the conservation of resources, environmental protection, efficient production, commercial competition and the enhancement of the quality of life of farmers

and society in general. Thus, while sustainable agriculture has to conserve natural resources and protect the environment (Pretty, Toulmin & Williams, 2011), it should also aim at improving human health, increasing people's quality of life, building strong communities and increasing food production to generate enough incomes to improve farmers' livelihoods (Velten et al., 2015).

Two main positions inform debates on how sustainable agriculture can be achieved (Velten et al., 2015). These positions are the techno-economic position and the agroecological-ruralist position. The techno-economic position argues that sustainable agriculture is achievable by working to maximize agricultural production from limited farmlands. The focus of the supporters of the techno-economic position is on agricultural intensification, the use of external inputs in large scale farming, the protection of material capital and the provision of effective market mechanisms to ensure sustainability. The agroecological-ruralist position on the other hand believes that sustainable agriculture is achievable through the use of organic farming methods, biological agriculture, low external input agriculture, biodynamic agriculture, regenerative agriculture and agroecology (Hansen, 1996). The idea is to implement processes that conserve the ecosystem by changing current farming practices and food consumption patterns (Velten et al., 2015).

Thompson (2007) argues that the agroecological-ruralist position and the techno-ecological position need not oppose each other. Rather, both positions have to complement each other in specific contexts to achieve sustainable agriculture. This thesis supports this view and agrees that elements from both positions can be combined to achieve context-specific agricultural production processes that preserve the environment and improve the livelihoods of the average farmer (Rigby & Caceres, 2001; Vos, 2007). Moreover, this thesis supports the argument that two-way communication is central to the sustainable agriculture discourse

because it ensures that farmers, researchers and policy makers have the right information to take informed decisions individually and collectively (Van den Ban, 1994).

3.2 The importance of soil fertility management to sustainable agriculture

Within Sub-Saharan Africa, it has been suggested that one way of achieving sustainable agriculture is by focusing on the improvement of soil management and maintenance (Singh, Singh & Reddy, 2001). This is because even though soils are considered an important farming resource (White et al., 2012), there is a high rate of soil nutrient depletion in the sub region (Montgomery, 2007; Morris, Kelley, Kopicki & Byerlee, 2007) as a result of soil erosion (Veihe, 2000), loss of soil organic matter content (Manlay et al., 2007) and soil fertility decline.

In SSA, there is a need to urgently address soil fertility decline, in particular, because it constitutes an "environmental, social and political time bomb" which threatens "the future viability of African food systems" according to Borlang as cited in Sishekanu et al. (2015, p.6). Similarly, Donovan and Casey (1998, p.3) suggest that "without restoration of soil fertility, the countries of Sub-Saharan Africa cannot solve their problems of serious food imbalances and widespread malnutrition". The implication is that countries in SSA urgently need to address soil fertility depletion as part of efforts towards sustainable agriculture and survival. For instance, in Ghana, although 57.1% of the land size area is good for agricultural purposes, most of the soils, especially those in the savannah zones, are not considered fertile enough for agricultural purposes due to high rates of nutrient depletion (Jayne et al., 2015). Thus, creating a situation where agriculture is persistently fraught with low yields (Tetteh, et al., 2017).

Sishekanu et al. (2015, p.21) define soil fertility as "the ability of the soil to supply all the essential plant nutrients in proper amounts, in available forms and in sustainable balance". Thus, fertile soils are those that contain enough quantities of the nutrients that a plant needs

to grow at every point in the life cycle of that plant. Fertile soils are productive soils since soil productivity has to do with the capacity of the soil to support the growth of plants based on the presence of various soil, plant, climatic and management factors which are conducive enough to improve crop yield (Nandwa, 2003). This study refers to soil fertility as the property of a soil that enables it to support plant growth by possessing and providing plants with the needed nutrients, soil organic matter and soil carbon.

In most of SSA, soil fertility management is considered critical for addressing soil fertility decline (Henao & Baanante, 2006). Soil fertility management is defined as "all the attributes, aspects and activities that maintain, enhance and sustain the ability and capacity of the soil to supply adequate quantities of nutrient elements for optimal plant growth" (Soil-Water Management Group, 2005, p.9). Thus, it refers to all activities aimed at ensuring that soils supply the needed amounts of nutrients for plant growth. In addition, soil fertility management involves putting in measures to improve the overall health of other components of the farming ecosystem such as land and water while addressing the prevailing social, economic and political factors affecting soil fertility (Technical Centre for Agricultural and Rural Cooperation [CTA], 2005).

Even though a number of soil fertility management approaches and practices have been recommended globally, not all of them have been found to be sustainable. According to the Soil-Water Management Group (2005), soil fertility management practices can broadly be categorised into either intensification or extensification approaches. Intensification refers to implementing measures to increase the agricultural yield per unit area through the application of inorganic fertilizers while extensification approaches to soil fertility management involve increasing the acreage of cultivated land by moving from old, nutrient-exhausted farmlands to new, nutrient rich ones. It is noteworthy that extensification is increasingly viewed as unsustainable due to rising population figures and the increasing use

of lands meant for farming for the development of other infrastructure (Reardon, Barret, Kelly & Savadogo, 2001). Thus, globally and in SSA, more attention is being paid to intensification approaches to soil fertility management.

From the 1960s to the present, intensification paradigms developed and promoted in Sub-Saharan Africa range from the use of inorganic fertilizers only to the use of a combination of inorganic and organic fertilizers (Vanlauwe & Giller, 2006). In Ghana, soil fertility management practices of farmers include crop or legume rotation and intercropping (Tetteh et al., 2017; Adjei-Nsiah, 2012), the use of different rates of only inorganic fertilizer (Martey et al., 2014), a combined use of organic and inorganic fertilizer (Adolwa, Schwarze, Bellwood-Howard, Schareika & Buerkert, 2017; Kombiok, Buah & Sogbedji, 2012) and the use of biochar (Yeboah, Asamoah, Boafo & Abunyewa, 2016; Yeboah, Ofori, Quansah, Dugan & Sohi, 2009). Currently, the most cited soil fertility management practice is known as Integrated Soil Fertility Management (ISFM) which is defined as:

> A set of soil fertility management practices that necessarily include the use of fertilizer, organic inputs and improved germplasm combined with knowledge on how to adapt these practices to local conditions, aiming at maximizing agronomic use efficiency of the applied nutrients and improving crop productivity (Vanlauwe et al., 2010, p. 17).

ISMF is also defined as:

> an approach to sustainable and cost effective soil management practices that include the use of fertilizers, organic inputs and improved cash crop varieties, combined with knowledge on how to adapt these practices to local conditions with an aim of optimizing agronomic use efficiency of the applied nutrients in order to improve crop productivity [and]…maintain or enhance a healthy soil (Sishekanu et al., 2015, p.14).

These two definitions, while not exhaustive of ISFM definitions, are exemplary in that they embody key elements of ISFM which are: the combined use of organic resources and inorganic fertilizers and the emphasis on knowledge sharing to create awareness and improve farmers' understanding of pertinent soil fertility management issues. Thus, ISFM ensures sustainability by enhancing farmers' existing soil fertility management knowledge to improve soil health and boost agricultural productivity (Sishekanu et al., 2015). This study conceptualises sustainable soil fertility management practices as the combined use of locally available organic and inorganic fertilizers together with farming practices which build up soil nutrients in order to preserve the environment, boost productivity, increase crop yields and household incomes in the long term.

3.3 Farmers' adoption of soil fertility management practices

Even though every soil fertility management practice has its individual strengths depending on the agro-ecological zones of implementation, the rate of adoption among farmers is often low (Ajayi, Akinnifesi, Sileshi & Chakeredza, 2007). The reasons cited for the low adoption include the characteristics of the soil fertility management practice (Tadesse & Belay, 2004), policy and institutional barriers such as land tenure, access to credit and markets and the agro-ecological context where the soil fertility practice is expected to be implemented (Ajayi et al., 2007). Moreover, Nyathi et al. (2003) opine that low adoption of soil fertility management practices can partly be attributed to the fact that such practices are often developed by scientists without considering and incorporating the contextual realities of small-holder farmers. Kombiok, Buah & Sogbedji (2012) also cite low and/or poor communication as one of the factors for the low adoption of soil fertility management practices.

3.4 Communication of soil fertility management

Sanginga and Woomer (2009) suggest that communication is one of the biggest challenges confronting the ability of national planners and development specialists to ensure widespread adoption of soil fertility management practices among farmers. Given the knowledge intensive nature of soil fertility management, there is always the challenge of finding the most effective means of ensuring that farmers access the information required to understand the soil fertility problem (Spurk et al., 2020) and implement context appropriate soil fertility management practices. Undoubtedly, this is dependent on the communication strategy and channels used for such purposes.

3.4.1 Strategies for communicating about soil fertility management

Strategies for communicating about soil fertility management are largely informed by existing development communication perspectives (Baah-Ofori & Amoakohene, 2021). These perspectives have distinct ways of conceptualising communication. For instance, the instrumental development communication paradigm views communication as uni-directional and top-down (Muchai et al., 2014). Communicating with this perspective in mind creates a gap between actors such as researchers and extension agents and farmers with the former assuming the expert role and transferring knowledge to the latter whose knowledge is often discounted (Abukari, Bawa & Awuni, 2021, Adero, 2015). Gwandu et al., (2014) suggest that diffusion approaches are effective to the extent that they persuade farmers to utilize the specific soil fertility management knowledge which they are provided with.

When communication is conceptualised from a participatory development communication perspective, it is understood as a transactional, two-way exchange that prioritizes farmers' feedback and respects the cultural context within which communication occurs (Adolwa et

al., 2018). This perspective is thought to guarantee farmers' understanding and increase their likelihood of adopting the discussed soil fertility management practices.

3.4.2 Channels for communicating about soil fertility management

Evidence suggests that the channel of communication is a major determinant of how well farmers, accept, understand and act on soil fertility management messages (Munthali, 2017). From the literature, multiple channels are currently being used to share information about soil fertility management and have been broadly categorized as either interpersonal, mass media, community based, print or ICT based audio-visual channels (Adolwa et al., 2012). Interpersonal channels include neighbours, relatives or friends, songs and poems (Sanginga & Woomer, 2009), farmer field schools, farmer to farmer training sessions and demonstration workshops organised by extension officers (Mubiru et al., 2004; Kimaru, 2011; Adolwa et al., 2012).

Mass media channels for soil fertility management communication include radio and television (Muchai et al., 2014). Radio, in particular, is considered a popular means of spreading information about soil fertility management because of its availability especially to farmers in rural areas (Adolwa et al., 2012; Munthali, 2017). Community radio has been found to be an extremely relevant means by which farmers access soil fertility management related information especially when messages are broadcast in farmers' local language (Adolwa et al., 2018). In addition, community radio has been found to enhance farmers understanding of soil fertility management especially with the establishment of community listening clubs or forums and the involvement of farmers in radio discussions through phone-in segments (Goswamy & Kashyapo, 2018). Print based channels for communicating about soil fertility management communication include extension brochures and booklets while videos, documentaries, mobile phones and CDs constitute some of the ICT based

audio-visual systems utilised for soil fertility management communication in the sub-region (Adolwa et al., 2012).

Despite the plethora of channels available for soil fertility management communication efforts, the literature suggests that farmers have various perceptions about their levels of effectiveness. That is, farmers do not perceive all channels as capable of ensuring their understanding of soil fertility management messages (Munthali, 2017). For instance, farmers perceive channels like extension agents, colleague farmers and mass media as useful for accessing information and knowledge about soil fertility management. However, more interactive channels such as learning centres, farmer field days, community demonstration and agricultural exhibitions are perceived by farmers as more accessible, credible, demonstrable and engaging (Sanginga & Woomer 2009; Agyekum 2016; Adolwa et al., 2018; Gwandu et al., 2014).

The discussion so far suggests a preference for participatory strategies and channels for soil fertility management communication as they provide farmers with context-based evidence of what works where and why based on joint farmer-scientist research (Bationo, Ulek, Koala & Shapiro, 2003). In addition, such strategies will ensure that communication is done using farmers' local language (CTA, 2005) to ensure greater interaction and heightened awareness about soil fertility decline and the need for collective action to address it (Farrell & Hart, 1998; Lee, 2005).

3.4.3 Participatory communication about soil fertility management

The use of participatory communication for soil fertility management exchanges ensures greater interaction between farmers and other stakeholders through dialogue, observation, diagnosis, experimentation and exposure to different types of knowledge (De Jager et al., 2004). In addition, participatory communication allows various stakeholders in the agriculture value chain to learn from each other in a non-manipulative and unimposing

manner (Huesca, 2002; Barrios & Trejo, 2003; Romanow & Bruce, 2006). Its purpose, according to Lee (2005, p. 1332) should be to make farmers develop an "orientation for learning style which facilitates exploration, evaluation and adaptation of technical alternatives in the broader concept of managing resources and earning a livelihood". In effect, participatory communication should enable farmers to appreciate all the dangers associated with soil fertility depletion and adopt their make informed soil fertility management choices. Currently, literature on the application of participatory communication to soil fertility communication efforts is only reflected in studies of Farmer Participatory Research (FPR) activities (Sanginga & Woomer, 2009).

3.4.3.1 Farmer Participatory Research and participatory communication

According to Freeman (2001, p. 1), farmer participatory research is a process for "developing and testing agricultural technologies" together with farmers, extension agents and other development institutions. In relation to soil fertility management, FPR brings together farmers and scientists to merge local and scientific soil fertility management knowledge and find context-friendly solutions to soil fertility problems through joint experimentation (Ramisch, Misiko, Ekise & Mukalama, 2006; Kolawole 2013).

For instance, FPR has led to various soil fertility management practices in SSA countries such as Zambia (Mapfumo, Mtambanengwe, Giller & Mpepereki, 2005), Malawi (Kerr, Snapp, Chirwa, Shumba & Msachi, 2007; Kamanga, Kanyama-Phiri & Snapp, 2001), Kenya (Msiko, Tittonell, Ramisch, Richards & Giller, 2008). Even though some studies report the challenging aspects of FPR as time and resource intensive (Snapp, Kanyama-Phiri, Kamanga, Gilbert & Wellard, 2002; Rusike et al., 2011), FPR which responds to the needs of local farmers (Kamanga, Kanyama-Phiri & Snapp, 2001; Nederlof & Dangbénon, 2007) is considered as effective for developing new technology and building farmers' capacity for experimentation and collective learning (Rusike et al., 2011).

Participatory communication is recognised as essential for FPR (Hall, Sulaiman, Clark & Yoganand, 2008) because of its inclusiveness and ability to foster greater interaction between farmers and other stakeholder groups through dialogue, observation, diagnosis, experimentation and exposure to different types of knowledge (Huesca, 2002; Barrios & Trejo 2003; Romanow & Bruce, 2006; Ballantyne, 2009; Odendo, Obare & Salasya, 2010). However, the discussion of participatory communication in FPR tends to focus on the channels or media for joint learning between researchers and farmers and the inclusion of local knowledge in FPR activities.

Concerning channels, the evidence, so far, points to the use of field-based learning centres located within farming communities for joint research purposes (Giller et al., 2011). Such centres have also been found to stimulate interactive learning and enhance farmers' access to and use of soil fertility management information (Kanyama-Phiri, Snapp, Kamanga & Wellard, 2000; De Jager, Onduru & Walaga, 2004; Gwandu et al., 2014).

Local knowledge, also referred to as indigenous or traditional knowledge, refers to the long standing traditions and practices of certain regional, indigenous or local communities. It is knowledge developed by local people and handed down from generation to generation (Mundy, 1993; Melchias, 2001). Lwoga, Ngulube and Stilwell (2010, p. 176) also define local knowledge as "the cumulative body of knowledge created over decades, representing generations of creative thoughts and actions within individual communities in an ecosystem of continuous residence in an effort to cope with an ever changing agro-ecological and socioeconomic environment".

The aforementioned definitions suggest that local or indigenous knowledge is place-bound and consists of activities practised by a well-defined group of people which have been handed down from generation to generation. However, Rhodes and Bebbington (1998) suggest that not all indigenous knowledge are of ancient origin. Instead, some are generated

everyday through trial and error and adaptations. This suggests that indigenous knowledge is that which is essentially informed by local expertise and experiences concerning specific practices or traditions.

Sen (2005) suggests that indigenous knowledge has the following characteristics: first of all, it is local or grounded in a particular community and situated in broader cultural traditions. Secondly, indigenous knowledge is tacit knowledge which is not always codifiable. Thirdly, indigenous knowledge is transmitted orally or through imitation or demonstration. Chikinzo (2006) suggests that in most rural contexts, indigenous knowledge forms the basis for local-level decision-making for a lot of social development issues such as agriculture, healthcare and food security. While such local knowledge may appear inconsistent, superstitious or wrong from an outsider's perspective, users of local knowledge see it as logical, useful and consistent with their beliefs (Mundy, 1993).

The importance of local knowledge in agriculture is informed by the argument that farmers have in-depth local knowledge about their local environments, farming conditions and problems and therefore tend to apply such local knowledge to their farming practices (Sumberg, Okali & Reece, 2003).

In relation to soil fertility management, evidence from researchers like Rushemuka, Bizoza, Mowo and Bock (2014), Dawoe, Quarshie-Sam, Isaac and Oppong (2012) and Fairhead and Scoones (2005) demonstrates farmers' indigenous knowledge is consistent with scientific ones in assessing the fertility levels of soils. In instances where local knowledge is found to be inconsistent with scientific ones, it has been suggested that local knowledge should continue to be the foundation for further exchanges between scientists and famers in order to find lasting, bottom-up solutions to soil fertility management problems (Barrios & Trejo, 2003; Romanow & Bruce, 2006; Ballantyne, 2009; Odendo, Obare & Salasya, 2010).

The interaction which occurs during farmer participatory research leads to knowledge co-production (Armitage, Berkes, Dale, Kocho-Schellenberg, & Patton, 2011) which is defined as the "collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems oriented understanding of that problem" (Armitage et al., 2011, p. 996). Knowledge co-production involves constant interaction, exploration, discussion and negotiation until all experts and stakeholders reach a common understanding (Edelenbos, Van Buuren & Van Schie, 2011). The implication is that participatory communication is a pre-requisite for co-production. This is because it enables dialogue that allows scientists to merge their scientific or expert knowledge with local knowledge.

However, Fisher (1995) points out that the extent to which farmers perceive the legitimacy of expert advice from scientists is dependent on how successfully experts are able to communicate knowledge in a way that is consistent with farmers' local values and addresses all the factors farmers perceive as relevant to solving specific problems. This means that communicating agricultural science requires more than just a transportation or translation of scientific message(s) or more than simply attempting to market a research product (Foster, 2009). Instead, it requires the presentation of messages in a way that makes it possible for farmers to relate the topic to their personal experiences and circumstances. To this end, Gawali and Rawat (2018) call for a need to utilise an assortment of techniques that can appeal to all interested parties during an interaction on specific scientific topics.

So far, the literature review has demonstrated that though soil fertility management is critical to sustainable agriculture especially in SSA, the rate at which farmers adopt various soil fertility management practices is still low. Of the many SFM adoption challenges identified in the literature, the one of interest to this thesis is communication. The evidence so far suggests that while the instrumentalist and participatory development communication

perspectives have informed soil fertility management communication strategies and channels, there's greater farmer preference and scholarly recommendation of participatory communication because it enhances message acceptance, understanding and farmers' willingness to implement specific soil fertility management practices. Furthermore, the available evidence shows that the use of participatory communication in FPR allows experts and farmers to interact and merge scientific and local soil fertility knowledge.

However, even though dialogue is a major aspect of participatory communication, the literature is silent on the exact dialogue techniques or tactics used by farmers during interaction about soil fertility management to ensure mutual understanding. This study therefore explored the dialogue tactics used by farmers and scientists to communicate about soil fertility management.

3.5 Challenges of participatory communication

In general, there are a number of challenges associated with the implementation of participatory projects. These include the fact that participatory projects are resource intensive (Bessette, 2006) and time consuming (Van de Fliert et al., 2010). Mubiru et al. (2004) also suggest that the difficulty associated with first, changing some stakeholders' attitude and understanding of their roles in a participatory communication affects the successful implementation of participatory communication. By implication, participatory communication is ineffective especially when some stakeholders consider themselves as better than others involved in the interaction. According to Gawali and Rawat (2018, p. 190), the assumption of such an "egoist" stance hinders effective participatory communication especially of scientific subjects such as soil fertility management.

Another challenge of participatory communication is that its implementation is often limited to the problem identification and prioritisation stages of projects and not to other crucial project stages like decision making, monitoring and evaluation (Msibi & Penzhorn, 2010).

Furthermore, Leeuwis (2000) argues that participatory communication efforts are sometimes characterised by conflict mainly because participants do not take each other's views seriously. Lastly, Ramisch (2014) suggests that participatory communication is unproductive when it does not address farmers' socio-cultural and economic conditions during the communication effort. The implication of the foregone is that while dialogue is critical to meaning exchange in participatory communication, the presence or absence of certain factors can either impair or enable effective dialogue (Gawali & Rawat, 2018).

For instance, the conditions for successful participatory communication have been identified generally as transparency and trust (Poulsen, Spiker & Winch, 2014), communication skill, facilitation capacity and leadership (Van de Fliert, 2010). Among farmers, Jaya et al. (2017) suggest that the factors that enable the successful implementation of participatory communication include the quality of information, respect for local culture, courtesy, cooperation, group cohesion and good leadership. Consequently, the suggestion is that the absence of the aforementioned factors could potentially hamper effective participatory communication. In addition, Ali and Sonderling (2017) propose that the application of participatory communication is shaped by how the concept is interpreted or perceived. To this end, scholars like Kigbu (2019) have called for further investigation into how various actors interpret participatory communication as part of efforts to understand any differences between how it is theorized and how it is applied.

On the issue of addressing soil fertility management using participatory communication, it is unclear from the literature which exact conditions ensure effective participatory communication. While, the literature provides some discussion about channels which are useful for participation and the outcome of their use (Sanginga & Womer, 2009; Agyekum, 2016; Adolwa et al., 2018), it is silent on the perceptions of scientists and farmers about participatory communication and its practical implementation. Thus, this thesis sought to

investigate these gaps by investigating scientists' and farmers' perceptions of participatory communication as applied in the ORM4Soil project and the conditions they deemed necessary for effective participatory communication especially on the issue of soil fertility management. Lastly, given the call by Spurk et al. (2020) for more research into the role of communication in the uptake of agriculture innovations, this study also examined the extent to which participatory communication informed farmers' adoption of soil fertility management.

3.6 Summary of gaps in literature which were addressed in this study

The literature review has shown that communication plays an important role in ensuring farmers' adoption of soil fertility management. Yet, it remains one of the most under-explored factors in the literature. While available evidence suggest that the instrumentalist and participatory development communication perspectives have informed soil fertility management communication strategies and channels, there's greater farmer preference and scholarly recommendation of participatory communication because its use of dialogue and interactive channels enhance message acceptance, understanding and farmers' willingness to implement specific soil fertility management practices. Furthermore, the available evidence shows that even though participatory communication is recognised as the bedrock of FPR, most studies focus on the outcome of the interaction. That is, it centres on how experts and farmers interaction and merge scientific and local knowledge to create new, context friendly soil fertility management practices.

One of the argument of this thesis is that even though dialogue is a major aspect of participatory communication, the literature is silent on the exact dialogue techniques or tactics used by farmers during interaction about soil fertility management to ensure mutual understanding. In other words, the dearth of knowledge regarding how farmers and scientists interact or dialogue to arrive at a mutual understanding of soil fertility management practices

was explored in this study. Secondly, the literature reveals a gap in literature concerning scientists and farmers' perceptions of participatory communication when applied to discussions about soil fertility management. Thirdly, the review also highlights the paucity of literature regarding the conditions for the effective execution of participatory communication particularly when addressing issues of soil fertility management. Lastly, though participatory communication of soil fertility management is highly recommended in theory, it remained to be examined the extent to which the implementation of participatory communication facilitated the adoption of soil fertility management practices. This thesis therefore examined this gap in the literature.

3.7 Chapter summary

The first part of this chapter reviewed literature on sustainable agriculture, the importance of soil fertility management to sustainable agriculture and factors impeding the adoption of soil fertility management practices among farmers. This was followed by a review of communication as a factor affecting the adoption of soil fertility management. Following this was an examination of literature on current soil fertility management communication strategies, channels and the significance of participatory communication to farmers' adoption of soil fertility management. The chapter then focused on reviewing evidence of participatory communication efforts about soil fertility management and the challenges of implementing participatory communication. The chapter ended by highlighting the gaps in literature which this thesis investigated. The next chapter discusses the philosophical orientation and research methodology for this study.

CHAPTER FOUR

PHILOSOPHICAL WORLDVIEW AND METHODOLOGY

4.1 Introduction

Communication research methodology is often informed by certain philosophical viewpoints such as ontology and epistemology. In that regard, in describing the methods and techniques adopted in collecting and analysing data for this research, this chapter first makes references to such philosophical background issues and follows with a discussion of the research methodology. Specifically, the chapter highlights the research approach, research design, study sites, sampling procedures, data collection methods and instruments. The chapter also discusses the role of a researcher in qualitative studies. This is followed by a section that describes the data analysis procedures. A discussion about the measures taken to ensure trustworthiness is also included in this chapter. The chapter concludes with a summary of the main points which have been addressed.

4.2 Research ontology, epistemology and methodology

Every research has certain underlying philosophical assumptions which inform the researcher's epistemology, ontology and methodology. Epistemology refers to the assumptions we make about the kind or nature of knowledge (Richards, 2003). Bryman (2004), suggests that epistemology is concerned with interrogating what counts as acceptable knowledge in a discipline. In addition, Cohen, Manion and Morrison (2007, p. 7) define epistemology as the way assumptions are made about "the very bases of knowledge-its nature and form, how it can be acquired and communicated to other human beings". In effect, epistemology deals with the way we study the world and make sense out of it (Crotty, 1998).

Ontology refers to the assumptions we make about the kind and nature of reality and what exists (Richards, 2003). Creswell (2013) suggests that qualitative research embraces multiple realities; therefore, researchers implement measures to collect data from multiple sources in order to present different perspectives on a particular issue. Research methodology refers to the entire processes of doing research. It has been suggested that the key to conducting responsible research is for a researcher to have an in-depth understanding and awareness of the predominant philosophical paradigms which guide research (Mertens, 2005). Key philosophical positions that guide research are positivism/post-positivism and interpretivism/constructionism (Al-Saadi, 2014).

4.2.1 The positivism/post-positivism position

Positivism suggests that meaning and meaningful realities already reside in objects awaiting discovery and exist independent of any kind of people's consciousness. It is based on an assumption that truth is static and always objective. Hence, the objective truth can be discovered if it is investigated the right way (Al-Saadi, 2014). The implication is that positivist knowledge is based on observation, is value-free, generalizable and replicable using rigorous scientific methods (Robson, 2011). Critics of positivism argue that its claim of deriving rules and laws only from observation is debatable due to the possibility of having future observations whose results are contrary to current rules and laws (Ormston, Spencer, Barnard & Snape, 2014). This led to the post-positivist position which suggests that knowledge is produced by testing propositions rather than on careful observation. Thus post-positivists believe that hypotheses have to be derived first from theories and then tested empirically against observations (deductive reasoning) (Al-Saadi, 2014). Researchers using the positivist/post-positivist position tend to use methodology that is closely associated with the natural sciences which is mostly quantitative in nature.

4.2.2 Intepretivism/constructionism

The epistemology of the interpretivist position is that knowledge is socially constructed. Thus, research should produce knowledge which is based on people's perceptions and interpretations of their realities and lived experiences (Ormston et al., 2014). Ontologically, this means that reality is based on the meanings socially constructed by the social actors in a particular context. As such, researchers subscribing to this philosophical position are expected to acknowledge their role in the research process and attempt to explore and understand participants' meanings and interpretations of specific phenomena by research participants (Cohen, Manion & Morrison, 2011). To this end, research is inductive and aims at generating theory from data instead of using the data to test an already existing theory.

4.2.3 The present study

The purpose of the present study was to explore and explain participatory communication and adoption of soil fertility management practices by examining the experiences of scientists and farmers involved in the ORM4Soil project. Therefore, this informed the study's interpretivist epistemology and constructivist ontology.

Interpretivism is based on the belief that social researchers find answers to their research questions by studying people's interpretations of phenomena that affect them. Therefore, subjective evidence is collected based on the experiences of the research participants. Interpretivism suggests that acceptable knowledge is gained by exploring the subjective experiences of people due to the assumption that those people have first-hand knowledge or information about what is being explored by a researcher.

A constructivist ontology assumes that reality is constructed by people in the social world. As people interact, they constantly make meaning of their experiences of the world around them (Creswell, 2013). Constructivism acknowledges that each individual has a unique way of interpreting or making sense of the world and seeks to explore and make sense of the

unique experiences of individuals in the research process (Crotty, 2004). In this thesis, within the context of constructivism, each participant was able to share their personal opinions or views about participatory communication as it unfolded in the ORM4Soil project.

4.3 Research approach

According to Creswell and Creswell (2018, p. 4), research approach is "the plan or proposal to conduct research which involves the intersection of philosophy, research designs and specific research methods". Three research approaches are often discussed in the literature. These are the qualitative, quantitative and mixed methods approaches. In line with the philosophical epistemology and ontology previously described, this study used the qualitative research approach. Qualitative research is defined by Denzin & Lincoln (2011) as:

> A situated activity that locates the observer in the world. Qualitative research consists of a set of interpretive, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings and memos to the self... qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, [and] attempt to make sense or interpret phenomena in terms of the meanings people bring to them. (p. 3)

Qualitative research is also defined by Creswell (2013) as that which:

> Begins with assumptions and the use of interpretive/theoretical frameworks that inform the study of research problems, addressing the meaning individuals or groups ascribe to a social or human problem. To study [the identified research] problem, qualitative researchers use an emerging approach to inquiry, [collect] data in a

> natural setting sensitive to the people and the places under study and [analyse the data in a manner] that is both inductive and deductive [in order to establish] patterns or themes. The final written report or presentation includes the voices of participants, the reflexivity of the researcher, a complex description and interpretation of the problem and its contribution to literature or a call for change (p. 44).

The two definitions quoted above highlight the main tenets of qualitative research. These are the fact that first, qualitative research unfolds in the natural context of participants with the aim of using a variety of methods to investigate and interpret the subjective meanings that people assign to their experiences of particular phenomena under study. This suggests that qualitative approaches focus on unearthing or revealing participants' perspectives, their meanings and multiple subjective views on specific topics of concern. Secondly, qualitative research focuses on collecting data from specific participants. The exactness with which participants are selected in qualitative research means that the study results are not generalizable to a large population (Creswell, 2013). The qualitative approach was used in this thesis because the objective was to gain an understanding of participatory communication as it unfolded between scientists and farmers involved in a project on soil fertility management.

Moreover, qualitative research is based on the assumption that reality is socially constructed and emerges from research participants' ability to describe their subjective experiences of phenomena of interest (Feeler, 2012). In other words, qualitative research enables researchers to investigate research participants' interpretations of their lived realities. This study used the qualitative approach to unearth and understand how stakeholders in the ORM4Soil project experienced and perceived participatory communication of soil fertility management. The study was also interested in understanding how project scientists and farmers dialogued to reach a mutual understanding of soil fertility management practices

and the extent to which the dialogue informed farmers' adoption or non-adoption of the soil fertility management practices.

Furthermore, qualitative research identifies researchers as critical to the data collection process. Their involvement in the data collection requires that researchers are reflexive (Creswell, 2013). Reflexivity allows researchers to be mindful of and acknowledge how their personal biases and values may potentially influence their research. To this end, I acknowledge my involvement as a student and research assistant on the communication component of the ORM4Soil project. My participation in meetings between farmers and scientists provided the opportunity to keenly observe various project events as they unfolded. To ensure that the research collection and data analysis phases were not influenced by my experiences on the project, I stayed close to the data by engaging in a line-by-line coding as a way of ensuring that the findings emerged from the data and not from me.

An additional feature of qualitative research is that it allows for multiple data collection methods to be used as a way of authenticating the findings of the study (Creswell, 2013). This study used multiple data collection methods to get a broad and in-depth appreciation of participatory communication of soil fertility management. Specifically, the study collected data using in-depth interviews, focus group discussions and observations. In addition, transcripts of a participatory radio programme on soil fertility management organised by the project were reviewed to analyse the interaction between scientists and farmers and examine the dialogue tactics they used to ensure mutual understanding of soil fertility management. The multiple sources of data collection helped to triangulate the data as part of efforts to strengthen the findings of the study.

The last feature of qualitative research is that it enables "complex reasoning through inductive and deductive logic" (Creswell, 2013, p. 45). This feature allows researchers to peruse their data several times to identify patterns, develop categories and themes

inductively from the data. Doing this allows researchers the flexibility to change or adapt aspects of their studies where necessary. Creswell (2013) suggests that qualitative research allows for deductive thinking when the emergent themes are constantly checked against the data. For this thesis, this feature of qualitative research gave the flexibility to adjust the number of interviews conducted as part of confirming the initial patterns or themes which emerged from the data analysis. Again, during data collection, the questions on the interview and focus group discussion guides were revised, where necessary, to ensure that the data being collected was useful enough to address the research questions.

4.4 Research Design

Research designs refer to the specific types of activities and actions within specific research approaches which provide direction for how a research should be conducted. In other words, the quantitative, qualitative and mixed method approaches each has specific research designs associated with them. Creswell (2013) names five main qualitative research designs or approaches as narrative research, phenomenological research, grounded theory, ethnography and case studies. This study used the grounded theory research design which is distinguished from other qualitative methods because of its potential to go beyond exploring and describing to explain complex phenomena in contexts which have not yet been fully captured by theory (Birk & Mills, 2011). Grounded theory provides researchers with the freedom to explore a given research topic and allow issues to emerge without requiring the formulation of a research hypothesis. The use of a grounded theory design also helps to generate rich insights into a topic which researchers are unfamiliar with (Jones & Alony, 2011). In addition, grounded theory allows the researcher to find information by exploring the data and allowing it to reveal insights instead of forcing preconceptions or assumptions on the data.

Based on the objectives of this study, the grounded theory design was selected in order to obtain in-depth information on the subject under investigation (Creswell & Creswell, 2018) and develop a substantive theory explaining participatory communication and how it influences farmers' adoption or otherwise of soil fertility management practices.

4.4.1 Grounded Theory

Grounded theory is a general methodology for developing theory that is grounded in data which is systematically gathered and analysed (Glaser & Strauss, 1967). It is a highly interpretive qualitative research approach which seeks to explain, describe and understand the lived experiences of the individuals being studied. Ruppel and Mey (2017) describe grounded theory as a framework for designing a study, collecting and analysing data with the aim of developing middle-range theories. Creswell (2013, p. 83) also defines grounded theory as "a qualitative research design in which the inquirer generates a general explanation (a theory) of a process, an action or an interaction shaped by the views of a large number of participants".

Thus, for studies using this design, the information obtained from study participants is expected to help develop a theoretical explanation of the issue under investigation. According to Glaser and Strauss (1967), two types of theories can possibly emerge from grounded theory studies: substantive theory and formal theory. A substantive theory is one which explains a specific area of study such as farmer-scientist participatory communication while a formal theory on the other hand explains a large area of study such as power roles, gender issues or deviant behaviour (Feeler, 2012).

The main difference between grounded theory and other forms of qualitative research is that while other qualitative methods merely describe individual and group experiences, grounded theory focuses on the generation or discovery of a theory to explain a process or action (Lawrence & Tar, 2013). The suggestion is that the ideas shared by study participants,

who have experienced the process or action under investigation, will lead to the development of a theory to explain current practices and provide a framework for further study of the process or action (Strauss & Corbin, 1998).

Two sociologist, Barney Glaser and Anselm Strauss, are identified as the originators of grounded theory in 1967 based on their belief that existing theories used for research were often inadequate in terms of their ability to offer a complete explanation for various phenomena. Thus, they advocated the development of theory from data to explain the actions, interactions and social processes of people. Since its emergence in 1967, grounded theory has had three main interpretations or variants (Jinghong, Xinyang, Shiming, & Wenbing, 2018) namely the original traditional interpretation by Glaser and Strauss (1967), the evolved interpretation by Strauss and Corbin (1990) and the constructivist interpretation by Charmaz (2006). Sebastian (2019) labels the three interpretations as classical, interpretive and constructivist grounded theory. According to Sebastian (2019), the three strands or interpretations differ in terms of their philosophical influence, their treatment of a researcher's prior knowledge and experience and the method of data coding and analysis.

4.4.1.1 Classical grounded theory

Glaser and Strauss (1967) in their book titled *The Discovery of Grounded Theory*, describe grounded theory as a method of generating theory from data without the use of any restrictive formula. Biaggi and Wa-Mbaleka (2018) suggest that Glaser and Strauss' definition of grounded theory require three things: first, that theory is built from qualitative data, second, that research is done without any preconceived ideas about the area or topic being studied and third, that researchers use the constant comparison method in data analysis. The suggestion is that qualitative research should not only lead to the reporting of the lived experiences of people but should go a step further to create abstractions from those experiences and conceptualize theory from the data. Secondly, Glaser and Strauss (1967)

suggested that researchers avoid reviewing literature prior to their studies. According to them, the literature review should be deferred till a theory has been developed from the data. Thirdly, Glaser and Strauss (1967) advanced constant comparison as the process of data analysis in grounded theory. This required researchers to compare every new data to existing concepts as part of the theory building process.[4]

In terms of philosophical influence, while scholars like Charmaz (2014) argue that classical grounded theory follows a positivist ontological approach, others are of the opinion that it does not subscribe to any philosophical or ontological perspectives. For instance, Berthelsen, Lindhardt and Frederiksen (2017, p. 414) suggest that Glaser's grounded theory is not associated with "any theory of science [or] philosophical conceptions of what is truth". Based on this, they argue that Glaser's grounded theory should be a purely inductive and flexible methodology.

In Addition, classical grounded theory suggests that researchers' exclude their prior knowledge and experiences (from literature review) from the research process. This is based on the argument that prior knowledge adds a significant bias to the data and negatively impacts the overall quality of the study. By doing away with prior knowledge and experiences, it is assumed that all the findings and the theory which is eventually generated will emerge from the data rather than from the existing ideas of the researcher (Glaser & Strauss, 1967).

Data coding and analysis according, to classical grounded theory, involves two main steps. The first step is substantive coding which involves coding all data till saturation occurs through the constant comparison method. Here, data is compared until certain themes begin to repeat themselves. The initial core themes lead to the discovery of a core category which

[4] See Glaser and Strauss (1967). *The Discovery of Grounded Theory* for a more detailed discussion of their version of Grounded Theory.

is the main phenomenon which connects all other categories together. The second step after the substantive coding is theoretical coding which involves making additional theoretical hypothesis to establish relationships between the remaining categories. Theoretical coding helps identify theory codes which are then merged to develop a substantive theory (Glaser, 2013).

4.4.1.2 Interpretive grounded theory

Interpretive grounded theory is also known as the systematic approach to grounded theory (Creswell, 2013). This type of grounded theory is attributed to Strauss and Corbin (1998) who in their book, *Basics of qualitative research techniques*, define grounded theory as a set of strategies, procedures and techniques for theory building. Strauss and Corbin (1998), offer a blueprint which explains the process of conceptualising and building grounded theory to explain a process, action or interaction on a topic. The philosophical orientation of interpretive grounded theory is interpretivist; therefore, placing emphasis on individuals' perspectives as important elements of theoretical understanding (Strauss & Corbin, 1994). Interpretive grounded theory also argues that theories can be subject to various interpretations and therefore its proponents encourage and applaud efforts by researchers to adapt the application of this version of grounded theory to suit their purposes.

One factor which distinguishes the Glaserian (classical) and the Straussian (interpretive) schools of grounded theory is the treatment of prior knowledge and experience(s) of the researcher. Proponents of the interpretive grounded theory suggest that researchers cannot delve into a study without prior knowledge or literature on the study area. Hence, Strauss and Corbin (1990) recommend that researchers begin with an examination of the literature in the area of study to ascertain the existing gaps. When this is done, researchers have to acknowledge the possible influence of the literature on their studies in order not to negatively influence the research focus and the data collection or categorisation processes.

In terms of coding and data analysis in interpretive grounded theory, Strauss and Corbin (1990) suggest an adherence to a highly structured method involving three main steps: open coding, axial coding and selective coding (Thai, Chong & Agrawal, 2012). Open coding involves the breaking down of data to create many concepts. Similar concepts are then grouped to develop sub categories. Axial coding involves connecting or building relationships among sub categories to create larger or more focused categories. Both open and axial coding stages involve the use of constant comparison of the data and emerging categories to identify similarities between themes and concepts prior to selective coding. Selective coding involves selecting a core category as your primary focus. Afterwards, the researcher engages in theoretical conceptualisation to enable the researcher verify any assumptions they may have.

4.4.1.3 Constructivist grounded theory

Charmaz (2006) is credited with the third school of grounded theory which prioritizes the phenomenon of research interest and shares the view that the data and how it is analysed should emanate from the shared experiences and relationships with participants and other sources of data. In other words, Charmaz (2006) believes that grounded theory does not emerge from raw data alone as suggested by Glaser but by researcher interpretations of the data. This school of grounded theory suggests that reality is constructed in the context within which a study is carried out. As such, context is critical for theory generation. Constructivist grounded theory calls for researchers to explore the meaning that their research participants attach to their experiences and examine how these meanings may contribute to theory generation (Farragher & Coogan, 2018).

Furthermore, constructivist grounded theory argues that the prior knowledge and experience of researchers is essential and useful for strengthening research projects provided that they do not interfere or define the research project (Charmaz, 2014). Thus, researchers are

expected to be conscious of and manage their previous experiences and perspectives in order to prevent them from influencing their current research instead of totally ignoring the potential impact their previous knowledge can have on their research. With constructivist grounded theory, coding and analysis includes first of all, naming all pieces of data and secondly, taking the most used data codes and organising the remaining data around them. In other words while the classical and interpretive grounded theory involve coding and analysis to create a core category for theory generation, constructivist grounded theory allows for the use of more than one category or theme in the coding process. Constructivist grounded theory uses coding styles such as word-by-word, line-by-line and incident-by-incident. In addition, data analysis involves constant comparison, note taking and memoing (Sebastian, 2019).

4.4.2 Rationale for the type of grounded theory used in this study

According to Goulding (2002, p. 55), grounded theory is suitable when the topic under investigation "has been relatively ignored in the literature or has only been given superficial attention". Thus, grounded theory is useful for exploring topics or issues which have previously been scarcely examined in literature and for which there is little understanding. During the literature search, none of the studies on communication and soil fertility management used a grounded study approach. Considering the paucity of information about the gaps identified from the literature review about participatory communication as applied in soil fertility management communication, this thesis sought answers using the grounded theory research design in order to unearth in-depth information about stakeholders' perceptions and experiences.

Specifically, the thesis used the interpretive grounded theory of Strauss and Corbin (1994) because it allowed for the literature to be examined first, to identify the gaps which need to be studied further. Moreover, this strand of grounded theory was also deemed appropriate

for this thesis because as a general rule of thumb, graduate students are required to consult existing literature to serve as a guide in defining a research topic. To this end, this strand was selected to meet the requirements of including a literature review in the thesis. In addition, this strand of grounded theory was chosen because it provided a systematic guide for data analysis and theory building (Feeler, 2012). Lastly, since the interpretive grounded theory places emphasis on individuals' perspectives as important elements of theory building and understanding (Strauss & Corbin, 1994), it was used in line with the philosophical assumptions of this thesis.

4.5 The ORM4Soil Project

The Farmer-driven Organic Resource Management to build Soil Fertility (ORM4Soil) Project was implemented in four countries in Sub Saharan Africa: Kenya, Ghana, Mali and Zambia from 2015-2020. The aim of the project was to find practical solutions to help farmers increase their soil fertility levels by jointly working with farmers to identify and test locally available organic soil fertility inputs. It was hoped that the joint experimentation and participatory communication would make farmers more likely to adopt the identified inputs and treatments which showed the most potential. Another focus of the ORM4Soil project was to analyse the social context within which farmers acquired and applied knowledge about soil fertility management. To this end, the project adopted an interdisciplinary approach; bringing together agronomists, soil scientists, agricultural economists and communication scientists who worked closely together with farmers to explore the technical, social, economic and communication settings in which farmers were situated and how these influenced adoption decisions.

In Ghana, the study brought together researchers from the soil science, communication studies, agri-business and crop science departments from the University of Ghana to work at two separate project sites selected from two agro-ecological zones. The first project site

was located at the Kwaebibrem District in the Eastern Region of Ghana and the second site was at the Ada West District in the Greater Accra Region of the Republic of Ghana. These project locations served as the study sites where data used for this thesis was collected.

4.6 Study Sites

The study sites used for the project were Sege and its environs in the Ada West District of the Greater Accra Region and Kade and its environs in the Kwaebibrem District of the Eastern Region. The agro-ecology of the two sites varied significantly in terms of soil types, rainfall patterns, crops cultivated and soil fertility levels.

4.6.1. Ada West District[5]

The Ada West District was carved out of the former Dangme East District in the Greater Accra Region. It is located approximately 80 kilometres from Accra, the capital of the Greater Accra region. The total land size of the district is about 323.721 square kilometres. Almost half of the district's 72,880 (Ghana Statistical Service, 2019) population is engaged in agricultural activities (Kofituo, 2018).

The agro-ecological zone of Ada West is described as the coastal savannah zone. It is characterised by shrub covered plains, short trees and savanna grass. The coastal savannah agro-ecological zone is characterised by a lower mean rainfall amount compared to rainfall amounts in the forest areas. In addition, the water holding capacity of the coastal savannah agro-ecological zone is one of the lowest. The soil in the Ada West area supports the cultivation of crops such as tomatoes, onions, shallots, pepper, okra, watermelon and sorghum. In spite of the immense contribution of agriculture to the development of the local economy, persistent agricultural challenges such as unreliable rainfall patterns, deforestation and loss of soil fertility threaten agricultural productivity. Soil fertility decline

[5] Most of the information from Sege in this section was obtained from the Ghana Statistical Service (2014) District analytical report for the Ada West District.

in the area is manifested in the presence of high rates of soil acidity and deficiencies in nutrients such as carbon, nitrogen and phosphorus (Issaka, Buri, Tobita, Nakamura & Owusu-Adjei, 2012).

The farmers and innovation platform members in the project were drawn from six communities in the Ada West Area: Toflokpo, Tugakope, Bonikope, Afiadenyigba, Addokope and Aditcherekope. Some farmers from each of these areas had the opportunity to experiment with the treatments used in the ORM4Soil project. Meetings were mostly convened at Aditcherekope which was closest to the district capital, Sege.

4.6.2 Kwaebibirem[6]

The Kwaebibirem District is found in the Eastern Region of Ghana. It has a population of about 113, 721 according to the 2010 housing and population census of the Ghana Statistical Service. The District possesses large tracts of arable land suitable for the cultivation of cash crops such oil palm, citrus, rubber and cocoa. In addition, the area is suitable for cultivating food crops such as plantain, cassava, cocoyam, maize and rice. The Ghana Statistical Service (2014) reports that about 70.8% of households in the Kwaebibirem District are engaged in agriculture. The agro-ecological zone in the Kwaebibirem area is described as the Deciduous Forest Zone. Soils in the area contain higher amounts of Soil Organic Matter (SOM) and are higher in nutrients than soils in the Coastal Savannah Zone of the Ada West District (Omari et al., 2018).

The farming system in the area is characterised by either mono-cropping, crop rotation, agro-forestry, mixed cropping or mixed farming which are modifications of the shifting cultivation and bush fallow systems. A principal feature of such farming systems as practiced in the district is the clearing of farmlands by means of the slash and burn technique.

[6] Most of the information about Kade in this section was obtained from the Ghana Statistical Service (2014) 2010 population and housing census district analytical report for the Kwaebibirem District. Obtained online at http://www2.statsghana.gov.gh/docfiles/2010_District_Report/Eastern/KWAEBIBIREM.pdf

This often results in bush fires which create more agricultural challenges such as land degradation and soil fertility depletion. Farmers involved in the ORM4Soil project were drawn from the following communities: Pramkese, Abodom, Otumi, Takyiman, Abaam and Asuom where some of them practiced the field experiments on their farms. Meetings with farmers were either held at Kade, the district capital, at Okumaning, where an agricultural research station at the University of Ghana was located or at any of the selected communities.

4.7 Locally available organic materials used in the ORM4Soil project in Ghana

For each agro-ecological zone, scientists and farmers jointly identified locally available organic materials which could potentially be used to improve soil fertility in the individual sites. At Kwaebibrem, the identified materials were empty palm fruit bunch (EFB), rice husk, palm oil mill effluent (POME) and cocoa pod husks. In the Ada West area, cow dung was identified as the most easily available organic material.

Empty fruit bunch (EFB) refers to the biomass obtained after plucking out the palm fruit from its bunch particularly obtained in large quantities during the production of oil palm. Rice husk refers to the hard protective coverings of rice grains which are separated from the grains during the milling process. Palm oil mill effluent (POME) is the wastewater derived from processing palm fruit found in large quantities in oil palm producing nations. It is found to be rich in organic carbon, nitrogen and minerals. Cocoa pod husks is the empty pod obtained after the removal of cocoa beans from the fruit. In the Kwaebibrem area, all of these locally available organic materials are considered as waste.

At Kwaebibrem, the empty fruit bunch and the cocoa pod husk could either be applied directly on the farm or composted with either water or POME prior to application. The rice husk was used for rice husk biochar before application. At Sege, the cow dung was either allowed to mature or was composted over a 90 day period before being applied to the crops

on the field. All the identified organic materials in the two sites were either mixed with reduced quantities of inorganic fertilizers (specifically Triple Super Phosphate or TSP and Urea) or applied singularly and compared to a control treatment on farmers' fields and at project sites. Farmers were taught to prepare and apply the treatments using participatory communication channels such as farmer field visits, workshops, innovation platform meetings and community demonstration sessions. In addition to these, a radio campaign was implemented at the Kwaebibrem area.

4.8 Ethical approval

Prior to actual fieldwork, ethical approval was sought and obtained in May 2018 from the Ethics Committee for the Humanities at the University of Ghana.

4.9 Sampling

Most grounded theory studies recommend the use of theoretical sampling in order to identify a set of participants that would allow a theory to emerge. Theoretical sampling enables a researcher to decide on further or subsequent sources of data to build a theory as themes, ideas and questions keep emerging from initial data collection and analysis. For this thesis, an initial decision was made to purposively sample participants in the ORM4Soil projects. Those initially identified were the farmers involved with the project, research scientists from agronomy and agricultural economics, extension workers and project site managers. The purposive sampling of these participants was based on the researcher's close association with participants during the project implementation, observation of how they engaged or communicated to each other and perception of their ability to provide information about the central research phenomenon being investigated in this study in order to build theory.

According to Palinkas, et al., (2015), purposive sampling enables researchers to identify, select and collect data from participants who have rich information about the phenomenon under study. Such participants or individuals are often selected based on their specific

knowledge and experiences concerning an issue under investigation (Creswell & Clark, 2011) and also based on their availability, willingness to participate and communicate their experiences and opinions on matters of interest (Bernard, 2002).

Following the initial analysis of the interviews and focus group discussions with research scientists, extension workers and farmers respectively, a number of ideas and questions remained unanswered or needed to be clarified in order to build a more robust theory. In line with the guidelines of theoretical sampling, other sources of information useful to the work were consulted. To this end, the audio recordings of a ten week participatory radio programme organised by the ORM4Soil project which captured unscripted dialogue between scientists and farmers in a studio setting were obtained. The audio tapes were transcribed and the transcripts reviewed to get a deeper understanding of how scientists and farmers dialogue to reach common ground on matters such as soil fertility management. Four graduate students who were involved in project field work activities and worked closely with farmers at various points during project implementation were also interviewed.

4.10 Description of interview participants

Twelve (12) participants were interviewed for this thesis. These comprised two agricultural scientists who were principal investigators in the project, four extension agents, two site managers, one located at each project site and four graduate students who assisted the principal investigators and actively interacted with farmers. All of these twelve participants were classified in this thesis as scientists because relatively, they were considered to have more technical or scientific knowledge of soil fertility management compared to farmers. All the interviewed scientists were male with ages ranging between 25 years and 60 years. In describing these respondents, I tried to keep them as anonymous as possible by assigning them pseudonyms and refraining from providing too much description that might lead to their easy identification.

Gideon

Gideon worked as a lecturer at the Faculty of Agriculture, at the University of Ghana. He had therefore had the opportunity to train students both at the undergraduate and graduate levels on various agricultural issues. Gideon indicated that he had over two decades experience obtained from working with farmers within and outside Ghana. He has worked on several projects and has in depth insights on working with farmers and communicating various aspects of agricultural science to them. His teaching and research were considered valuable to the execution of the project. Gideon was actively involved in all project activities. He was present at almost every Innovation Platform meeting with farmers. In addition, Gideon participated in field visits, community demonstrations and radio discussions and was usually at the fore of communicating with farmers in the ORM4Soil project.

Samuel

Samuel was also a lecturer at the Faculty of Agriculture, at the University of Ghana who had also trained hundreds of students both at the graduate and undergraduate levels. He has over two decades experience working with farmers within and outside Ghana. Samuel's work was also considered valuable to the execution of the ORM4Soil project. Samuel was actively involved in dialoguing with farmers and attempting to make them appreciate the value of using the soil fertility management practices being discussed. Samuel participated in farmer field visits, innovation platform meetings and some community engagement sessions where he played a major role in communicating with farmers.

Richmond

Richmond was a research assistant who doubled as a graduate student pursuing a degree in one of the agriculture-related disciplines of interest to this project. His role as a research assistant meant that he worked closely with one of the principal investigators on the project.

Richmond often represented the principal investigator and interacted with farmers when the principal investigator could not attend events personally. Richmond had about five years' worth of experience working with farmers. Richmond, communicated with farmers and worked hard to ensure the effective operation of the Innovation Platforms.

Emmanuel

Emmanuel was also a research assistant and a graduate student studying one of the agriculture-related disciplines of interest to this project. He also represented one of the principal investigators on the project, whenever he could not attend field visits and community engagement sessions. Emmanuel was also one of the resource persons who interacted with farmers during the radio campaign.

Eddy

Eddy was also a graduate student pursuing graduate studies in communication studies. During the early part of the project, Eddy was involved in a Participatory Rural Appraisal (PRA) exercise that led to the identification of inputs by farmers. Eddy was actively involved in interacting with farmers prior to the actual start of the project. He shared his views on communication during the PRA and before the actual project implementation.

Bright

Bright came to the project with about ten years' experience working as an agricultural scientist and also as a community liaison officer after having worked with several NGOs in Ghana. Bright's NGO expertise placed him at the forefront of the initial PRA conducted at the Ada West Area. As a graduate student working on the project, Bright was studying an Agricultural related discipline of interest to the project. At the beginning of the project, Bright was actively involved with broaching the subject of soil fertility management to farmers and explaining project objectives to farmers. He was also involved with working closely with farmers to identify the locally available organic amendments. The interview

with Bright was to obtain a clearer understanding of broad project activities and specific project communication activities at Ada West in particular especially at the beginning of the project.

Joshua

Joshua was employed as a research assistant by the project and assigned the duty of being one of the site managers. Joshua worked on the project for about three years in total but also had about six years' experience working as an extension agent with the Ministry of Food and Agriculture (MoFA). As a research assistant, he worked closely with farmers especially during field trips and community demonstration sessions. During such engagements, his extension expertise was brought to bear in explaining soil fertility, soil fertility management and soil fertility management practices to farmers. Joshua also served as a resource person for some episodes of the radio programme.

Tetteh

Tetteh was employed by the project to supervise and manage research at one of the research sites. He described himself as having about 21 years' experience researching, supervising fieldwork and ensuring the successful execution of various projects. He was one of the two scientists who understood the Ga-Adangme language used by the farmers at Ada West. He played a key role as a translator at Ada West during field visits but did not contribute much during IP meetings and discussions.

Tony

Tony had experience in extension work and provided translation services during project visits to Ada West. He translated concepts from the principal investigators and graduate students during such field outreaches. Tony also organised IP meetings and field visits and interacted with farmers during such meetings.

Charles

Charles was one of the extension agents the project worked with. He had about 30 years of extension experience. As the extension agent partnering the project, he played an active role in the initial recruitment or mobilisation of farmers in the area for the ORM4Soil project. Charles was actively involved in organising field visits and IP meetings. Outside the project context, Charles also advised other farmers on the soil fertility management practices discussed in the project and how farmers can implement them for maximum benefit. Throughout the duration of the project, Charles often expressed his expectation of a significant monetary reward or bonus from project leaders. Unfortunately, instead of such a one off payment, Charles was often given monies to cover transportation and food during project meetings; something he was always unhappy about. This affected his involvement in the conversation when scientists and farmers met to dialogue.

Frederick

Frederick was also an extension agent who worked closely with the project. He had about five years of extension experience. Frederick was actively involved in the initial recruitment of farmers in the one of the areas for the ORM4Soil project. He was also involved in organising field visits and IP meetings for farmers. Outside project contexts, Frederick provided farmers with further advice on soil fertility management practices discussed in the project and how farmers can implement them for maximum benefit. Even though Frederick also had some monetary expectations from the project leaders, the fact that such expectations were not provided did not affect his involvement and dedication to project activities.

Dennis

Dennis was also an extension agent who worked closely with the project. He had about 18 years of extension experience. Dennis was actively involved in organising field visits, IP

meetings and community demonstrations. In addition, Dennis provided farmers with further advice on soil fertility management practices discussed in the project and how farmers can implement them for maximum benefit. It is unclear whether Dennis had any other expectations of monetary reward from the project aside what was given him occasionally after meetings.

4.11 Description of focus group discussion participants

Kwaebibrem farmers

Out of the 25 farmers who took part in the FGDs at Kwaebibrem, only six were female. In terms of demographics, the age range of farmers in this area was between 30 and 70 years. However, majority of the participants were above 40 years. While majority of them reported no formal education, there were a few who had completed middle school form four. There was one University graduate and one farmer who had completed Junior High School (JHS). In terms of farming experience, majority of the farmers at the Kwaebibrem area had over 20 years of farming experience. Most of them cultivated cash crops and therefore owned tens of acres of either oil palm or cocoa only, a combination of oil palm and cocoa or a combination of oil palm, cocoa and citrus. Aside the cash crops, the farmers in the area cultivated other food crops like maize, rice, plantain and an assortment of vegetables.

Farmers at Kwaebibrem were relatively richer and had a higher standard of living compared to farmers at Sege. For instance, in most cases, farmers in this region owned their farmlands. In addition, the climatic conditions of the agro-ecological zone at Kwaebibrem was favourable compared to that of Ada West. Farmers in the area had enough extra income which they could easily invest in the organic soil fertility management amendments. The Kwaebibrem farmers could also afford to purchase inorganic fertilizers at subsidised prices. However, they were also aware that though inorganic fertilizers required continuous purchase and application to increase yield, they did not ultimately help to improve soil

quality. Thus, once got to know about the possibility of spending less on inorganic fertilizers by switching to using locally available organic materials, the farmers' interests were naturally stirred.

Farmers at Ada West

Twenty five farmers participated in the focus group discussions at Ada West. Of this number, there were only three females. In total, the age range of the farmers at Ada West was between 25 years and 60 years. However, majority of participants were 40 years and below. While some farmers reported having no formal education, a few reported JHS as their highest educational qualification. In terms of farming experience, the Ada West farmers had more farmers with less than 10 years of cumulative farming experience. Farmers in this area mainly focussed on cultivating food crops such as sorghum, maize, pepper, tomatoes and water melon on smaller land sizes compared to those of farmers at Kwaebibrem.

The climatic conditions in Ada West were also harsher than that of Kwaebibrem. Rainfall was erratic, the sun was harsh, the fertility of the soil was poorer compared to Kade. Farmers therefore had to farm under very severe climatic conditions. Aside the harsh farming conditions, farmers at Ada West were not as "rich" as those at Kwaebibrim. Comparing, the two sites, it was evident that the standard of living at Ada West was lower. Farmers therefore often struggled to purchase inorganic fertilizers. Farmers in Ada West are concerned about the poor soil fertility levels and recognised that inorganic fertilizers damage the soil. While they welcomed the idea of improving soil fertility by applying cow dung, they appeared constrained by a lot of other contextual factors when it came to adoption of the cow dung. In addition, farmers at Ada West expected some financial assistance based on an unofficial agreement with project leaders at the start of the project. For many of the farmers in the

area, their involvement in communication activities and their dedication to other project activities was greatly hampered by the unfulfilled financial assistance promise.

4.12 Sample size

Various views exist concerning the sample size of grounded theory studies. According to Mason (2010), most of these views are mostly recommended guidelines and not backed by any specific empirical data. For instance, some grounded theory studies such as that of Hirchfeld, Smith, Trower and Griffin (2005) have used as few as six participants. However, for most qualitative research (including grounded theory studies), there appears to be a consensus that the sample size is highly dependent on the research objectives and the ability to gather enough data to address the objectives raised till a point of saturation is reached (Charmaz, 2012).

For this study, the total population purposive sampling method was first used to select participants. Total population purposive sampling involved collecting data from the entire population which shared specific experiences, knowledge, skills, due to the smallness of population size[7]. To arrive at a logical theory, only the core people involved in the project at both project sites in Ghana were included in the project. Project participants consisted of farmers, agronomy and socioeconomic project scientists, other innovation platform members (who may not be farmers), extension agents and site managers working at both project sites.

The study classified project participants broadly into two groups: scientists and non-scientists/farmers. Scientists referred to individuals with technical, scientific knowledge and know-how about soil fertility management. Typically, this group included project research scientists and graduate students with expertise in agronomy, soil science and agricultural

[7] This description of total population sampling was obtained by an article from www.dissertation.laerd.com/purposive-sampling.php

economics, site managers who had oversight responsibility of the project sites in the communities and extension agents who were involved with the projects at the specific sites. The non-scientists included farmers and other members of the innovation platforms whose soil fertility management information was primarily based on indigenous knowledge together with little or no accurate technical knowledge on soil fertility management.

In all, the study initially identified fifty-eight (58) participants. This comprised fifty (50) farmers from both study sites, two research scientists (supervising both sites), four extension officers and two site managers. After initial analysis of the data from these people and the need for further data, four graduate students who had at various points in the implementation of the project, worked closely with farmers and were involved in community demonstrations and innovation platform meetings at both Kwaebibrem and Sege were also interviewed to bring the total number of study participants to sixty-two (62) participants. Lastly, 10 transcripts of farmer-scientist interactions from a ten-week radio campaign were reviewed. The findings from the additional data collected from these sources were compared to those from the initial interviews and FGDs to address the research objectives and build a theory.

4.13 Data Collection

Data collection was done using in-depth interviews, focus group discussions, participant observations, a review of transcripts of audio recordings of instances of dialogue between scientists and farmers in the ORM4Soil project.

4.13.1 In-depth interviews

In-depth interview is a qualitative data collection technique that involves conducting intensive individual level interviews with a small number of respondents in order to explore their perspectives on a particular subject matter, idea, and situation (Boyce & Neale, 2006). Interviews enable a researcher to gain an understanding of a phenomenon as it exists or is understood among the group of people who are interviewed. In other words, interviews were

useful for eliciting individuals' subjective experiences and views about a phenomenon of interest (Lindlof, 1995).

Twelve (12) in-depth interviews were conducted in order to obtain detailed information about the topic under investigation. Interviews were held with two research scientists, two site managers, four extension workers, four graduate students who interacted closely with farmers on the project. In-depth interviews were held with the 12 project participants labelled as "scientists" in this study. The interviews were often conversational or dialogic and highly flexible. This structure made room for me to build rapport and trust with participants (Glesne, 2011). The resultant bonding helped to create a relaxed atmosphere in which participants freely shared their personal interpretation of their experiences and perceptions of participatory communication as it unfolded in the ORM4Soil project.

The consent of all participants was sought prior to the beginning of each interview. All participants consented and willingly participated in the study by providing the required information without any form of coercion. In return, the participants were assured of confidentiality prior to the start of the interviews.

4.13.2 Focus group discussions

Six focus group discussions (FGDs) were organised for this thesis. Three were held in the Kwaebibrem area and the other three were held in the Ada West area. FGDs were used because they are a type of qualitative interview that brings together groups of people who have diverse perceptions, judgements and experiences about particular topics to share their perspectives. The people who take part in a focus group are known to have some thorough insight into the issues under investigation due to their experiences of that issue. Thus, the farmers who took part in the focus group were interviewed together to encourage deeper interaction and the joint construction of meaning (Bryman, 2004). Focus groups were also used in this thesis because according to Creswell (2013), they provide group safety which

enables participants to provide information they may be hesitant to provide if they were to be interviewed individually.

Though there are debates surrounding membership numbers of FGDs, typically, the membership of FGDs are between groups of six and 12 people who share certain common experiences to discuss issues which are of interest to a researcher (Bryman, 2004). In some cases, some researchers recommend groups with large numbers because of a need to reflect a diversity in responses to the topic being investigated. In other cases, fewer groups are preferred especially where a researcher does not anticipate much diversity in responses to the topic of interest (Bryman, 2004).

In terms of recruitment into the focus groups, the extension staff at both sites played a major role in mobilizing all farmers and innovation platform members working with the ORM4Soil project. Once farmers and extension workers agreed on a date and venue, they shared the information with the researcher. At Kwaebibrem, the FGD was held at the District Offices of the Department of Agriculture at Kade. For Ada West, the recruits agreed to meet at a church located at Adikyerekope, a suburb of Sege, the Ada West District capital. The FGDs were first held at Sege in January 2019. The Kade FGD was held in May 2019. On the agreed dates, at both Ada West and Kwaebibrem, not all project farmers showed up for the FGD. At Ada West, farmers who showed up on the said date were organised into three groups. Two of the groups had eight participants each while the third group had nine participants. The Kwaebibrem FGD had one group with seven members, another with eight members and the third with ten members. At both study sites, group membership comprised both males and females. All the groups had more male than female participants.

4.13.3 Participant Observation

According to Creswell (2013), observation is one of the major tools for collecting qualitative research data. Observation requires researchers to observe and take notes of a given

phenomenon in the field setting using all their five senses (Angrosino, 2007). Creswell (2013) distinguishes between four types of observation: complete participant, participant as observer, observer as participant and complete observer. The complete participant observation is where a researcher is fully engaged with the people he or she is observing as part of establishing greater rapport with the people being observed. Participant as observer also has the researcher participating in activities at the site. However, in such an instance, the participant role is more salient that the researcher role. This type of observation enables the researcher to gain insider views about what is being studied. Observer as participant means that the researcher only operates as an outsider to the group under study and only watches and takes notes from a distance without being directly involved with the activities of the group. A complete observer is neither seen nor noticed by the people being investigated.

The second type of observation that is, participant as observer was used in this study. Participant as observer enables a researcher to partake in a study and also observe or investigate a topic of interest with the full knowledge of the actors being observed (Lindlof, 1995). This type of observation enables the researcher to participate in project activities while observing phenomenon of interest to him or her.

I was a participant in the ORM4Soil project and doubled as a student researcher. At every meeting, project participants were reminded that I was present to participate and also observe and learn about communication as part of my PhD studies. The information from observations used in this study was gleaned from watching and listening to conversations during innovation platform meetings, community engagement activities and farmer field visits. In addition, the ORM4Soil project organised a radio campaign at the Kwaebibrem area. During the campaign, I was present in the studio to observe and listen to interactions between scientists and farmers present in the studio and also listened to how scientists

engaged other farmers who called into the show. Based on the objectives of the study, a checklist was developed to guide all observations.

Specifically, the following were noted during the observation and listening sessions: dialogue between farmers and scientists, with particular attention being paid to the tactics used by both groups in their attempt to explain soil fertility management to each other. Participant observation was also used to capture overt behaviours and non-verbal cues expressed during the participatory communication effort.

In all, the observation data was from four innovation platform meetings where project leaders were present, four farmer field days, 10 weeks of observing in-studio activities of a participatory radio campaign and a community engagement activity. Again, nineteen (19) different episodes of scientist-farmer interactions were observed over a three-year period (2017-2019).

4.13.4 Audio transcripts

Audio recordings of ten episodes of scientist-farmer interactions broadcast during a radio campaign organised by the project were also used as data. I collected the audio recordings and transcribed the conversations between scientists and farmers in order to understand how they arrived at a common understanding of soil fertility management and the how participatory communication was utilized to inspire farmers to adopt the soil fertility management practices in the project.

4.14 Data collection instruments

To collect the needed data, various instruments were designed. An interview guide was used to collect data from the in-depth interviews. A focus group discussion guide was used to collect data from the focus groups and an observation checklist was used to record data from the observation sessions.

4.14.1 Interview guides for in-depth interviews

Two different sets of interview guides were developed and administered separately to extension staff and site managers on the one hand and project agronomy and socio-economic experts on the other hand. Although together, these groups of people were classified in the study as having scientific knowledge about soil fertility management, the interviews were conducted with an understanding of a possible difference in the way both groups communicated with farmers. The interview guides were semi-structured. They each had a list of questions covering a range of topics which needed to be asked based on the research objectives. The researcher was however not restricted to asking the questions in the exact order in which they were listed on the guide because the questions listed on semi-structured interview guides were to direct the dialogue between interviewer and interviewee and gain as much information as possible.

Thus, the questions asked were open ended and allowed participants to think and reflect on the topics being investigated before providing answers. Often, such probing questions outside the framework of the interview guide were asked for clarification of previous comments or opinions shared by research participants. The interview guide had questions covering topics which addressed the broader research questions. Before the start of any interview, the purpose of the study was explained to participants who were also assured of confidentiality. The interviews were recorded with a tape recorder for later transcription. In addition to the recorded interviews, notes of significant statements and responses which needed to be explored further were taken during the interview process.

4.14.2 Focus group discussion guide

For the focus group discussions, a semi-structured focus group discussion guide was developed to collect data. This guide was not followed rigidly; rather, it served as a guide for the group conversation to help participants stick to the issue(s) being discussed. As such,

where necessary, the responses of participants served as a basis for asking further questions to enable the researcher gain a deeper understanding of the issues being investigated. Prior to the beginning of the group discussion, the purpose of the study was explained to participants and they were encouraged to sign a consent form before being engaged in the study. Each focus group discussion lasted for an average of 1 hour, 30 minutes. At the Ada West District, the project extension officer and project site manager provided translation services during the focus group discussion. They translated the questions for the participants and translated the responses back to the researcher.

4.14.3 Observation checklist

An observation checklist was developed to guide the researcher in scientist-farmer interactions. The checklist detailed elements scientists and farmers adopted during their interaction/dialogue. It also specified the mannerisms and responses to conversations or interaction sessions which helped the researcher to understand the techniques or tactics employed by both groups during interaction. With a notebook and a pen, I noted down brief descriptions of my observations of scientist-farmer interactions. I later reflected on them and noted down questions which were further investigated during the in-depth interviews and the focus group sessions.

4.15 The Role of the Researcher

Corbin and Strauss (2008) suggest that researchers using grounded theory should not be removed from their study participants; instead, they have to be actively engaged with study participants while being conscious of their own biases as researchers and putting in measures to prevent those personal biases from influencing the progress of the work. I acknowledge that my involvement in the ORM4Soil project as a research assistant and as a student could have possibly made me focus on certain concepts during the interview and the data analysis process.

As a result, throughout the data collection and analysis, I consciously sought the meanings ascribed by participants rather than imposing my own experiences and biases on them. For instance, during the data collection, the questions the participants were asked in this thesis were not based on any theories or my own expectations. Rather, the questions asked were based on my observations and conclusions about the research gaps in literature which needed further investigation. I also asked a lot of open ended questions to allow participants to share opinions and perspectives freely. Also, the questioning was done in a conversation style to make participants relaxed enough to share their experiences. This style of questioning also gave me the opportunity to listen and probe participants' responses further before drawing any conclusions.

Specifically, to make participants relax, at the beginning of both the interviews and the focus group discussion sessions, all participants were reminded that there were no right or wrong answers. I assured them that their honest answers would be highly appreciated to help me understand the phenomenon under investigation better. Participants were encouraged to speak without fear of victimisation. During the FDGs, especially at Sege, it was noticed that the female participants, in particular, were relatively withdrawn and did not contribute to the discussion as much as the males did. I therefore made more effort to consciously invite submissions from the women participants at Sege in order to include their points of view in the study. Usually, a lot of coaxing preceded getting the women at Sege to contribute to the FGDs. There were a few instances where some members of the FGDs disagreed with the submissions made by other participants in the group. During such instances, I assured the group that I was interested in every response and not just in the responses majority of the participants agreed to. Therefore, participants who expressed "dissenting views" were encouraged to speak up more often.

Moreover, some members of some FGDs were more assertive than others. This resulted in instances where such members came close to monopolising the discussion. In such instances, I reminded such people to allow others to share their opinion too. At other times, such assertive members were encouraged to delay their submissions until other members had spoken. Besides, there were a few instances when the FGDs strayed outside the boundaries of the topic of interest. In such cases, participants were allowed to talk for a brief while and then subtly reminded of the objectives of the FGD and the need to stick to them so that we could end the discussion early enough.

Also, during the data analysis, I painstakingly, resorted to line by line open coding and identified, as much as possible, "in vivo" codes to ensure that I was not imposing my impressions on the data but was allowing participants views to reflect in the data analysis.

4.16 Data Analysis

For grounded theory studies, data analysis is critical because it informs the emergence of the theory. Grounded theory uses a constant comparison approach with data being continually compared at each step of the data analysis. To help with data analysis, I engaged in memo writing and went through the three stages of coding for interpretive grounded theory.

4.16.1 Memo writing

I began the data analysis by transcribing all the audio recordings obtained from the radio campaign, in-depth interviews and focus group discussions. I read through the transcripts several times to familiarize myself with the information provided by participants. After this, I also read through my field notes from observation sessions to get a full grip on the range of issues which were emerging from the data. The transcripts were stored in Microsoft word format. As I read through the soft copies stored on my computer, I highlighted certain statements of participants which I thought stood out, supported or provided clarity to a

submission made by other participants and typed my comments concerning such quotations at the margins of the transcripts I was reading. Creswell (2013) describes the comments written down during such a process as memos. According to Creswell (2013, p. 183), memos are "short phrases, ideas or key concepts that occur to the reader".

In grounded theory research, writing memos is important because it allows the researcher to note down immediate reactions, responses, thoughts, ideas and questions that emerge during data collection and initial data analysis. Writing memos allows a researcher to record salient observations to which they would like to return and examine further. My memos in this thesis consisted of initial highlighting of quotations, key words or phrases and commenting on them in the margins of the transcripts.

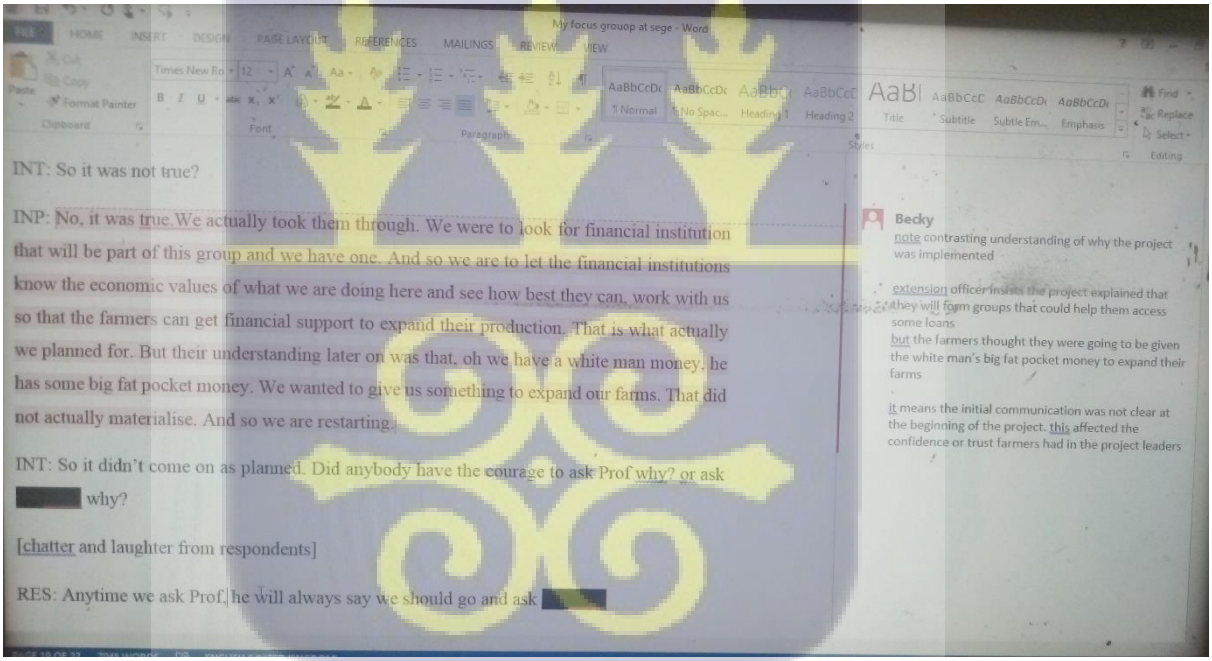

Figure 1: Picture showing how I wrote memos in the margins of the word document as I read through the transcripts

In addition, I also wrote brief summaries of salient issues identified during the reading of the transcripts and questions that came to mind as I read through the transcripts. The questions included:

- How do scientists communicate soil fertility and its management to farmers in a way that ensures that farmers understand them and vice versa?
- What informs how scientists and farmers choose to communicate soil fertility and its management to each other?
- How do farmers and scientists know that they have reached a mutual understanding of soil fertility management?
- Is participatory communication enough/ a guarantee for adoption of soil fertility management practices?

These questions were noted down and reflected on. The more I reflected, the more it became obvious that the questions were sub questions that fit into my broader research questions. These questions enabled me to critically read through the data in order to better understand the information it presented and direct the analysis of the data. The memos also helped me to identify initial patterns in the data which were further examined during the coding process.

4.16.2 Coding

Coding involves the process of sorting the data into smaller segments of information, labelling particular segments of the text and looking for evidence for the label or code from the various data sources being used for this thesis. Coding helped to select, separate and sort the data which was initially collected. This then led to the establishment of initial categories based on which further data was collected for analysis. By closely examining the data and the information it presented, I was able to focus on the meanings it presented rather than imposing my personal assumptions on the data. In line with the requirements of data analysis procedures in grounded theory, the three levels of coding were done: open coding, axial coding and selective coding.

4.16.2.1 Open coding

Open coding is the initial coding phase of interpretive grounded theory which allows researchers to closely examine the data to identify themes, ideas or concepts using words, phrases or statements that emerged from the data. For each audio transcript, during open coding, I coded each line and also coded complete thoughts in the transcript. Since the transcripts were in Microsoft word, the line by line coding involved providing summary descriptions of every line of my data transcripts in the margins of the word documents. The advantage of line by line coding is that it opened up the data to critical scrutiny and also enabled me to capture participants' exact responses and not impose my assumptions of what they were saying on the data. Coding by complete thought also helped me to capture participants' complete thoughts or comments, especially when the individual lines did not make much meaning for meaningful analysis. A total of 172 codes were initially recorded during the open coding activity. These codes were recorded in a table created with Microsoft word and matched to research objectives. After further reading of the transcripts and the assigned codes, similar codes were condensed or merged; thus, resulting in a total number of 32 codes.

4.16.2.2 Axial coding

Axial coding explores the relationship between categories developed from initial coding and makes connections among them. The codes from the open coding were merged further into larger categories. To ensure that the categories being created emerged from the data and not my imagination, I developed table in Microsoft Word which matched the research objectives to the initial codes from the open coding process and the larger categories from the condensed codes. An additional column was then created to record direct quotes from the transcripts to support the codes and categories which had been created.

Table 1: Excerpts of open coding and axial coding in a Microsoft word document.

Column A: Initial codes from Farmers' perceptions of participatory communication at both sege and kade	**Column B1:** Farmers' perceptions of participatory communication at both sege and kade	**Column B2:** Further coding to identify categories	Sample supporting quote from the transcripts
Learning together/learn from each other	Enabling knowledge sharing	Mutual learning (20)	one thing that made all of us come together and share ideas and also communicate together which helps is because it helps us know what each farmer goes through that is every farmer has his own farming methods and what he or she grows on it, but when we come together we all share our thoughts and also you get to know what each farmer does on his farm and one can also apply same method at his farm.
Sharing ideas/opinions	Enabling better understanding		You see we can share our ideas, tell our challenges and other problems we are facing and suggestions can be made or said.
Joint collaboration	Sharing and interaction among co-equals	Understanding (18)	when I also come, what I want to do is to be able to say whatever problem I have to the farmers here so that if anyone has a solution to it he can share so that I can learn from them and do same at my farm. That is what I do.
Leads to dialogue and deliberation	Learning based on observation		At times, there some problems I do encounter but, I've tried times and times but no solution. But when we meet together like this you come to realize a colleague farmer has encountered such problem before and was or has been able to find a solution to it so he or she shares which help me to go by it and solve that problem in my farm. Also, we all meet and everyone is contributing it brings some joy within and among us which also helps you to involve yourself well into the farming practice

Free speech	Making decisions and implementing them based on observation	Self-help/self-mobilization (8)	Our involvement empowers us to tell others about happenings in the project. For example I have applied the techniques to extent that a lot of farmers surrounding my farmlands are also adopting. Some are learning. The joint learning helps. So that we are able to encourage others to practice it because we have experimented it, experienced it and so can easily share the results with others.
Not controlled by one person	Self-help/ self-mobilization		when we meet, we don't speak English. We use the local language. Everybody shares their opinion freely because " wisdom does not reside in the head of one person alone". Even our executives give room for as many people to express their opinion before they speak. So at our meetings, everybody is at liberty to speak.
Democratic process	Teaching others	Decision making (Adoption/trial) (10)	
Patience to let everybody speak	Observation makes it believable, relatable and understandable		
Inclusion of everybody's opinions	Decision making based on what is observed		

Table 1 provides an explanation of how the initial coding was done. In the first column labelled column A, all the codes of farmers' perceptions of participatory communication

were listed. There were fifty-six (56) codes in total. After reading through the transcripts and the initial codes, I condensed the fifty-six codes into eight (8) codes. These eight codes were further condensed into four (4) codes which described a category called perceptions. As shown in the table, I used different colours to represent similar ideas which were later merged or condensed. This process was repeated for all the other objectives. In the end, I had five (5) major categories and thirty-three (33) sub-categories emerging from the entire coding process.

Strauss and Corbin's (1990) procedures for axial coding specify that researchers should relate categories together through a model that establishes relationships. Specifically, Strauss and Corbin's (1990) model suggests looking for relationships among categories that explain the causal conditions regarding a given phenomenon, the context which informs the phenomenon, intervening conditions, action/interaction strategies and consequences. To this end, after identifying the major categories, I matched the associated sub-categories to them (Strauss & Corbin, 1990).

4.16.2.3 Selective coding

The third stage of analysis in grounded theory is selective coding which allows a researcher to integrate the concepts or categories identified during open and axial coding. Selective coding involves identifying a single category as the central phenomenon and constructing a story around it. To do this, I reflected on the data, the codes and categories identified and examined the inter-relationships among them and grouped them into either causal conditions, contextual conditions, intervening conditions, action/strategies or consequences as suggested by Strauss and Corbin's (1990) model.

After critically reflecting, asking myself questions and reading through the data, the single category identified as the central phenomenon was labelled "influence". In the end, I generated a theory to demonstrate how the identified central phenomenon connected all the

other identified categories to explain participatory communication and adoption of soil fertility management practices. The theory generation involved creating a visual model which illustrated the relationships among all the identified categories from the data analysis.

4.17 Trustworthiness

Trustworthiness in qualitative research is synonymous with validity and reliability in quantitative research (Creswell & Creswell, 2018). According to Creswell and Miller (2000), trustworthiness is concerned with investigating whether the findings of a qualitative study are accurate from the point of view of a researcher, research participants and the readers of a research report. Lincoln and Guba (1985) suggest four criteria for trustworthiness in qualitative research. These are credibility, transferability, dependability and confirmability.

4.17.1 Credibility

The credibility of qualitative research refers to the confidence that can be attributed to the research findings as representing the truth of the data obtained from participants. It is the confidence one has that a researcher has correctly interpreted the view of participants (Lincoln & Guba, 1985). Qualitative researchers establish research credibility by employing various strategies such as prolonged engagement with participants, persistent observation, triangulation and member checking (Sim & Sharp, 1998). For this thesis, the researcher spent a considerable amount of time engaging with participants by attending and spending time together with farmers and scientists at workshops, meetings, community demonstrations, radio campaigns and field visitations over a four-year period (2016- 2019). At all such encounters with scientists and farmers, I observed their activities, listened to their interactions and engaged both groups as part of efforts to identify some of the issues which shaped the focus of this study. This led to the establishment of rapport and the building of heightened trust among participants. As a result, participants confidently and

honestly provided the information needed to answer the research questions without fear or intimidation.

Another technique I adopted as part of ensuring credibility in this thesis was the use of triangulation. I obtained data from multiple data sources from multiple sites. Specifically, data was obtained through interviews, focus group discussions and observations. In addition, data from transcripts of audio recordings were used in developing this thesis. Gibson (2014) suggested that in qualitative research, more data sources increases the confidence that can be placed on the findings of research. The data collected from multiple sources was constantly compared to shed light on different perspectives of the emerging themes from the data as part of the theory building process.

The researcher also engaged in member checking. According to Lincoln and Guba (1985), member checking is the single most important technique for establishing credibility because it helps a researcher to determine if he or she has accurately captured or interpreted participants' responses and thoughts. I undertook member checking by sharing interpretations of findings and study conclusions with selected participants to ascertain whether they accurately reflected their responses about the topic of interest.

4.17.2 Transferability

Transferability refers to the degree to which the results of qualitative research can be transferred to other contexts or settings. Usually, the decision about the transferability of a study is dependent on the ability of the reader of a research to determine whether the researcher's vivid descriptions of the entire research process can enable the reader to transfer the study to his/her context (Korstjens & Moser, 2018). The first part of this chapter provided a vivid description of the research objectives, project case study, project sites, sampling procedures, data collection instruments, data collection methods and procedures for data analysis. All these were done in an effort to assist the reader to make a judgement about the transferability of the findings of the study.

4.17.3 Dependability & Confirmability

Dependability refers to participant's evaluation of the findings, interpretations and recommendation of the study in order to establish whether they are supported by the actual data provided by the study participants. Confirmability, on the other hand, refers to the degree to which findings of the research can be confirmed by other researchers as actually emanating from the data and not from the figment of the researcher's imagination (Korstjens & Moser, 2018). In other words, dependability checks for consistency in the research process while confirmability checks for neutrality of the research process.

Dependability and confirmability are both established through an auditing of the research process (Creswell, 2013) which entails providing records of the research paths throughout the study and the provision of precise details which can facilitate an independent audit of the research processes. To achieve dependability and confirmability, in this thesis, I provided vivid descriptions of the entire research process and the conclusions drawn from the data analysis processes. In addition, I also ensured that throughout the entire research process, I kept copies of all relevant documents. For instance, I stored my raw data, transcriptions, field notes, memos, initial codes, notes on ideas of how categories were related and how they all came together to form a theory. I also kept the steps I went through to apply for and secure ethical approval for this work. In addition, I kept copies of all my data collection instruments as well as various versions of my proposal and dissertation. These were all carefully organised and safely stored where they can be easily retrieved and referenced when needed.

4.18 Chapter Summary

This chapter began with a description of the philosophical underpinnings of this thesis and explained how the philosophy informs the methodology used for the thesis. The chapter has also described in detail, the research design, procedures for sampling, data collection and analysis and ended with a discussion of measures taken to ensure the trustworthiness of the

entire research process. The findings of the study are presented and discussed in the next chapter.

CHAPTER FIVE

FINDINGS

5.0 Introduction

The purpose of this study was to explore how participatory communication enabled scientists and farmers to explain soil fertility management to each other and how this interaction facilitated farmers' adoption of soil fertility management practices. The guiding research objectives were to:

1. Identify the dialogic tactics used by scientists and farmers during participatory communication about soil fertility management.
2. Identify farmers and scientists' perceptions of participatory communication about soil fertility management.
3. Identify the conditions that informed successful participatory communication about soil fertility management.
4. Describe how participatory communication facilitated the adoption of soil fertility management practices.

This chapter presents the findings for each objective and the theoretical model which emerged from this grounded study.

5.1 Findings in relation to research objective one: Dialogic tactics used during participatory communication about soil fertility management.

The first research objective sought to explore the dialogic tactics used by farmers and scientists during participatory communication of soil fertility management. The findings of this research reveal that participatory communication occurred at two levels: between scientists and farmers on the one hand and among farmers themselves in the presence of scientists on the other hand. In both scenarios, a number of conversational or dialogic tactics

were employed. While some were used mutually by scientists and farmers, others were exclusive to either group.

5.1.1 Dialogic tactics used by scientists

Scientists communicated soil fertility management using a number of tactics to facilitate message acceptance and understanding among farmers. These tactics included using metaphors and examples during message delivery, making direct reference to local knowledge, using peer influencers and repeating messages.

5.1.1.1 Metaphors

This study showed that in the attempt to break down scientific concepts to farmers, scientists used metaphors to simplify messages for farmers to understand. For instance, in an attempt to explain crop nutrients which contribute to soil fertility, one scientist had this to say:

> *"...For example, when you are preparing soup, you need meat or fish, vegetables, salt, pepper, onions, etc. It is the same with the nutrients in the land or soil. We have nutrients like what we call nitrogen, phosphorus and potassium (NPK) which should be in specific proportions for crops to grow. For the soup, if you use too much of one ingredient you will end up spoiling its taste and you will be unable to consume it. In the same way, every crop needs these nutrients in certain proportions to grow...So we want to let farmers know that when we speak of nutrients in the soil, just like ingredients for soup, they are those components we said earlier like nitrogen, potassium that the crops absorb in proportions to be able to grow. As we cultivate and harvest, the plants are taking those nutrients away from the soil and there is the need to replace that..."* **Gideon (Radio campaign)**

The above provides evidence of how scientists explained soil nutrients by referring to things that farmers can easily relate to. In this case, by juxtaposing soil nutrients with the ingredients needed to make soup and by comparing the need for soils to have the right nutrients proportions to the need for tasty soup to have the right nutrient portions, scientists succeeded in simplifying the message to enhance the chances of increasing farmers'

understanding. In another example, one of the scientists interviewed described how he explained the nutritional requirements of soils to farmers:

> *"…I made the farmers understand that the soil is like a human being. As a human being eats, drinks and breathes, the soil also does same. So, what farmers feed the soil is what it [the soil] will produce for you. So if farmers are able to put in proper things, then they will automatically reap proper things…we let farmers understand that if they want to farm, they should bear in mind that the soil eats, drinks and breathes. Hence, farmers need to provide all these things for the soil to help it generate the required nutrients need for crop growth and increased yield…"* **Joshua (In-depth interview)**

Again, another scientist explained why farmers should combine organic and inorganic fertilizers as follows:

> *"… So the chemical fertilizers have the three necessary nutrients we spoke of earlier and when you apply it to the land, it quickly transfers those nutrients to the lands. So from our research, we found out that, inorganic fertilizer leaves the lands after a maximum period of one month, so if you are not lucky and it rains after its application, the fertilizer will stay only for a short time in the soil and if the roots are not able to feed from it [the inorganic fertilizer] in time, you have just wasted your money. But the organic fertilizer gives the land and crops nutrients in smaller quantities and stays for a longer time in the soil. Even after a year, organic fertilizers still release nutrients for crop growth and soil enrichment. Just like the way we give a sick person both medicine and food to aid with fast recovery, it is also good to combine the chemical fertilizer with the organic ones so they work together. One releases nutrients quickly to the soil and lasts for a short time while the other lasts longer in the soils and enriches soil nutrients and soil fertility.* **Gideon (Radio, Campaign)**

In the two quotations above, the soil is metaphorically likened to a human being. Farmers are made to appreciate the fact that soils need nutrient varieties just like human beings. By comparing soils with low fertility levels to a sick person, the scientist was able to capture farmers' attention to the gravity of having infertile soils. This enabled the farmers to better

appreciate the fact that soils with low fertility or soils which do not have the basic nutrients in the right quantities are sick soils which need nutrients recover. Moreover, by comparing organic soil inputs to food and inorganic ones to medicine, scientists sought to highlight the importance of integrated soil fertility management practices to farmers. This helped farmers appreciate the import of scientists' messages better.

5.1.1.2 Examples

Scientists also used examples to justify the need for farmers to adopt the soil fertility management practices discussed in the project. To this end, one scientist had this to say in his attempt to urge the adoption of soil fertility management practices:

> *"In the past, when there was a football match in Togo, it took two days before you heard about the results in this country [laughter and chatter]. But today, even when a goal is being scored elsewhere, we are able to watch it live [on television] here in this country. So we develop over time, and the clock is ticking; but for we Africans, farmers especially, we believe so much in the old ways of doing things that we fail to take what we have learnt seriously. However, things are evolving and that is why research and technology have shown us that certain things like burnt rice husk (bio char), compost, oil palm residue, animal droppings and the rest can help make things better for us as farmers...so we have to change to suit the times"* **Gideon (Radio campaign)**

The above quote shows that communicating change to farmers requires some skill. It is not simply a matter of preaching change. Rather, it requires tact to present the message to farmers in a convincing way. From the above quotation, the football example is used to demonstrate the positive sides of change. The scientist explains that just as technology has enabled the viewing of live football matches, it can improve upon farming if farmers accept and incorporating new farming practices. The football analogy resonated so much with farmers when it was used because it generated further discussion as farmers recounted previous ways of knowing about the results of football matches.

Examples were also used by scientists to make farmers appreciate the value of making changes to boost their farming activities. In the following example, a scientist urged attitudinal change among farmers using an example which compared the benefits obtained from "frivolous" investments to the benefit derived from investing in farming. The scientist then subtly stressed the need for farmers to delay gratifying themselves until their farms were established enough to bring in extra regular income which could then be spent on other pleasurable things a farmer might be interested in.

> *"You see, when you decide to use organic fertilizers, the initial cost of investment is higher compared to the cost of using inorganic fertilizers. Farmers often question why they should invest so much in farming. You see, we have to change our attitude as farmers and see farming not just as a hobby or something we just do. We have to start seeing farming as a business and make up our minds that we are farming because we want to make profit and improve our standards of living. What is the use of using money obtained after harvesting our produce to buy beer for you and your friends? Why should you use the little money you get after selling your produce to buy the latest cloth on the market? Or why should you use the money to buy the latest pyrex bowls or set of utensils? The interesting thing is that the bowls, cloth and utensils we always buy from the market become old fashioned in to time because new designs are introduced all the time. "*
>
> *Farmers: Laughter and side comments agreeing with the statement that has just been made*

Samuel continues:

> *"...rather than spending the little profit we get from our current farming practices on some of these things, let us change our attitude, change how we see farming and invest in the organic treatments we have been talking about. In the long term, we will see the results we want...we will have more money in our pockets..."*

Farmers*: silence*

The above is an extract from a conversation between Samuel and the Innovation Platform members at Sege, recorded in my observation notes.

The silence that followed the second time was awkward and deafening. For some time, nobody spoke. Farmers were allowed to process the information they had received. After a while, a farmer asked for details about initial cost and the potential profit that could be made if one decided to use organic resources. After the question was asked, the scientist then took the farmers through a simple analysis of the costs and benefits of using the amendments being discussed.

The importance of using examples in explaining soil fertility management to farmers was summarised by Joshua as follows:

> *"When you are communicating with a farmer and you don't use practical examples, you have achieve nothing because at the end of the day, they are unable to remember anything. Using practical examples ensures that the lessons remain with farmers. It is important that the examples used are not abstract. Rather, they have to be practical examples which farmers can easily relate to so that at the end of the day they can understand and easily remember what was communicated to them."* **Joshua (In-depth interview)**

5.1.1.3 Direct reference to local knowledge

Using local knowledge as a starting point for message delivery

One of the dialogic tactics used by scientists to make farmers understand them better was the reference to local knowledge as conversation starters. This tactic enabled scientists to capture farmers' attention and stimulate their interest in the discussion.

> *"When there were no chemical fertilizers, our forefathers knew that leaving crop residue to rot on the farm was a way of enriching the soil…but along the line, they adopted chemical fertilizers mainly because of the yield it produced… but our research over the past four years has taught us that we have organic things around us that we used to throw away which we can now use to enhance the fertility of our soil…we have to go back to our old ways… [and] use the organic things in our environment for compost and apply it [the compost] to enrich our lands. This*

research has made us realise that we have very good local materials that we can use to improve our farming." **Gideon (Radio campaign)**

Similarly, another scientist referred to local knowledge in the following quote:

"To add or replace nutrients after harvesting, our forefathers used to leave crop residue on their farmlands and called it 'pro ka'[which can loosely be translated as allowing the crop residue rot and be absorbed into the soil]. They did this to enable the land absorb the nutrients from the crop residue. Through research, we have realised that we can also practice some form of "pro ka" by using other locally available organic materials such as Empty fruit bunch (EFB), cocoa pod husk and palm oil mill effluence (POME) to build the nutrients in the soil." **Joshua (Radio Campaign)**

In the above quotes, the reference to what the "forefathers" did is an indication of local knowledge or local farming knowledge handed down from generation to generation. Such knowledge was mostly known and applied in farmers' local contexts. Where scientists had no local knowledge about certain matters, they began conversations by asking farmers for examples of the local practices. The answers that farmers provided then served as the basis for sharing scientific knowledge.

Richmond had this to say:

"When you are communicating to farmers, you don't just have to go straight to the point and force them to listen to you. You can begin by asking questions and getting to know what they know. As they give you answers, you can then build up on the answers they give and gradually introduce what you know from a scientific point of view." **(Richmond, in-depth interview)**

Scientists were able to better explain the issues to farmers by juxtaposing local and scientific knowledge and presenting the advantages and disadvantages of each. The relevance of pairing local knowledge with scientific knowledge was summed up by one scientist as follows:

"We realised that if we underestimate the farmers by assuming they don't know anything, we would be wrong because there are certain things a farmer may do which will surprise scientists. Thus, it was important for us to learn from them because if we had relied solely on the scientific ways of doing things, we would have failed totally but because we also brought their ideas on board, paid attention to what farmers knew already and engaged them in the activities of the ORM4Soil project, it contributed to the project's success." **Joshua (In-depth interview)**

5.1.1.4 Using community based peer influencers

Scientists recognised the importance of not always taking centre stage during discussions at meetings. Whenever possible, they identified and celebrated farmers who were already implementing the organic soil fertility management amendments on their farms and had received some sort of recognition at either the district, regional or national levels. Such farmers were often given the opportunity to share their experiences with their colleagues. This was particularly the case at Kwaebibrem where scientists gave such farmers the opportunity to address their contemporaries, urging them to also adopt the soil fertility management practices. At one of the meetings, the following was observed.

When we arrived at the site, the extension officers were excited. Apparently, one of the farmers involved with the project had recently received an award as the regional best farmer. In the course of the meeting, the scientist invited him to stand and the whole gathering recognised his efforts with an applause after which he received congratulatory messages from the team. He was then invited to share his success story with his fellow farmers. The farmer in question explained to his peers his initial reservations about applying organic soil fertility management inputs on his farm. He explained how he eventually decide to try after several repeated messages from one of the professors and the extension agents. He then went on to testify about the benefits of using the soil fertility management practices. Particularly, he was elated about the yield and the fact that he now spent a lesser amount of money to purchase inorganic fertilizer because the organic inputs stayed longer in the soil and did not get easily washed away or depleted like the inorganic fertilizers. Based on this, he urged other farmers to get involved and also try out the organic inputs and then decide if they will use it in the long term like he had decided to do.

Source: Observation notes from Kade IP

Also, during the radio campaign, a well-known peer influencer referred to as Chief Farmer was given the opportunity to share his experiences when necessary. Chief Farmer was not part of the project but he was a regular discussant on the radio show which hosted the campaign. Because his views were cherished by the farmers who tuned into the programme, Chief Farmer was allowed to participate in all the studio discussions and testify about his experiences with the soil fertility management practices as a way of encouraging other farmers to try the organic inputs which were being discussed. For many farmers, Chief Farmer's views were an "independent" assessment of the soil fertility management practices which were discussed during the radio. Chief Farmer's submission typically would sound as follows:

> *"When a student goes to school and plays instead of paying attention when a teacher is teaching, that student often scratches his head and chews on his pen when it is time for exams… What I am saying is that as a farmer, I learn and adapt. Because of that, I am often recognised at the regional and national levels. Please my farmers be patient with your land. It is all we have. No one will bring us any other extra land from somewhere else. Know how to treat your land and pamper it…to improve our farmlands, we should replace the nutrients using locally available materials with reduced quantities of fertilizers and we will see the profits we stand to gain afterwards"* **Chief Farmer (Radio campaign)**

5.1.1.5 Repetition and practical demonstrations

According to the scientists interviewed for this study, one tactic used in participatory communication was the use of repetitions and practical demonstrations to reinforce messages. This tactic helped scientists avoid possible misunderstanding and reduced the likelihood of farmers forgetting about the issues discussed during an interaction.

> *"When you teach something, to ensure that it has been understood, you have to ask or make follow up enquiries. You ask for examples from them [farmers] and ask them [farmers] to demonstrate it. Otherwise, forget it! You will assume that they have understood you but actually, you will realise that they have not understood you. So, you must always do follow up [demonstrations] to know that what you taught them has been understood."* **Joshua (In-depth interview)**

Joshua further went on to say:

> *"When you go to a farmer and you want to introduce something to him/her, you can't just get up and say farmer do this. No! What I know about change is that it takes years for someone to change. So you just tell the farmer for instance, Oh Agya Kwaku [name of farmer], they are talking about this and I believe that the thing will work so can you give me about a metre square plot of land in your farm for us to test if the thing will work? In that case, you are getting a demonstration plot in the person's own farm. The person goes about his normal farming business and you also do what you are doing and the results of what you are doing will tell the person what to do. So practically, this is the way you have to go about it. When you make a one-off recommendation to a farmer, he/she will not mind you. Your suggestion will be abstract until you demonstrate what you are saying. Demonstrating your suggestions for them to see the results is what will convince farmers.*

From the above, message reinforcement through repetition and the use of channels that allowed scientists to demonstrate the soil fertility management practices while farmers observed was essential for farmers' understanding. To this end, the ORM4Soil project used channels such as field visits and community demonstration or engagement sessions as a way of presenting the message(s) to farmers in the most practical way possible to enable them understand it. The importance of such channels is emphasized by the following participants:

> *"I think what helps farmers to understand the message is demonstration. When a farmer gets to see what you have been talking about for a long time, it helps him to understand and become convinced that what you are saying works… when you just go and tell him [a farmer] a combination of this chemical and this chemical does this, without him seeing what you are talking about, he will leave and what you are talking to him about will also leave [his mind] without being remembered or understood.'* **Richmond (In-depth interview)**

> *"Right from the beginning of the project, we involved them [farmers] in everything. We took them [farmers] to the field. They [farmers] saw how we added the treatments and also saw the crops and the yield. We didn't tell them this has more yield. We went to show them and they decided for themselves by selecting the treatments they would love to practice on their farms. A number of them even implemented their preferred treatments. So, they had a practical encounter of the things we were saying. It helped them understand and also equipped them to try what we had been discussing with them."* **Samuel (In-depth interview)**

The above shows a general agreement among scientists that no matter how much effort was put into talking and explaining issues to farmers, if farmers were not given the opportunity to physically experience the issues being discussed, it greatly hampered their understanding or appreciation of what was being discussed. Being cognisant of this, scientists in the ORM4Soil project after initial explanation of soil fertility management issues and the importance of attitudinal change, resorted to constantly reinforcing messages by repeating the salient points at every opportunity. In addition, messages were reinforced by allowing farmers to attend field visits or community demonstrations where they could observe or practice what had previously been discussed, ask questions and make decisions based on what they had observed. In the words of Joshua, communicating with farmers without reinforcing messages through demonstrations was like "*pouring water on a stone."* In other words, it was a wasted effort or an exercise in futility.

5.1.2 Dialogic tactics used by farmers

This study also found that farmers employed a number of tactics during conversations with scientists and with their colleague farmers. When farmers engaged other farmers, it was to encourage collective action or urge them to adopt the soil fertility management practices. In addition, farmers challenged each other to have a change of attitude. Farmers often asked scientists questions or sought clarification on some of the issues which had been discussed. In their conversations with scientists and other farmers, farmers used the following dialogue

tactics: analogies, testimonies, proverbs and reference to local knowledge. These are explained below:

5.1.2.1 Analogies

Farmers had a tendency to use analogies as a way of stressing certain salient points in their attempt to deepen their understanding of soil fertility management issues. For instance, the Chief Farmer compared soil fertility management to child care. Using such an analogy highlighted the gravity of neglecting one's soil and the consequences of continuous cropping on soils with low fertility levels.

> *"If you give birth to a child and don't feed the child or give it good food to eat or good training, the child will become malnourished with kwashiorkor and be stunted in its growth compared to his other siblings who are well fed. That is how our lands/soils are. The more we farm, the more the nutrients deplete. To improve our soils, we should replace the nutrients using locally available materials with reduced quantities of fertilizers and assess the profits we stand to gain afterwards."* **Chief Farmer**

Farmers also used analogies to encourage their colleagues to spread the lessons they had learnt from participating in the project. In the quote below, a farmer uses an analogy to describe farmers who fail to share new knowledge with their fellow farmers as greedy or selfish.

> *"...assuming you are hungry and visit a friend's home where you are well-fed but refuse to direct a hungry brother to that house upon your departure, then you are a greedy or selfish person. So I will urge my fellow farmers to share what they have learnt here with other farmers."* **Guest Farmer (Radio Campaign)**

Farmers also resorted to the use of analogies when they were urging behaviour change and adoption of the soil fertility management practices. The speaker in the example below urges farmers to be willing to step out of their comfort zones where necessary. In other words,

while farmers urged other colleagues to maintain beneficial farming practices, they urged them to be willing to discard harmful practices and try new things.

> *"…if we decide to learn, the business will evolve. But if we keep thinking 'me nim me nim' [to wit- we know more than the professionals] then things will be as they are. Someone will lament: for how long? But just like Prof said, it is a gradual process, so if a woman is able to get pregnant, give birth and have the patience to breastfeed till the child starts crawling then walking why can't we as farmers also be patient? My fellow farmers, if you do not give yourselves a chance to experience this [organic SFM practices], you will never experience its benefits. Let us try what the professionals are teaching and decide if it works or not."* **Chief Farmer (Radio campaign)**

By using the analogy of how a nursing mother patiently nurtures her baby, this farmer is able to clearly explain to his colleagues the need to, at least, try something new, patiently wait to see the results that new thing will yield and then make a decision to either adopt or not based on the observed results.

5.1.2.2 Testimonies

One common dialogic tactic employed by farmers during their interaction with their colleague farmers was the sharing of testimonies. Usually, farmers shared their experiences to encourage other farmers to adopt the discussed soil fertility management practices. Farmers also shared success stories and testimonies as a way of endorsing the treatments. Examples of farmers' testimonies are presented below:

> *"I am a cocoa farmer, I also cultivate oil palm and other things. Therefore, I use the cocoa husks and residue from the oil palm for mulching on my cocoa farms. Now, I know can these items can also be used as organic fertilizers and I am here to learn so I go and apply them on my farms. I also just learned that when you burn rice and maize chaff, you can also use the product as organic fertilizer. Rice husk is abundant in this area but previously, because we had no use for it, it was left as a mountain of waste. Now, I know rice husk can be put to good use. So, these are the things that I have just learnt and as the chief farmer, I have to go back and share with my fellow*

farmers… because this will certainly enhance farming and help us produce more for the economy. If we keep using chemical fertilizers which deplete the land and kill the micro-organisms in the land, it will cost more to the farmer and produce less yield in the long-term but if we implement this new technology and work with it, I am sure it will be of great benefit to our work." **Chief Farmer (radio campaign)**

"Taking a closer look at the programme, you realise that it is prominent here at Kwaebibrem, but I know of some people at Sege who are also participating in the project but are doing things differently than we are. For instance, instead of the biochar, they use cow dung, and what they do is, after collecting the cow dung, they dry it up to get rid of the heat that is in the dung before applying it as compost on their farms and you can tell the vast difference between those who use it and those who do not. And what I learnt is that, we can make use of the things around us that we used to dispose of because we did not know what to use it for. Now, we know their use and the various ways they can be applied to make farming less expensive. Even though the government says they have subsidised the price of fertilizers, a bag of fertilizer still costs 80GH excluding transportation, but if we use the cocoa pod husk that we used to throw away, the empty fruit bunch we ignored and others, I can find another purpose for that money I was going to use to buy the fertiliser. For instance, I can use it to pay my child's school fees. So I want to encourage every farmer to engage the Professor and his students to teach us everything about the things around us that we can use as organic fertilisers on our farms. **Farmer & member of the Kade IP, the submission was made during the radio campaign**

The sharing of testimonies was also used by farmers to encourage attitudinal change among farmers and to encourage them to share the new knowledge learnt with other farmers. This example is captured in the quotes below:

"This project has helped us because Prof taught us that we will always buy the white man's fertilizer; but the organic ones are always around us and easily accessible. The last time, some friends were asking me why I had gathered the EFB and cocoa pod husk and I told him that we have learnt something new. For instance some of the 'kramas' are sited at stony places where they leave the POME and simply cultivate plantain. Yet, the plantain yield from such places are better than those from the forest. My friend told me he had also heard of the usefulness of the cocoa pod

husk and urged me to use it on my farm. I told him I will only try on a small piece of my land and when I did, the yield was quite higher than usual. It has really helped. When someone asks me, just like the knowledge did not remain in Prof's head, I also don't want it to remain in my head. Some people don't teach others the new knowledge they have acquired but I teach so that others will also get to know about it." **FGD participant, Kade.**

The following participant also gave a personal testimony about how switching to the use of organic amendments had enabled him to save money that would otherwise have been used to purchase inorganic fertilizer. Based on the savings made, he urges other farmers to adopt the organic amendments in order to enjoy similar benefits.

"I personally will not make a loss by buying and using fertilizer and I will not burn the crop residue on my farm either. Like I said earlier, our fathers did not expand the lands available for farming. We are using the same lands they were using for farming so if you are a farmer, I implore you to add new farming practices acquired through research and development to your knowledge. When you speak to farmers, they disagree because what they do appear to be working for them; however, the continuous use of archaic farming practices is one of the reasons farmers are not progressing. We should listen and learn so we can all progress in the farming business and bring an end to the perception that farmers are poor people." **Chief Farmer (Radio Programme)**

5.1.2.3 Proverbs

During their submissions to colleague farmers, farmers used proverbs and idiomatic expressions to deliver their message and emphasize a point they wanted to make. Proverbs were used particularly when farmers were urging their colleagues to be open to learning about the soil fertility management practices. Two most used proverbs were: "Obi nnim a, obi kyere" and "Nyansa nni obaa ko tiri mu". 'Obi nnim a, obi kyere' is loosely translated as "if someone doesn't know something, another person teaches him". 'Nyansa nni obaa ko tiri mu' is also translated as "wisdom does not reside in only one person's head". The use of these two proverbs during farmers' submissions captured or highlighted the essence of

participatory communication and also stressed the need for farmers to be open minded in order to learn new things from other people.

> *"I always tell my fellow farmers that it is a problem when you do not know certain things because in most cases, someone else may be more knowledgeable than you. As such, one always has to investigate and find answers to what one doesn't know because 'obi nnim a, obi kyere'"* **Farmer, Kade FGD**

Another had this to say:

> *"Perhaps, you may think of yourself as older than even Methuselah but remember that there was also King Solomon who, though was very young, was filled with wisdom and excelled because of it. So if you don't have knowledge, seek it particularly from wiser people when they offer it. 'Obi nnim a, obi kyere"* **Chief Farmer, radio programme**

Another also shared the following:

> *"When we come here, we share ideas. Everybody's opinion matters. It is important that we share what we know and learn something new because 'Nyansa nni obaa ko tiri mu.'"* **Farmer, Kade, FGD**

Another proverb which was noted was "*wo anko obi efuo mua, wo dwene s3, wo nkoa ne okuafo"*. This is translated loosely as "if you don't go to another person's farm, you will believe yourself to be the only good farmer around." This proverb signified the need for one to get out of one's comfort zone, brace the odds and explore new things. It also connoted being courageous and prepared to take risks. By referring to this proverb, farmers who were already trying out the various soil fertility management practices encouraged their colleagues to explore and add new knowledge and skills to what they already knew.

Though not used often, one proverb that was used by farmers to stress group participation and the need for communal support was *"pray3 wo h) e, wo yi baak o a, na ebu, wo ka bo mu a, ere nbu"*. This is translated as "it is easy to break a single stick of broom but difficult to break many sticks of broom which have been bound together." This proverb stressed the

need for farmers to be united in their quest to improve upon their current farming conditions by getting on board, experimenting with new ideas and sharing their experiences with their fellow farmers.

5.1.2.4 Direct reference to local farming knowledge or farming practices

This study found that like scientists, farmers also made direct reference to local farming knowledge or farming practices handed down from generation to generation when making submissions.

> *"...If our forefathers succeeded at doing it, it was because they had more land at their disposal. The land has changed so there is the need for us as farmers to vary our ways... these days, due to new technology and new knowledge, we have the opportunity to improve on the farming practices of our forefathers"* **Farmer, FGD, Kade**

Another also said:

> *"Just as I said the other time, previously (generations ago), fertile lands referred to untouched [virgin] forestlands. Such lands were a sight to behold. When you walked through the farm, it was as if you were walking on woollen carpet. Our forefathers knew how to treat the land. For instance, they did not burn the grass immediately after weeding. Rather, they left the cut grass on the land and planted items like cocoyam and plantain ...that is the trick farmers of today are not aware of. By leaving the cut grass on the field, our forefathers were able to keep the top soil intact [and preserve the soil nutrients] so that it produced a very good yield to confirm the fertility of the land. But these days, farmers weed the land and burn the weeds thereby leaving the land bare and dry. In the event that it does not rain afterwards, farming on such a soil leaves crops malnourished and weak... So, all that they are saying now is something I agree with and hope they explain it better to the farmers so they understand because it is even going to help reduce our cost of farming or production since we will stop using the chemical fertilizers and switch to the organic fertilizers."* **Chief Farmer (radio programme)**

The quotes above shows that farmers' call for change was either based on a call to entirely discard certain current local farming practices or a call to modify and improve current ways of farming. By first referring to existing soil fertility practices, farmers were able to compare their advantages and disadvantages to those of the new soil fertility management practices being discussed and decide on the best way forward.

5.2 Findings in relation to research objective two: farmers' and scientists' perceptions about participatory communication about soil fertility management.

One of the objectives of this thesis was to explore the perceptions of both scientists and farmers about the use of participatory communication to discuss the issue of soil fertility management. The following section begins with a presentation of the findings of scientists' perceptions and follows with farmers' perceptions.

5.2.1 Scientists' perceptions of participatory communication

Among scientists, participatory communication was mainly perceived as an effective way of communicating with farmers because it fostered interaction which led to finding collective solutions to farming problems.

> *"Yes, it is a good thing… we want a situation where the farmer has a say, extension will have something to say, then the researchers will also have something to say. So, together we will have collective ideas about how to solve society's problems"* **Tony (In-depth interview)**

In the words of Joshua:

> *"Participatory communication helped ... it was fantastic. It was very effective because if we [scientists] had relied only on our knowledge and wisdom, we would have failed totally. But when we brought their [farmers] ideas on board, it really helped."* **Joshua (In-depth interview)**

Emmanuel also had this to say:

"This approach brought researchers, farmers, transporters, input dealers together to find solutions to a specific problem. It is not as if a solution was brought from somewhere and dumped on the farmers. So I see it to be open for farmers to share their ideas with researchers and other opinion leaders." **Emmanuel**

"The idea was to ensure that the farmers identified the locally available organic materials that could be used so that we [scientists] also meet them half way with scientific knowledge to improve what they do. The use of channels like the Innovation Platform (IPs) helped very much in this regard." **Richmond**

In addition, scientists perceived the use of participatory communication channels such as field demonstrations and community demonstrations as a means for message reinforcement. Demonstrations and field visits enabled farmers to practically experience and observe the soil fertility management practices which had previously been discussed at meetings. Once farmers could observe, they could ask and have their questions answered. This, in turn, helped farmers to make decisions about whether or not they wanted to adopt the soil fertility management practices. According to scientists, field visits also boosted farmers' confidence and made them own the research.

"*You see, you can do all the talking but what convinces a farmers is the things he can feel or see with the naked eye. Once a farmer sees evidence of something which has been discussed over a period of time, the farmer is in a better position to go and replicate that thing on his farm. If it works, he will adopt it. So in this project, the demonstrations really helped. We took the farmer to the field throughout all stages of the project to observe what was being done on the field. Then, we encouraged them to replicate or adapt their observations on their farms. Once they saw the results, it was easier to adopt based on their understanding…"* **Gideon (In-depth interview)**

"I think it [participatory communication] allows individuals to communicate whatever they have in mind. It allows everybody to say whatever he or she has in mind…when we come for the meetings, the farmers express their grievances and you see that they are happy because the project makes room for them to participate. Thus, their attendance to meetings is very encouraging. They attend enthusiastically. Also, during field visits, the farmers are excited because they see the solutions to the actual problems they are facing on their farms…" **Tetteh (In-depth interview)**

Scientists also reported a feeling of gratification or contentment after participatory interaction with farmers. For many of them, its use during the entire research process offered opportunities for immediate feedback and mutual learning.

> *"On a personal ground I think participatory communication is a very effective tool for engaging farmers. It makes you feel comfortable about what you are doing because you get immediate responses from the beneficiary of the information and also it makes you know where you are heading towards in terms of its social acceptance and profitability."* **Gideon (In-depth interview)**

By engaging farmers in a participatory way, scientists were able to address all their concerns instantaneously and also assess the likely outcome of such an engagement. Scientists were however quick to add that they also perceived participatory communication as expensive to implement.

> *"... It is a very good tool of communicating; however, it is a very expensive way of doing things in the sense that you need to keep bringing the farmers to the site. So in terms of transportation, meals and other soft ways of talking to them, you need money. Notwithstanding, it is the best way of communicating."* **Gideon (In-depth interview)**

Moreover, scientists indicated that the implementation of participatory communication in projects did not always guarantee that farmers will have some knowledge or ideas they wished to contribute to the discussion. According to them, it was common to find some farmers attending meetings fixated on the idea that scientists were the ones with all the solution to their problems. In such instances, farmers with such an ideology came to the discussion mainly to share their problems and were unwilling to volunteer possible local solutions to them. Therefore, participatory communication encounters required a lot of time to encourage farmer participation and explain the need for them to find local ways of addressing farming problems instead of always looking to find solutions from outside their local contexts.

"To me, it was good just that the challenge of opening it up to other people is that sometimes you try to let them come up with solutions but they will always be complaining about problems; meanwhile, the solution lies with them. The good aspect is that sometimes we try to make them identify local solutions to their problems and encourage them not to wait for help from external organisations. Sometimes, we are able to find local solutions to problems without the involvement of any external body. So the participatory communication works. The more the discussion is opened up to farmers, the greater the tendency for them to always highlight their problems but as scientists, we have a duty to help them divert attention from their problems and focus on finding useful solutions from within their environment. **Emmanuel (In-depth interview)**

5.2.2 Farmers' perceptions of participatory communication

The farmers interviewed during the FGD perceived participatory communication as useful based on three outstanding themes. First, they perceived participatory communication channels, in particular, as engaging and facilitating their involvement in research activities. This enabled them to verify the results of the previously discussed soil fertility management practices during demonstrations. Second, the farmers perceived participatory communication as resulting in mutually beneficial interaction which boosted their confidence. Third, participatory communication was perceived by farmers as creating an atmosphere that motivated them to work harder.

5.2.2.1 Participatory communication as enabling verification of soil fertility management recommendations

For farmers, participatory communication was perceived as useful because it allowed for dialogue with scientists throughout the entire project. Moreover, the use of channels such as field visits and community demonstrations helped to clarify their abstract appreciation of topics which had previously been discussed. By going to the field and observing how the various soil fertility management practices affected crop growth and yield, farmers were better paced to take decisions on the way forward.

> *"Field trips result in group discussions. First, we are allowed to roam through and observe the various plots. Then we converge and report back to the entire group, our assessment of the various soil fertility treatments based on the observed growth and yield. Each farmer then informs the group about the specific soil fertility management practice he/she is likely to implement on his/her farm. Our discussions and decisions are based on what we see or observe on the field."* **FGD participant, Sege**

Another participant had this to say:

> *"The entire project was done together with us. We were part of it. In fact, in previous times, we were only informed about research results. They will come and tell us: the researchers have done some research and they are saying farmers should adopt. But we had no way of verifying if the research was true. We were only told to implement the results of such research. But this one, when we decided on the locally available organic materials to use, everybody was given the opportunity to even try it out for themselves. So, we were able to verify the results for ourselves. The result was that in the end, it made it easier for farmers to adopt. This is better than only sharing the results of research done somewhere with us. If the guidelines are shared with you and you understand and implement it and you see the results, it is better than having someone do it somewhere and coming to inform you only about the results. It helps us to share ideas and know clearly what we are working to achieve. Nobody does it somewhere and comes to tell you"* **FGD participant, Kade**

5.2.2.2 Participatory communication as mutual interaction for mutual benefit

Farmers also perceived participatory communication as facilitating free speech. For most of them, participatory communication fostered democratic interaction in which the contributions and opinions of especially the farmers present were respected. Participatory communication gave farmers the confidence to voice their opinions without the fear of being judged:

> *"… All you have to do is to indicate by raising your hand that you want to speak. Nobody intimidates you, nobody is afraid, we talk freely. If only you want you speak, you show by hand and you are given the opportunity to speak."* **- FGD participant, Sege**

> *"My understanding is that I don't have the knowledge. So during participatory communication, I ask for explanations and nobody shuts me down."* **- FGD participant, Sege**

Farmers were highly appreciative of the interaction enabled by participatory communication because it provided them the opportunity to share their problems and also listen to and learn from both scientists and their colleague farmers. The more they interacted, the more farmers understood issues surrounding soil fertility in general and the soil fertility management practices being discussed in the project.

> *"I think the project set out to do this because our elders say "wisdom does not reside in one person's head". By the grace of God, we know our researchers have realised there is declining soil fertility and so they have drawn closer to farmers so that they get to understand what each farmer knows and learn from farmers' experiences… the result of participatory communication is that it leads to new knowledge which we can pass on to our children."* **FGD participant, Sege**

> *"One thing that made all of us come together and share ideas is that it helps us know what each farmer goes through. That is, the sharing of ideas when we come together makes us realize that every farmer has his own farming challenges and farming practices. The more we interact, the more we learn from the experiences of our colleagues. Due to this, some farmers have shared testimonies regarding how advice from their colleagues have helped them achieve improvements in their farms…so when we come together to communicate and share ideas, we get to learn a lot from each other and we practice what we learn in order to improve our farming."* **FGD participant, Kade**

5.2.2.3 Participatory communication as a source of motivation

One important perception of farmers about participatory communication was that it motivated and gave them hope of achieving success with their farming. Farmers saw the field visits, the experience and testimony sharing and the frequent interaction during meetings as a morale booster since such platforms provided them with the opportunity to learn new things from each other. Communicating in a participatory way made farmers

aware that most farming challenges encountered at the individual level were not peculiar. As farmers shared their problems and found solutions from the submissions of others, they were encouraged to persevere in the farming business until they became successful.

> *"Meeting together helps a lot because you can share a problem you might be encountering on your farm and receive advice from a colleague who has already experienced same… gradually, you get to know that, at least, there is hope or room for improvement so you also work hard to succeed"* **FGD participant, Sege**

Others supported this assertion as follows:

> *"Honestly, when we went to Sege and I saw the conditions under which they did their farming, I realised how fortunate I am here at Kwaebibrem. Because the nutrients have not been completely exhausted from the land here as is the case at Sege. So it encouraged me to do better."* **FGD participant, Kade**

> *"When we all meet and everyone is contributing, it brings some joy within and among us which also helps you to involve yourself well into the farming work."* **FGD participant, Kade**

Once farmers were motivated to act based on their understanding from the participatory interaction, they felt empowered to share the new knowledge with their fellow farmers.

> *"Our involvement empowers us to tell others about what we have been discussing and doing in the project. For example, I have applied the techniques to the extent that other farmers are also adopting them. The joint learning helps us to encourage others to practice it because we have experimented with it and experienced the results and so we can easily share the results with others."* **FGD participant, Kade**

Despite its perceived usefulness, participatory communication was seen by farmers as extremely time involving. The duration of meetings was long because the views of as many participants as possible had to be heard and issues explained till all participants clearly understood or agreed on what needed to be done.

> *"Sometimes, it prolongs decision taking. Because everybody is speaking, we have to wait for everyone to speak before we take a decision"* **FGD participant, Kade**

Also, farmers perceived participatory communication as having the potential to distract attention from the main issue being discussed. As more people were given the opportunity to talk, the more likely it was that discussions which were unrelated to the topic at hand would emerge to unnecessarily prolong meetings.

> *"In our attempt to share the good news with others, it opens up for people to derail the discussion or throw people off from the main discussion."* **FGD participant, Kade**

However, farmers indicated that they had accepted that dialoguing for mutual understanding required time. Therefore, even though meeting durations could be long, farmers indicated a willingness to stay throughout the discussion until everybody understood the message about what needed to be done to manage soil fertility loss.

> *"Participatory communication results in a more prolonged meeting time because we dialogue; but the good thing is that everybody leaves with an understanding of what was discussed and what has to be done. It is a challenge but not much of a huge challenge."* **FGD participant, Sege**

5.3 Findings in relation to research objective three: the conditions necessary for successful participatory communication

The third research question sought to investigate the conditions necessary for effective participatory communication. Both scientists and farmers shared some views on this issue. The data revealed a number of conditions that either maximised or minimised the level of interaction between scientists and farmers. The conditions deemed as necessary for successful participatory communication were identified as: honesty and transparency, knowledge of the socio-cultural context, knowledge of the local language, respect, involvement of opinion leaders, respect for farmers' time, selecting an appropriate venue, leadership and commitment

5.3.1 Honesty and transparency

Among the scientists interviewed, there was a consensus that for participatory communication to be successful, honesty and transparency were required at all phases of the ORM4Soil project. According to the scientists, being forthright about project aims, expectations from project participants and about what the project had to offer participants was essential to avoiding misunderstandings which could, in turn, influence participants' expectations and commitment to communication efforts.

> *"First, there must be honesty on the part of the researchers. They must tell the farmers what they want to do and take steps to engage everybody and clear all doubts. Secondly, there must be a contract-either a verbal or written social contract between farmers and researchers about each group's responsibilities in the project, what farmers can expect from the project and what researchers are bringing on board, okay? Thirdly, the agreements must be followed to the letter and if there is the need for change, there must be re-engagement between all concerned* – **Bright (In-depth interview)**

In the ORM4Soil project at the Ada West area, it appears that at the start of the project, researchers did not clearly explain to farmers what they could expect to benefit by participating in project activities. This affected participatory communication activities in the area. For instance, it was found that some promises made to farmers at the beginning of the project were not followed through. As one scientist put it:

> *"Okay, the initial communication we [project staff] had with the farmers was not very clear in terms of what the farmers stood to benefit from the project. We asked them to give us an acre of land for experimentation and promised to plough for them and only use a portion of it for research…but somewhere along the line, it's like, we adopted a new strategy where, we just, ploughed only a portion of the field instead of the whole field as we initially promised them."* **Tony (In-depth interview)**

In addition, right from the beginning of the project, there was confusion concerning farmers' receipt of some monetary incentive or reward for allowing portions of their lands to be used

for field experimentation. While the Kwaebibrem farmers were given some money especially during the first cropping season, the farmers in the Ada West area reportedly received no such money.

> *"Actually, the agric extension officers concerned, made the farmers think there was a lot of money which the project supervisors were not making available to the farmers. This led to farmers making a lot of demands that the project could not meet."* **Tony (in-depth interview)**

Richmond also explained further:

> *"The misunderstanding started from the beginning of the project. Although the first community got the concept and understood everything, I think the case was different in the new community. Somehow, members of the new community thought there was going to be a distribution of money…but Prof [mentions name] tried so many times to debunk this perception…"* **Richmond (in-depth interview)**

At Ada West, in particular, unfulfilled promises and unmet expectations dampened farmers' spirits and affected their commitment to project activities. During meetings, I observed that farmers appeared a bit distant or reserved and often had to be cajoled to partake in the discussion. One of such observations is reported below:

At this meeting, after the welcome and self-introduction, the lead project scientist reiterates the agenda for the day. One of the main issues for the day's discussion is how to strengthen the Sege IP and encourage self-help among farmers. When the floor is opened for further discussion, there is total silence. No IP member says anything. Farmers appear far in thought as if this is not what they had hoped will be discussed at today's meeting. The scientist then launches into a monologue. He reminds the group that the communication is supposed to be participatory. He further encourages members not to be selfish but to share their knowledge with the rest of the group. The researcher continues to encourage farmers to move away from a desire to always be in competition with fellow farmers instead of always being self-seeking and keeping their knowledge to themselves. All the submissions of the scientist are translated by the extension officer who further encourages the farmers to speak. When a farmer eventually speaks up, it is not to comment on the issue at hand but to lament on the need for monetary assistance from the project. In response, the scientist states that the project has no money for farmers but has knowledge to offer which when implemented, can change the farming fortunes of farmers in the area. Farmers at this point are clearly disappointed and appear not to believe this scientist.

Observation at Ada West IP meeting

At Ada West, seeming lack of transparency about money affected farmers' trust of scientists especially when they said the project had no money to offer. The disbelief and mistrust affected the extent of their involvement during meetings and informed the content of majority of their contributions during the discussion. Rather than focusing on discussions about soil fertility, there was a general tendency for farmers to keep making references to their farming problems and the fact that they needed money to solve those problems. This observation was confirmed by one of the scientists interviewed:

> *"It was obvious that farmers quickly expressed their grievances like not being given money and other farm inputs during meetings. But I always told them they didn't need money, what they needed for instance, was this platform [innovation platform] whose aim included mobilizing farmers to get the organic soil fertility resource in large quantities."* **Tetteh (In-depth interview)**

The scientists, in some instances, tried to rectify the situation by stressing that the project was not in the area to distribute money to farmers.

> *"So anytime we come to a meeting, I tell them you need the basic materials that the project is working with to improve soil fertility. I always try to make them understand the objective of the project."*- **Tetteh (In-depth interview)**

At Kwaebibrem, this strategy of constantly repeating project objectives to farmers coupled with a constant demonstration of project results to farmers worked. Though the Kwaebibrem farmers did not benefit fully from the incentive package, they were not too bothered because, at least, they had the opportunity to witness the results from farm visits and from their own experimentation. The situation was not the same at Ada West.

> *"Consistency or repetition of the message is key. Equally essential is being able to constantly demonstrate to the farmer. At Kade this was done, but I can't say same for Sege. So you realise that participation in Kade was higher than it was in in Sege."* **Samuel (In-depth interview)**

When there is honesty and transparency, farmers' involvement in project activities and in participatory communication is higher. This is because it generates trust among participants. On the other hand, the absence of honest and transparent communication creates disaffection

for the project and its activities especially when farmers believe they are being short-changed. Tony shares the importance of opening up about expectations in future projects:

> *"In future projects, I think that we can specify the project objectives and state the possibility of having some modifications in the course of project implementation. This way, when the time comes for any changes to be made, it will be easier for them to accept."* **Tony (in-depth interview)**

5.3.2 Knowledge of Socio-cultural context

This study found that for participatory communication to be successful, there was the need particularly for researchers to be conversant with certain social and cultural practices or values in the project area. These include: knowing the local language, respecting and involving local opinion leaders, respecting farmers' time and selecting appropriate meeting venues.

5.3.2.1 Knowing the local language

Some of the scientists interviewed suggested that one of the conditions central to effective participatory communication was scientists' knowledge of the local language because it had an impact on the ability of scientists to effectively interact with farmers using examples and references to things farmers could relate to. An inability to communicate in the local language was considered a major drawback in participatory communication encounters. One of the scientists put it this way:

> *"Another snag is the ability of the scientist or the communicator to effectively communicate with the farmers. I was fortunate to have been with them for a long time. I also spoke the same local language as they did and was usually with them in the same community. Moreover, I shared the same ethnicity. Therefore, I knew what they knew and could relate to them better. However, if you get a scientist who doesn't have these qualities, it will become a big challenge. For example if you are from the northern part of Ghana, the environment where you are brought up in is different. So assuming, I had to work in the northern part of Ghana, I could not have effectively communicated with them [farmers] based on what they know."* **Gideon (In-depth interviews)**

All the ORM4Soil project scientists spoke the Akan language which was the local language of the people in the Kwaebibrem area. As such, it was easier for them to communicate with farmers in that area, drawing on terms or examples they were familiar with. However, at Ada West, scientists and farmers relied heavily on translation services during interaction. This impacted effective participatory communication and the attainment of mutual understanding between scientists and farmers at Ada West. Although scientists agreed that translation may have contributed to less effective participatory communication at Sege compared to Kade, they downplayed the extent to which it was affected as evidenced in this submission by Gideon:

> *"Communication at Sege wasn't seriously affected in the sense that most of them could understand Twi and [mentions the extension officer] understood the Twi and so was able to translate it for the farmers. But I agree that communication was not as effective at Sege (Ada West) as it was at Kade."* **Gideon (In-depth interview)**

It is noteworthy however, that the issue of not knowing the local language at Ada West could have had a bigger impact on participatory communication and understanding of soil fertility management in the Ada West area than scientists were willing to admit. This is because, I observed the potential of losing message content during translation at meetings. The predominant language at Ada West is Ga Adangme, which is a variant of the Ga language which I understood. Given that both languages had some vocabulary in common, there were times when I could follow the Ga Adangme translations of scientists' messages by the extension officer. There were some instances where I noticed that the translator either exaggerated what scientists were saying or prompted farmers to provide certain response types to scientists. On the few occasions where I challenged the translator, he dismissed it with laughter.

But the gravity of the impact of translation on communication and understanding emerged during the focus groups at Ada West. Consistently, farmers recounted one of their main

disappointments with the project leadership as their inability to fulfil the promises made at the start of the project. For these farmers, since the project had failed to live up to its promise of giving them money to improve or expand their farming business, they found no reason to get extremely involved in the project activities in general and in communication sessions in particular. During the FGDs, when I probed further to know who had told them that such monetary assistance was available, farmers mentioned the extension officer (who doubled as the translator) as the source of such information. When I queried him, the translator admitted: *"I used to add some flesh to it."* **Tony (In-depth interview)**

The Ada West case clearly points out the need for projects to have at least one team member who speaks and understands the local language of the study area and also has a fair appreciation of local socio-cultural conditions from which they can draw examples during their participatory communication efforts.

5.3.3.2 Respect for and involvement of opinion leaders

Scientists emphasized that familiarizing oneself with the study context in order to identify the opinion leaders and pay homage to them prior to the start of the whole project was necessary for effective participatory communication. For this project, opinion leaders identified by scientists included community leaders such as chiefs, leaders of other prominent community-based groups of importance to the project, district extension officers and chief farmers or farmers who had received some form of reward or recognition at the district, regional or national levels for their outstanding performance. According to the scientists interviewed, opinion leaders could either encourage or discourage people's participation depending on the extent to which project leadership engaged and involved them in project activities. In other words, once project leaders were able to first explain project objectives to such leaders, the easier it was to garner the support of community leaders for project related activities.

"You need to engage the opinion leaders in the area. For instance, in the case of Kade or Pramkese, we involved all the opinion leaders, the district agric officer, the extension officers in the area, the chief of the area and the chief farmers. So, they were all part of the system because if we didn't involve them, they would be hurt. You see, in the social structure, wherever you enter into the society, words or information goes round so if they ask the chief or the head whether he is aware of the presence of visitors and he says no, then he, together with other community leaders, will then start to undermine the work you are undertaking in the community. But if you involve them, they will say "oh yes, when they came, they came around and we had a big chat." That will be a big plus to your efforts in the area. It is very good to know the social structure and involve them [community leaders] effectively. In addition, whenever you visit the community, you have to go and pay homage to the leaders and introduce yourself and your team to them. By so doing, if you even fail to visit them during subsequent visits, there will be no problem. But if you think that you are from the university and that you are dealing with only the agric extension officer, it will be difficult because when you go out of the town, word goes round to know what you came there to do and if you don't involve the opinion leaders, it will backfire." **Gideon (In-depth interview)**

The effect of having regular engagements with community opinion leaders was felt in the ORM4Soil project in the sense that particularly at Kwaebibrem, chief farmers, some members of the District Assembly and the presiding members of the District Assembly who were all farmers, were involved in project activities. They were present during meetings, field visits and community demonstration sessions. In addition, chiefs and sub-chiefs of the various communities where demonstrations were held were invited to participate in the meetings and given the opportunity to address the farmers. When they were given the opportunity to speak, these opinion leaders endorsed the project activities and encouraged the farmers to fully participate in all project activities. The situation was not entirely the same in the Ada West area. Even though the presiding member of the district assembly was a member of the IP, scientists did not rigorously engage and involve other opinion leaders like the chiefs. Consequently, such leaders were absent from project meetings and hence

could not endorse what the project was doing in the area and encourage farmers' involvement.

5.3.2.3 Negotiating access and acceptance

When scientists and farmers meet, it is typical for farmers to perceive scientists as more knowledgeable. At the same time, there is the potential for scientists to believe that they are more knowledgeable than the average farmer. The result of such a situation is the creation of an "us" versus "them" dichotomy when both groups meet which potentially threatens smooth communication. Being cognisant of this, scientists often attempted to close this gap between the two groups in order to gain acceptance by farmers. This was done by negotiating and redefining how farmers saw them. For instance, at the start of every interaction, scientists took the trouble to assume the role of farmers by explaining that even though they were coming from the University, they were also farmers who cultivated various crops. They also carefully explained to farmers that they had their interests at heart and were therefore interested in working with them to find mutual solutions to any agriculture-related problems they may have. It was therefore typical for farmers to make statements similar to the one below at the beginning of meetings:

> *"Today, we are here to learn from you farmers. Are you aware I am also a farmer? I am a farmer just like you. Although I work at the university, I am also a farmer. Farming is a noble occupation because, everybody ultimately has to eat to live. But the Ghanaian farmer has too many problems and we need to work together to find solutions to them. So this morning, I won't be doing the talking alone. We will be interacting or deliberating and sharing ideas especially on how we can improve the nutrients in the soils in which we plant"* **This statement from Gideon was made during an IP meeting at Kade. It was quoted from my observation notes**

During another meeting, another researcher negotiated group access and acceptance by reassuring farmers of their readiness or willingness to learn from them also.

> *"When we come here, we are all equal. Nobody knows too much than the other. Our elders say, 'Wisdom does not reside in the head of only one person'. What I have to say is important but what you also have to say is equally important. So feel free and speak…bring your suggestions and ask your questions. There are no right or wrong answers. We are interested in sharing ideas and learning from those ideas so we can improve on our farming. Remember that the ultimate goal is to find solutions to the problems we encounter on our farms. In this case, how do we build the nutrients in our soils without having to rely on the white man's fertilizer which is expensive and we always have to buy? What we are saying is that we can use natural or organic things within our environment. Things which we used to throw away just like that. Mind you, these things stay longer in the soil and help enrich the soil unlike the white man's fertiliser which can easily be washed away when it rains…"* **This statement from Samuel was made during one of the IP meetings at Sege. It was quoted from my observation notes**

At another meeting, Gideon stated:

> *"This morning, we have come all the way from Accra to discuss ways of improving farming in general and improving the richness of our soils. Because we are interested in learning from you in this project, we urge you to share freely. It is true that we have come from the University in Accra but we have farmers' interests at heart. I own a cocoa farm. In the same way, my colleague here also owns large acres of cocoa and citrus. Yes, we may be Professors but we are also farmers and we have worked with farmers from all over the country. You will be surprised to know that we also learn a lot from farmers when we meet with them. We also sometimes implement what farmers teach us in our farms or add to what we already know. So we work with farmers… we support farmers… together, let's think of how we can improve our farming instead of always waiting for government or the white man to bring us assistance"* **This statement from Gideon was made during an IP meeting at Sege. It was quoted from my observation notes**

Clearly, for participatory communication to take place, scientists have to relate to farmers as equals. Thus, they are forced to bridge any gap (whether real or perceived) which may exist between them and farmers to pave way for farmers to see them as colleagues who are genuinely interested in building partnerships to improve farming conditions and better

farmers' livelihoods. The more scientists identify as farmers, the easier it is for farmers to accept them for deepened interaction between. Moreover, when scientists identify as farmers, it breaks down any perceptions farmers have that scientists are far removed from their farming contexts and so do not understand or fully appreciate farming challenges enough to be able to provide workable solutions to them. Furthermore, when scientists identify as farmers, it boosts farmers' confidence in themselves, encourages farmers and makes them feel accepted. This, in turn, makes farmers tend to be more relaxed and open to contributing to a more insightful or engaging discussion. The following by some of the FGD participants at Kwaebibrem sum it up:

> *"When we come together we all share our thoughts and ideas … listen well and it encourages us and we communicate and share ideas… and we also practice it when we get to our farms …so it can also help improve our farming"* **FGD participant, Kade**

> *"This project has given people the opportunity to learn from us. The researchers and our fellow farmers learn from us. When we come together, everybody's opinion matters. As we interact, we have to listen carefully and always study so we can advise other people too."* **FGD participant, Kade**

5.3.2.4 Respecting farmers' time

One of the conditions for successful participatory communication observed in this thesis was the importance of scheduling meetings at the convenience of farmers and being punctual on the agreed day. In the ORM4Soil project, meeting days and times were largely based on farmers' availability. The extension workers at the various study sites worked closely with farmers to schedule meetings. Once meeting days and time were decided on, extension officers informed the research scientists. If scientists were available on the said date, it was agreed and preparations made towards the said date. If scientists were not available, farmers were informed to select a new date. The advantage of scheduling meetings on days chosen by farmers was that it increased the chances of assembling more

farmers and increased the likelihood that more farmers would be involvement in the discussion.

> *"They choose their time because they mostly have their own scheduled activities within the community. In order to avoid a clash with those communal activities and avoid a situation where farmers are unable to attend and participate in meetings, we leave it up to them to select a time that will be most convenient."* – **Tony (In-depth interview)**

Having decided on a date for a meeting, it was also important that scientists in particular attended on time. I observed the dissatisfaction of farmers when researchers were not punctual for meetings. Farmers did not hesitate to express their discontent when meetings were not started on time. A late start clearly affected farmers' degree of participation, their alertness and cooperation throughout the meeting. For instance, on one occasion, the research team arrived at Kade two hours late for a meeting. A meeting which should have started at 9 am began at 11 am. Upon arrival, the following was observed:

> The meeting venue was almost empty. The number of seats were more than the number of farmers present. The team from Accra were two hours late and very apologetic. Yet, the few farmers who had stayed behind were obviously unhappy. They took turns to express their disappointment at our lateness. They informed the team that most of their colleagues had left to attend to other equally important matters. One of them in particular was furious and questioned what right we had to keep him and his colleagues waiting for that long. Project team leaders allowed the farmers to express their displeasure, all the time apologising till tempers were calm before moving on to the day's agenda. However, it was obvious that on that day, farmers' enthusiasm levels were low. They did not contribute to the day's discussion as they usually did. As such, the day's deliberations were cut short.

Observation made during one of the IP meetings at Kade

Following this experience, it was subsequently decided that for meetings at Kwaebibrem, the team would travel a day earlier and lodge in the town in order to be punctual for the following day's meeting.

5.3.2.5 Choosing an appropriate venue

Another context related issue of importance to the participatory communication effort was the setting or place of meeting. Setting was critical to creating a congenial atmosphere for participatory communication to take place. For instance, at Kade, one of the first places where project scientists met with farmers was at a conference hall located at the district offices of the Ministry of Food and Agriculture (MoFA). This was observed:

> The setting was like a classroom with farmers seated facing the group of scientists who had showed up for the meeting. Behind the scientists was a white board where they occasionally wrote down points for discussion or contributions from farmers. Although project leaders tried to encourage farmers to take part in the discussion freely, it was clear how formal this particular gathering was. Farmers were not at ease. They were not contributing much to the discussion. Rather, they occasionally asked questions. It was obvious that majority of them wanted to listen to "instruction" instead of contributing to the discussion. The setting and seating arrangement created an "us" and "them" dichotomy. The setting and seating arrangements were defeating the project's aim of creating a level platform for participatory dialogue.

This observation was made during one of the earliest project IP meetings at Kade

Noticing the impact the setting and seating arrangement discussed above had on the day's interaction, project scientists decided to change the setting and seating arrangements of subsequent meetings. For instance, at both Sege and Kade, successive meetings were held in places such as church premises or under shady trees in the farm. This was to make them feel at ease and comfortable. During such meetings, the seating arrangement was highly informal. For instance, all participants often sat in a big circle with scientists dispersed around various points of the circle. When meetings were held in the farms, both scientists and farmers mingled freely. Some sat on logs, on boulders, some stood, etc. The flexibility in choosing meeting venues and deciding on seating arrangements successfully created a community feeling and stimulated further discussion among participants.

5.3.2.6 Leadership and commitment

One other necessary condition for successful participatory communication which emerged during data analysis was the level of commitment of project participants. According to some of the scientists, failure to clarify the roles and responsibilities of project members' right from the beginning of a project had tremendous impact on some members' commitment to the entire project. When people were not committed, it fuelled frequent misunderstandings and conflicts at the least opportunity. This situation further stalled the implementation of project activities. Additionally, misunderstanding among the project team members sometimes affected some members' readiness to coordinate and supervise various aspects of project activities. Ultimately, it affected the success of project activities;

> *"So the project at Sege failed basically because of a lack of leadership. It was a good concept but it didn't work because of a lack of leadership. A lot of things which were supposed to be done after the PRA were not done. You just needed to go the community and see the level of poverty and the opportunity to change it if we had coordinated properly and focused more on Sege."* **Bright (In-depth interview)**

The above quote from Bright perhaps harshly represents the situation at Sege as a failure. Yet, it rightly points to the fact that there were major implementation challenges at Ada West which, to a large extent, could be attributed to poor leadership and supervision. For example, no researcher was stationed at the Sege area. Aside the extension staff, all other project members lived outside Sege and only embarked on occasional field trips. Hence, not much time was spent in the area to check the accuracy and quality of what needed to be done on the field. This also inhibited the successful implementation of the Innovation Platform in the area. The situation was different at Kade where one of the main scientists was stationed in the community and so had enough time to supervise the field experiments and also engage the farmers. Indeed, reflecting on what could have be done differently, one scientist was of the view that in future,

> "*… ideally, there must be a researcher stationed in the community to monitor the project and see how things go. Supervision and implementation are necessary."* **Gideon (In-depth interview).**

5.4 Findings in relation to research objective four: how participatory communication facilitated adoption of soil fertility management practices.

The last objective of this thesis sought to ascertain how participatory communication facilitated adoption of the soil fertility management practices discussed in the ORM4Soil project. The findings suggested that participatory communication enabled farmers and scientists to engage further. The deepened level of engagement boosted farmers' understanding about soil fertility management. Once farmers understood better, they were more motivated and confident about implementing the soil fertility management practices.

> *"I didn't know that the EFB and cocoa could make the soil fertile but now I do. We used to throw those items away. So I attend meetings gladly because I knew what I got from the meetings. It is like going to church. If you don't understand the Bible, there is no point going to church. I come for meetings to get the knowledge, ask all my questions and understand it better so that I can implement it on my farm"* **FGD participant, Kade**

> *"During one of the field visits, I asked how come one bunch of plantain had so many fingers. They explained to me that it was because of the application of the EFB, empty cocoa pod husk. So based on that understanding, I also decided to come back and apply same on my farm."* **FGD participant, Kade**

> *"When I didn't know about this, I used to make huge investments because of the high price of fertilizers. With this new knowledge from Prof, it takes just a little investment to reap high yields. Now that we understand, we won't go back to fertilizer. Even Kwame Nkrumah said backwards never so we won't go back."* **FGD participant, Kade**

> *"Field trips result in group discussions. We discuss what we have observed. We were put into groups. So we observed various plots and discussed and reported back to the entire group, our assessment of the various treatments. Afterwards, we made decisions as to what treatment to implement on our farms when we go back to our villages. Our discussions and decisions are based on what we see or observe on the field."* **FGD participant, Sege**

> *"Knowledge is important. The black man always wants money. But I believe the knowledge gained is important. When applied, the results were evident for all to see in terms of yield. Now once you get a good market/price, you will sell and make money. It changes our standard of living."* **FGD participant, Kade**

Once farmers tried the soil fertility management practice(s) of interest to them and could testify about their benefits, they confidently shared their new knowledge with other farmers.

> *"Our involvement empowers us. Based on the understanding we get, we are now able to tell others about happenings in the project. For example, I have applied the techniques to the extent that a lot of farmers surrounding my farmlands are also adopting. Some are learning. The joint learning helps us to encourage others to practice what we are doing. We are able to share our results with our colleagues because we have experimented and seen the results of the soil fertility management practices."* **FGD participant, Kade**

> *"You see sometimes, the evidence speaks for itself. For instance, passers-by are able to approach you after observing your produce and ask "what did you do or what have you done to get such a fine produce? Then you take the opportunity to teach them."* **FGD participant, Kade**

The suggestion is that while participatory communication increased farmers understanding, motivation and confidence levels, it was not a sufficient condition to guarantee a long term adoption of soil fertility management practices. Evidence from the two agro-ecological zones revealed that aside communication, there were other factors which influenced farmers' decision to either adopt or reject soil fertility management practices. This suggests that although participatory communication is important, it is not solely adequate for adoption. In other words, eventual adoption is dependent on a combination of farmers' understanding and other intervening factors such as the affordability, availability and ease of use of the soil fertility management practices.

"Yes, the participatory approach helped to a greater extent to the adoption of the technology because the farmers were involved in the development of the project and were involved in the application of the labels to the treatments. At various points in time, they were invited to come and see and select the best treatments they want. So going through all these processes, nobody will tell them that this is good or bad. The communication strategies and the participatory approach we used helped actually to a greater extent for farmers to adopt the technology. However, other factors such as the affordability of the technology, the availability of the technology and ease of application also counted. For example, they [farmers] have seen that the EFB and the biochar can significantly reduce the money they spend on fertilizer but we are now constrained with how to send the EFB to the field. How do we prepare the compost? Because if you don't shred the EFB into smaller sizes, its decomposition will take longer. If we get a machine it will help with the adoption because it will facilitate the shredding and the compost preparation will be easier. Again, another capital intensive item will be the aboboyaa [tricycle]. So yes, although the participatory approach was very good, there are other things like affordability, availability and ease of use. All those things are important." **Gideon**

In addition to availability, accessibility and ease of use, the FGDs also revealed that adoption of soil fertility management practices was also dependent on additional factors such as the accessibility of soil fertility management materials, environmental or contextual factors and characteristics of the individual farmer.

5.4.1 Accessibility of soil fertility management materials to farmers

It was found that farmers were more likely to adopt the organic soil fertility management materials if they were easily accessible. For instance, at Kwaebibrem where farmers cropped large acres of oil palm, cocoa and rice, waste products from these crops in the form of empty fruit bunch, cocoa pod husk, rice husk biochar and POME were available in large quantities and were easily accessible. Thus, most farmers could access and use the organic materials identified in the area on their farms without having to worry about the cost of transportation. At Kwaebibrem as one participant from one of the FGDs stated:

> *"Some communities have kramas which make the EFB easily available. You just have to go for them. It is free of charge."* **FGD participant, Kade**

Another participant stated:

> *"The cocoa pod is available for free in my farm. I only have to ask my children to help me gather them and rent an abobo yaa [tricycle] to cart EFB for me. That is at a lesser cost than if I were to buy fertilizer. And I will get a lot of profit."* **FGD participant, Kade**

However, farmers at Kwaebibrem agreed that in a situation where farms were distant from the source of the organic material, it could affect their readiness to adopt the organic soil fertility management practices due to transportation costs they would have to incur. This issue about the transportation cost and its impact on adoption emerged strongly at Ada West. There, kraals were often situated farther from the farms to prevent the cattle from grazing on the food crops. This implied that the Ada West farmers had to spend extra money to cart cow dung from the kraals to their farms. Unfortunately, the economic conditions of the farmers in the Ada West area hampered their ability to access the cow dung and apply it on their farms.

> *"One of the challenge at Sege was that the cattle which produce the cow dung have a tendency to destroy crops. So, cattle are reared at a distance away from the farms. Thus, the cow dung has to be transported unlike at Kade where the empty fruit bunch and other things were available in the farms"* **Richmond (In-depth interview)**

> *"We now know the method but the cow dung is always far away from us so we need the machine [tractor] to always convey the cow dung to our farms. But we can't always afford to rent a machine [tractor] so we are appealing to the leaders and professors to help us solve this problem."* **FGD participant, Sege**

5.4.2 Observing the benefits of implementing the soil fertility management practices

Aside accessibility, one other factor which impacted adoption was the ability of farmers to observe the benefits of using the organic materials. If farmers could observe and experience

the benefits in terms of yield, increased profits, longer shelf life and the production of healthier food, it was easier for them to commit to adopting and using it in the long term.

> *"I have a higher yield. I don't need to be told. I have adopted and I am implementing the EFB and cocoa pod husk. Those amendments are beneficial not only for cash crops but also food crops like plantain. The produce is so big in size and so attractive that you can sell it at a higher price which increases overall profitability. We see an improvement in yield and it attracts a higher market price."* **FGD participant, Kade**

> *"The truth is, when you farm with chemicals, it affects the produce. For example, garden eggs and tomatoes have a short shelf life when you grow with inorganic fertilizer; but, such vegetables take a longer time before decaying when you grow with organic fertilizers. For example, with oranges, when you apply inorganic fertilisers, after a minimum of one week after harvesting, it will start wilting but if you apply the organic fertilizers, you can store it for up to about 40 days before it begins to wilt. So I know that in the same way, produce cultivated with fertilisers and organic inputs have different effects on the body when consumed. So food produced with organic inputs give more strength [nutrients] to the body compared those produced with inorganic fertilizers."* **FGD participant, Kade**

> *"With the inorganic fertilizer, I mean the NPK, exposure to a little heat after application causes a reaction that makes the crop die after harvesting one or two times. But with the organic fertilizer, you can harvest for a period of two months. If you harvest pepper, it will flower again, it will keep flowering and bearing fruit for about two months. And so the organic resource has an added advantage."* **FGD participant, Sege**

5.4.3 Contextual/environmental factors

This study also found a number of contextual or environmental factors which influenced adoption. These included the climatic conditions of the agro-ecological zone and the land tenure arrangements. The climate of the two study sites was significant to adoption of the organic materials. Kwaebibrem or the Kade area experienced more rainfall, and had relatively more fertile lands than Ada West. What this meant was that the conditions of crop production at Kwaebibrem were more favourable and could support the use of the organic amendments. To a large extent, farmers at Kwaebibrem could expect enough rainfall to

assist the organic materials to work to achieve the expected results. However, at Ada West, the climatic conditions were harsh and the fertility levels of the soil were worse compared to those of Kwaebibrem. Rainfall was erratic and the area experienced long periods of dry, scorching sun which destroyed crops. The prevailing climatic conditions at either site either contributed to or inhibited adoption. This was observed by one of the scientists:

> *"One other thing that affected adoption at Sege is the environment. Their farming conditions were not as profitable as those at Kade. They had very harsh climatic conditions at Sege and there was a problem with the availability of water. It was a harsh condition."* **Samuel (in-depth interview)**

During the focus group sessions at Ada West, farmers kept suggesting that though they understood that cow dung improved soil fertility and yields, other conditions had to be met. For instance, without irrigation facilities to water their crops, applying cow dung would be an exercise in futility. One farmer expressed his frustration:

> *"All we need is water and dam. When they apply the cow dung without water the thing [crops and soil] will not do well."* **FGD participant, Sege**

Another also stated:

> *"We need money to buy the sucker pump so that we irrigate and get the cow dung to work. This will mean more crops to sell and we will get money, plenty money."* **FGD participant, Sege**

For many of the farmers at Ada West, the absence of irrigation systems to provide water to support crop growth after the cow dung was applied served as a demotivation factor to the adoption of the soil fertility management practices.

5.4.4 Individual farmer motivation and commitment

Farmers' motivation and commitment to investing in the discussed soil fertility management practices was also a factor that influenced adoption. Many of the Kwaebibrem farmers had the extra money to invest in soil fertility management practices. Most farmers at Kwaebibrem were "richer", compared to their colleagues at Sege, because they cultivated

cash crops like cocoa and oil palm on lands which usually belonged to them. These two crops had a ready market and so they knew that they could easily sell off any additional yield which would come as a result of applying the organic materials. Moreover, the presence of peer influencers- farmers who had won awards- at Kwaebibrem had an impact on adoption. Notable or respectable farmers at Kwaebibrem often took the lead as early adopters. In most cases, such lead farmers were able to serve as sources of motivation to other farmers to also get involved by adopting the organic inputs.

> *"The farmers at Kade are dynamic. They grow cash crops with fetch them money. Some of them had won awards and they were able to pull other farmers because they trusted them. So for Kade, yes this influenced adoption. As we speak now, some of the farmers are using the technology. Sege, I don't think so."* **Samuel**

The situation at Ada West was completely different since farmers' motivation levels and commitment to investing in the land were low. Most farmers were just not in a financial position to invest their meagre funds into soil fertility management. As one farmer put it:

> *"Initially they told us they will be paying for the land they are using but those money didn't come so it has made us stop practicing what we have been taught."* **FGD participant, Sege**

His colleague was in agreement:

> *"This project is good but we don't have the capacity like the money to get the organic resources. We will appreciate any financial assistance to help us implement it."* **FGD participant, Sege**

An additional source of low motivation among the Ada West farmers was the fact that majority of farmers were migrants and were not land owners in the area. One scientist put it this way:

> *"The farmers at Sege are not motivated. They have very harsh climatic conditions. So they do a lot of other things to make ends meet. I will say for the farmers at Kade, they spend about 50-60% of their time on their farms but they do farming as a business so they devote more time to their farming activities compared to Sege where*

they do the seasonal farming and most of the farmers are migrants so when it is the rainy season, they come, when the rains go, they go away unlike Kade who farm all the time. So I saw Sege as a deviant... it was more challenging and I think that next time if we should design a project, I think we should focus more and devote more attention there" **Samuel**

5.5 Grounded Theory

A substantive grounded theory was developed from the findings of this study to explain participatory communication and adoption of soil fertility management practices. The model presented in figure 2 depicts the relationship among the various categories and subcategories which emerged from the data. During the coding process, the categories and sub-categories identified were as follows:

Contextual influences
Dialogic tactics
Motivations
Adoption influences
Committed leadership
Trust
Honesty
Transparency
Respect
Local knowledge
Metaphors
Examples
Proverbs
Testimonies
Analogies
Demonstrations
Perceptions
Observations

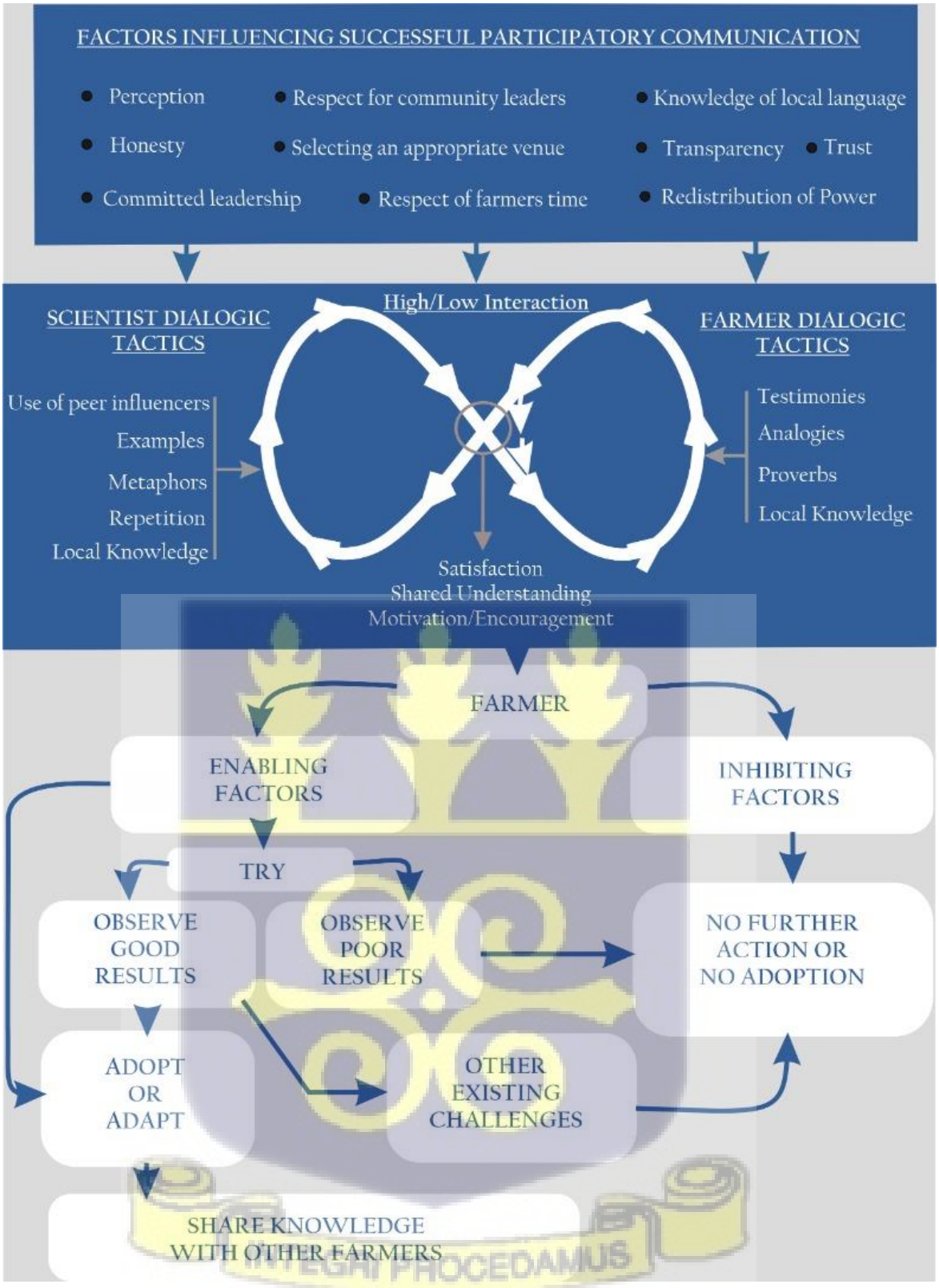

Figure 2: Model of the participatory communication and adoption of soil fertility management practices theory

5.5.1 Explanation of the model

After selective coding, the core category which was selected and around which this theory was built is influence. This is because from figure 2, the contextual conditions were found to inform the degree of participatory communication between scientists and farmers. A varied combination of the contextual conditions could generate either high or low interaction levels among discussants. During participatory communication, the dialogic tactics employed by farmers and scientists ensured joint learning and mutual understanding of soil fertility issues and also motivated and increased farmers' confidence in their ability to, at least, try the discussed soil fertility management practices. However, figure 2 shows that a farmer's ultimate decision to adopt specific soil fertility management practices was not a straight path but was determined or influenced by a set of adoption factors which ultimately informed farmers' choices in terms of whether or not they would adopt or reject the soil fertility management practices.

Figure 2 also shows that participatory communication ensures a two-directional interaction from scientists to farmers and vice versa and among farmers themselves. Again, figure 2 shows that the dialogue between scientists' and farmers' is infused with metaphors, analogies, proverbs, examples, testimonies from community based peer influencers, repetition and demonstration and direct reference to local knowledge. The use of these dialogic tactics in conversations about soil fertility management among scientists and farmers facilitates message simplification and mutual understanding. While scientists find this kind of interaction satisfying, farmers find motivation, encouragement and confidence from it.

Figure 2 also suggests that participatory communication is not intrinsically an adequate condition for sustained adoption of soil fertility management practices. Rather, other conditions or factors informed a farmer's decision to adopt or reject the discussed soil

fertility management practices. The factors which enabled farmers' decision to adopt soil fertility management practices were the availability, accessibility, affordability and ease of use of the soil fertility management practices, environmental factors such as favourable climatic conditions of the agro-ecological zone, land tenure and high income levels. Specifically, the study found that farmers who were motivated and committed to improving the fertility of their soils were those who owned their farmland and had the required extra resources for investment. On the other hand, factors which prevented farmers from adopting the soil fertility management practices, even when they understood their benefits, were the costs of transportation (due to the distance of the soil fertility amendments from the farmlands), unfavourable climatic conditions, absence of irrigation facilities, lack of resources, farming on rented land and farmers' unwillingness to invest in rented land.

Figure 2 also summarises farmers' pathway to adoption by demonstrating that while inhibiting factors were an outright deterrent to adoption, enabling factors encouraged adoption only after farmers observed the results following a period of trying the soil fertility management practices. However, if the results observed were good, (high yield) the presence of other challenges (such as bad market prices) served as disincentive to sustained adoption.

5.6 Chapter Summary

This findings presented in this chapter were based on analyses of transcripts from twelve in-depth interviews, ten episodes of an unscripted radio programme, six focus group discussions and observation notes. Data from these sources were analysed using the open, axial and selective coding procedures in grounded theory. During coding, I constantly compared the data from the various sources. The data analysis resulted in four major categories and several sub-categories which have been presented in this chapter in relation to each research objective. This chapter also presented a visual depiction and explanation of

the substantive theory which emerged after the data analysis. The next chapter discusses the findings of this thesis in relation to existing literature.

CHAPTER SIX

DISCUSSION OF FINDINGS

6.0 Introduction

The purpose of this study was to explore how participatory communication enabled scientists and farmers to explain soil fertility management to each other and how this interaction facilitated farmers' adoption of soil fertility management practices. The guiding research objectives were to:

1. Identify the dialogic tactics used by scientists and farmers during participatory communication about soil fertility management.
2. Identify farmers and scientists' perceptions of participatory communication about soil fertility management.
3. Identify the conditions that informed successful participatory communication about soil fertility management.
4. Describe how participatory communication facilitated the adoption of soil fertility management practices.

An examination of the categories which emerged in this study revealed their connectedness with the findings of previous literature. In this chapter, a discussion of the findings in relation to existing literature is presented.

6.1 Dialogic tactics used during participatory communication about soil fertility management.

The first research objective sought to explore the dialogic tactics used by farmers and scientists during participatory communication of soil fertility management. The findings of this research revealed that during participatory communication occurred at two levels: between scientists and farmers on the one hand and among farmers themselves in the presence of scientists on the other hand. In both scenarios, a number of conversational or

dialogic tactics were employed. While some of these dialogic tactics were used mutually by scientists and farmers, others were exclusive to either group.

6.1.1 Dialogic tactics used by scientists

Scientists communicated soil fertility management using the following dialogic tactics: metaphors, examples, direct reference to local knowledge, peer influencers and repetition of messages. The use of these dialogic tactics facilitated message acceptance and understanding among farmers.

The science communication literature suggests that during presentation of technical messages, experts, in particular, have to break down technical knowledge by using simple language and examples that non-technical people can easily understand (Marcu et al., 2015; Asplund, 2011). Scientists therefore explained soil fertility management drawing on metaphors and relatable examples. Doing this ensured that the message was properly understood. According to Asplund (2011), one effective way scientists can use to present technical messages to non-scientists is by relating the information being provided to familiar concepts using certain linguistic devices such as analogies, stories, metaphors and examples. This view is shared by Marková, Linell, Grossen and Salazar Orvig (2007) who argue that the use of such linguistic devices enable scientists to present complex messages in formats that make it easier for non-scientists to understand. For instance, in explaining how people made sense of synthetic meat, Marcu et al. (2015) referred to the social representations theory and suggested that people usually attempted to make sense of unfamiliar things or concepts by anchoring new or unfamiliar ideas in familiar ones using metaphors, analogies, contrasts and by asking questions to guide their understanding.

Metaphors, in particular, have been found useful for helping people to understand new and abstract phenomena or get a fresh perspective on things that they may have already been familiar with (Asplund, 2011). Docherty (2004) argues that human beings rely, to a large

extent, on metaphors to understand the things around them better by constant comparison or juxtaposition which helps them organise their thoughts and critically examine various scenarios before making decisions. This view is shared by Boozer, Wyld and Grant (1991) who also suggest that metaphors play an important role in structuring how people unconsciously perceive themselves, their lives and the world around them. Thus, metaphors are useful in communicating about technical matters.

It is however important to note that not every kind of metaphor is relevant or effective for conveying technical messages. Boozer et al., (1991) suggest that appropriate or effective metaphors are those that are derived from the intended audience's vocabulary and experiences. Boozer et al. (1991, p. 65), further suggest that metaphors that make reference to words which are familiar to the audience, stand a better chance of creating "logical connections" in the minds of the audiences.

Even though scholars like Rigney (2001) and Marcu et al. (2015) concede that metaphors cannot provide a complete picture of what is being described or explained and can potentially limit the scope within which non-scientific people interpret scientific topics, metaphors are still considered effective for helping non-scientists better appreciate and understand scientific messages (Rigney, 2001).

The use of a healthy human being metaphor to explain soil fertility is in line with the work of Bloksma and Struik (2007) who also used the metaphor of a healthy human being to explain how sustainable farms could be designed to farmers in The Netherlands. According to Bloksma and Struik (2007), using a metaphor of a healthy human during discussions with farmers is a powerful way of conveying soil fertility messages because of its ability to evoke imagery of life and health and also stimulate discussions about how to create and sustain healthy farms. In the same way, the use of the healthy human metaphor to explain soil fertility and soil fertility management not only facilitated understanding but challenged

farmers to strive to implement soil fertility management practices that would ensure that their soils were healthy and fertile enough to support maximum crop yield.

This study showed that while the essence of scientific topics such as soil fertility could not be reinterpreted based on discussions between farmers' and scientists, participatory communication allowed scientists to consult with farmers, unearth local realities, translate and communicate scientific concepts in locally relatable terms using the identified dialogic tactics for the purposes of achieving meaning for mutual understanding.

Moreover, the tactic of using peer influencers as part of participatory communication stimulated enhanced dialogue because farmers related better with information from their peers. This finding resonates with that of Bliss et al. (2019) who found that farmers appreciated and trusted testimonies or experiences from their peers because they were often honest portrayals of success stories and challenges encountered during the trial of various agricultural practices. Again, Rose, Keating and Morris (2018) highlight the relevance of peer to peer learning by suggesting that farmers listen more to advice emanating from "peer champions" who are mostly people who are, in many ways, just like them. In other words, peer influencers are credible and their experiences easily attracts farmers to engage them in further dialogue.

Repetition, according to Jackson (2016) does not solely refer to multiple use of exact words or phrases. Rather, it can refer to the use of ideas which are similar or have some sort of resemblance. Through repetition of similar ideas either during the same or at different meetings, scientists demonstrated the urgency of the message being discussed and reiterated the need for farmers to attach all seriousness to it. Although it has been argued that excessive message repetition can potentially cause people to lose interest (Cacioppo & Petty, 1989), in this study, message repetition did not cause farmers to be weary or disconnected from the topic but maintained their interest and facilitated better understanding. Thus, the value of

message repetition as found in this work confirms the literature which suggest that higher frequencies of repeated messages inform attitude formation and behavioural change (Kohli, Harich & Leuthesser, 2005; Nordhielm, 2002; Schmidth & Eisend, 2015). Moreover, the use of channels which allowed scientists to demonstrate the soil fertility management practices was another means of message reinforcement. This finding therefore supports that of Michelson, Barrett, Palm, Maertens and Mhango (2020), Kondylis, Mueller and Zhu (2017) and Lunduka, Snapp and Jayne (2018) who suggest that farmer-led demonstration plots are effective channels for enabling farmers to learn about new agricultural technologies such as Integrated Soil Fertility Management. Moreover, the finding supports that of Stephens and Rains (2011) that repeating messages through various complementary channels increases the audience's perceptions about the usefulness and relevance of the information being shared. The findings also support that of Bationo et al, (2003) that the repetition of messages through channels which allow for demonstration provides farmers with evidence which empowers them to make decisions about their most preferred soil fertility management practices.

6.1.2 Dialogic tactics used by farmers

The use of analogies, testimonies proverbs as dialogic tactics of farmers ensured that certain salient points were highlighted during their interaction in their attempt to deepen their understanding of soil fertility management issues. According to Nichter and Nichter (1986, p.63-64), "a good analogy is like a plough that can prepare a population's field of associations for the planting of a new idea…introducing ideas that do not relate to the local culture is like scattering seeds in the wind". This quote signifies the usefulness of analogies for providing relevant frames within which people can receive, interpret and understand new ideas. While there is evidence of the use of analogies in the health communication (Whaley, Stone & Brady, 2014; Galesic & Garcia-Retamero, 2013; Casarett, Fishman Alexander et al., 2010) and climate change (Rami, Stern & Maki, 2017; Armstron, Krasny & Schuldt,

2018) literature, their use was not evident in the agricultural communication literature. This finding therefore highlights the potential of using analogies for communication about soil fertility management.

According to Angladea, Godfroya and Coquila (2018), testimonies are experiential knowledge acquired by performing an action and shared to provide contextual evidence of what works. They suggest that testimonies are one of the elements of dialogue-based education. The importance of testimonies or success stories in dialogue, as found in this study, supports the findings of Angladea et al. (2018) who suggest that the exchange of testimonies between farmers and other practitioners enables the grounding of knowledge among them and also encourages autonomous and critical thinking. Moreover, this finding conforms to those of Lewis, Johnson, Farris and Julie (2004) and Irungu, Mbuga & Muia (2015) who suggest that the sharing of successful, real life experiences by real people helps to make a given topic more relatable and believable.

Proverbs are wise philosophical expressions which are used in to allow people to explain abstract things and assist people to better understand the world around them (Granbom-Herranen, 2018). According to Quan-Baffour (2011), proverbs are used in communication to indicate the importance of messages in most African communities. Similarly, Kqofi, Amate and Tabi-Agyei (2013) suggest that among the Akans, proverbs are used in discussions to assign more weight to a topic or issue under discussion. Obeng (1996) also suggests that, in some instances, proverbs are used euphemistically to explain something.

By using proverbs during dialogue, farmers in this study sought to emphasize and lend prominence to aspects of their message(s) to encourage behaviour change and adoption of the discussed soil fertility management practices. This finding confirms the significance of proverbs in agricultural communication as suggested by Singh and Dorjey (2004) who indicate that proverbs are powerful for conveying agricultural messages because they make messages more credible and facilitate behaviour change among farmers.

6.1.3 Dialogic tactic used by both farmers and scientists: direct reference to local farming knowledge or farming practices

One dialogic tactic used by both scientists and farmers was the reference to local knowledge. Both groups often referenced local knowledge as a basis for comparing the usefulness of local soil fertility management practices and the ones proposed by the ORM4Soil project. Thus supporting findings of scholars such as Warren and Rajasekaran (1993), Chikinzo (2006), Barrios and Trejo (2003), and Romanow and Bruce (2006) which suggest that local knowledge is a useful information base which facilitates communication and decision making in rural societies. Farmers' satisfaction and joy when their local knowledge was referenced during participatory discussions resulted in their deepened interest in project activities and increased their likelihood of trying the soil fertility management practices which had been discussed. This finding therefore supports that of Hemmerling et al. (2020), that referencing local knowledge in communication activities has the advantage of increasing the confidence that community members have in development projects and also increases their dedication or commitment to project activities.

6.2 Farmers' and scientists' perceptions about participatory communication about soil fertility management.

One of the objectives of this thesis was to explore the perceptions of both scientists and farmers about the use of participatory communication to discuss the issue of soil fertility

management. This objective was based on the argument that how participatory communication is implemented is dependent on how it is conceptualised (Ali & Sonderling, 2017). Both scientists and farmers perceived participatory communication as effective for message understanding and boosting farmers' confidence in implementing the discussed soil fertility management practices. Thus, supporting the findings of Mirani and Mirani (2013), Sanginga and Woomer (2009); Agyekum (2016), Adolwa et al. (2018) and Gwandu et al. (2014). However, while scientists bemoaned the cost of implementing participatory communication, both scientists and farmers expressed some reservations about the time required for interaction. Thus, supporting the findings of scholars like Bessette (2006) and Van de Fliert et al. (2010).

6.3 The conditions necessary for successful participatory communication

The argument that participatory communication does not occur in a vacuum (Tietaah, 2016) necessitated the third research question which sought to investigate the conditions necessary for effective participatory communication. Both scientists and farmers shared some views on this issue. The conditions deemed as necessary for successful participatory communication were identified as: honesty and transparency, knowledge of the socio-cultural context, knowledge of the local language, respect, involvement of opinion leaders, respect for farmers' time, selecting an appropriate venue, leadership and commitment.

The contribution of honesty and transparency to building trust in participatory communication efforts validates findings of authors like Vivian (1994), Adedokun (2008), Poulsen, Spiker and Winch (2014) and Tufte and Mefalopuos (2009). Moreover, the significance of socio-cultural factors such as the knowledge and use of local language, respecting and involving local opinion leaders, respecting farmers' time and selecting appropriate meeting venues to successful participatory communication confirmed some findings in the literature. For instance, the CTA (2005), suggests that knowing and using local language in soil fertility dialogue deepens the interaction. Also, Farrell and Hart (1998)

and Lee (2005) suggest that using local language for soil fertility communication helps to easily mobilise collective action. Where not knowing the local language necessitated the use of translation services, the study shows the possibility of having inaccurate translation of messages and how this can hinder effective participatory communication. Unfortunately, the literature is currently silent on the role translation plays in communicating about agriculture especially in rural contexts. There is therefore the opportunity for further research in this area. Furthermore, the value of respecting and involving opinion leaders as necessary for participatory communication confirmed the findings of Sackey et al. (2017) and Poulsen et al. (2014).

According to Hofstede (2017), there are culturally accepted power inequalities within the Ghanaian society. As such, most Ghanaians expect and accept a degree of hierarchical order where people occupy various ranks without explanation. However, Servaes (1996) suggests that conquering stereotyped thinking and redistributing power is important for genuine participation. Being cognisant of this cultural hierarchy, scientists often sought to reposition themselves by identifying as farmers and assuring farmers of their willingness to learn from them. For most farmers, such a repositioning/identification increased their confidence, put them at ease and facilitated their contribution to the discussion. Thus, this finding demonstrates the need for development actors to change their mentalities from vertical ones to horizontal or bottom up ones (Dagron, 2009; Mbisi & Penzhorn, 2010). However, beyond addressing possible gaps between scientists and farmers, the suggestion is that scientists also take steps to reduce or avoid relational gaps among farmers themselves on the basis of gender, social status or leadership.

Being time conscious, choosing an appropriate venue and having committed project leadership were other factors which were considered essential to successful participatory communication. While these factors have not been extensively investigated, Jaya et al. (2017) and Angladea et al. (2018) suggest that actions which present development actors as

courteous and culturally sensitive contribute to successful interaction. Moreover, committed leadership has been found to be critical for achieving group cohesion and facilitating group discussions (Van de Fliert, 2010; Jaya et al., 2017).

6.4 The extent to which participatory communication facilitated adoption of soil fertility management practices.

The last objective of this thesis sought to ascertain how participatory communication facilitated adoption of the soil fertility management practices discussed in the ORM4Soil project. The findings suggested that participatory communication enabled farmers and scientists have a deeper level of engagement which enhanced farmers' understanding about soil fertility management. This finding supports that of Azizah, Kliwon, Keppi, and Hamidah (2014) who suggest that farmers' levels of empowerment increase when they are involved in research projects which use participatory communication strategies. However, while participatory communication increased farmers understanding, motivation and confidence levels, it was not a sufficient condition to guarantee a long term adoption of soil fertility management practices. Rather, adoption was conditioned on the availability, accessibility and ease of use of the soil fertility management practice, environmental or contextual factors and characteristics of the individual farmer.

The findings on enablers and inhibiters of soil fertility management adoption found in this study corroborate findings of several other studies on the factors influencing adoption of soil fertility management practices. For instance, Ajayi et al. (2007) cite reasons such as household specific barriers (including lack of money for investment, household size, perceptions about soil fertility as a problem), policy and institutional barriers (land tenure, access to credit and markets) and geo-spatial barriers (different farming conditions in different agro-ecological zones) as reasons for low or non-adoption. Jamal et al. (2014) also suggest that adoption is influenced by factors such as the characteristics of the technology, access to credit, social influences and institutional factors. The findings of this study also

support those of Akudugu, Guo & Dadzie (2012) and Makokha, Odera, Maritim, Okalebo and Iruria (1999) who suggest that adoption of farming technologies is influenced by the benefits farmers expect to gain from adopting the technology, the availability of the treatments and the impact of the treatments on plant growth and yield.

6.6 Chapter Summary

This chapter discussed the findings in relation to existing evidence form the literature. The next chapter summarises the research findings and presents the conclusions, recommendations and areas for further research.

CHAPTER SEVEN

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.0 Introduction

Development communication research and practice in Africa have been largely informed by the application of either the instrumentalist or participatory perspectives to mainly assess the role of communication in achieving various outputs (Tietaah, 2016). Describing this approach as failing to respond to local realities, Tietaah (2016) advances a constructivist perspective to development communication in Africa which proposes an examination of how development communication accounts for participants' realities, media ecologies and encourages affirmative action.

Poor or ineffective communication is often identified as a barrier to farmers' adoption of soil fertility management practices (Spurk, et al., 2020). Yet, there is considerable theoretical evidence that participatory communication increases the likelihood of farmers' adoption of soil fertility management. This thesis argued that the available studies on participatory communication and soil fertility management tends to focus the channels that stimulate message exchange without addressing other equally important aspects of participatory communication.

Drawing from Tietaah's (2016) constructivist paradigm, this thesis argued that if one of the core elements of participatory communication is dialogue, then there is limited evidence of how the dialogue in participatory communication unfolds to facilitate message exchange(s) between scientists and farmers and how this dialogue then contributes to farmers' adoption of specific technologies. The study also investigated scientists' and farmers' perceptions about participatory communication, the contextual conditions for the successful implementation of participatory communication and assessed how participatory communication influenced adoption of soil fertility management practices.

Using a project on soil fertility management sited in two agro-ecological zones in Ghana, the study used a grounded theory design. Data was collected from scientists and farmers who participated in the project using focus group discussions, in-depth interviews, observations and reviews of transcripts of a participatory radio programme. In line with the procedures of grounded theory data analysis, data was analysed through the stages of open coding, axial coding and selective coding. To avoid bias in analysis, I did a line by line and complete thought coding of all transcripts to allow the findings and the substantive theory to emerge from the data. In this chapter, the main findings are first summarised prior to the presentation of the study's conclusions, contributions to knowledge, recommendations and areas for further research.

7.1 Summary of findings

This research found that during participatory communication, there was a dual pattern of interaction first, between farmers and scientists and secondly among farmers alone. Thus, while scientists interacted with farmers and vice versa, farmers also used the same opportunity to interact and ensure that the information being shared was adequately understood. The study also revealed that the discussion of scientific or technical subjects such as soil fertility management was informed by the use of dialogic tactics. While some of the tactics were exclusive to either scientists or farmers, others were common to the two groups.

On the part of scientists, the study found the exclusive use of four main dialogic tactics during participatory communication about soil fertility management. These tactics were metaphors, examples, the use of peer influencers and message repetition. Among farmers, three main dialogic tactics were exclusively used during participatory communication about soil fertility management. These were proverbs, testimonies and analogies. The common tactic employed by both scientists and farmers was the use of local knowledge as

conversation starters. The use of these dialogic tactics enabled effective message delivery and ensured mutual understanding of the soil fertility messages.

The findings suggest that while participatory communication in the context of science does not lead to the redefinition of evidence, it is successful in translating concepts into locally relatable terms for the purposes of achieving meaning for mutual understanding. The use of context appropriate metaphors, analogies, testimonies, examples and proverbs confirmed the literature that reiterates their usefulness for simplifying complex scientific messages (Asplund, 2011; Markova et al., 2007; Docherty, 2004) and attaching salience to issues (Singh & Dorjey, 2004; Quan-Baffour, 2011).

Another finding of this study was that scientists and farmers had multiple perceptions about participatory communication. Among scientists, participatory communication was perceived as effective especially for enhancing farmers understanding about the topic of soil fertility management; however, they also expressed worry about the expensive cost and time required to implement participatory communication. On their part, farmers perceived participatory communication as useful for in-depth understanding and appreciated the ability of the informed interaction to motivate them, increase their confidence levels and inspire them to try the soil fertility management practices while encouraging their colleagues to do same. By presenting findings on farmers' and scientists' perceptions about participatory communication, this study confirms the general preference of participatory communication for addressing soil fertility management (Rusike et al., 2006; Mugwe et al, 2009) and also adds to literature about the cost associated with implementing participatory communication projects (Bessette, 2006).

Moreover, this research also found that a number of conditions heralded successful participatory communication. These included honesty, transparency, trust among stakeholders involved in the interaction, scientists knowledge of the local language,

scientists respect for and involvement of community leaders in project activities, respect for farmers, selection of appropriate meeting venues, redistribution of power and the extent to which project leaders were united and committed to the participatory activities. While these findings broadly confirm those found in the literature regarding factors for successful participatory communication (Adedokun, 2008; Poulsen et al., 2014, Palis, 2006), the two agro-ecological zones studied revealed that varied combinations and degrees of all the identified conditions influenced the level of interaction or dialogue that unfolded in a participatory discussion. Of particular importance was the finding that translators could potentially jeopardize the communication effort by rendering inaccurate or exaggerated interpretations of messages especially in situations where development actors had limited knowledge of the local language.

This study found evidence that the main advantage of participatory communication was its deepened interaction and potential to generate understanding of soil fertility management. However, participatory communication did not singularly guarantee a long term adoption of soil fertility management by farmers. Thus, confirming the argument that access to information does not guarantee adoption of farming technologies (Mwangi & Kariuki, 2015). Rather, long term adoption was dependent on a number of factors such as access to soil amendment materials, the ability of farmers to observe the benefits of using the soil fertility management practices, context-specific farming or climatic conditions, land tenure arrangements, individual farmer wealth and the opportunity farmers have to learn from each other. These adoption related factors confirm those widely discussed in the literature (Ajayi et al., 2007; Jamal et al., 2014 & Akudugu et al., 2012).

The model that emerged from the data analysis explained the contextual factors affecting participatory communication, the dialogic tactics used by scientists and farmers during participatory communication and how they contributed to mutual understanding of soil

fertility management. The model also demonstrated that farmers' decision making process is complex and based on a combination of factors such as communication, climatic conditions, individual farmer motivations and preparedness to take risks and the characteristics of the soil fertility management practices.

7.2 Implications of research findings

The findings of this research confirm that participatory communication has the potential for facilitating successful dialogue that increases farmers' likelihood to accept and adopt soil fertility recommendations. However, its success is dependent on a number of contextual issues. The implication is that the optimism of participatory communication should be qualified by certain realities. Therefore, interventions which aim at utilising participatory communication should be cognisant of and address those realities in order to yield greater dialogic outcomes.

Another implication is a need to be more inclusive in the definition of participatory communication especially when scientific topics are concerned because while participatory communication does not redefine scientific evidence, it allows for scientific concepts to be translated using dialogic tactics that draw from local imagery. Thus, on scientific topics, participatory communication can be said to begin with consultation, lead to the discovery of local realities and appropriation of local concepts and result in achieving meaning for mutual understanding.

The findings also imply that even where participatory communication leads to a conviction about the value of a soil fertility management recommendation, the chances of that recommendation being implemented may be attenuated by factors such as the recommendation's ease of use, availability, accessibility, prevailing climatic conditions, land tenure arrangements, farmer motivations and preparedness to take risks.

7.3 Conclusion

Following the investigation of participatory communication from the constructivist perspective, this study concludes that when exchanging technical or scientific messages, farmers and scientists employ context specific dialogic tactics which are useful for message delivery and understanding. Again, a myriad of contextual issues determine the successful implementation of participatory communication. Moreover, based on the proposed theoretical model emerging from the findings, farmers' decision making processes are conditioned by multiple factors which inform their decision to adopt or reject agricultural practices such as soil fertility management. Lastly, despite the widespread depiction of participatory communication as a major panacea for overcoming the problem of farmers' low adoption of soil fertility management practices, this study concludes that participatory communication is a necessary but insufficient condition for enabling adoption. Instead, adoption is contingent on broader factors (including land tenure, climatic conditions, characteristics of the soil fertility management practice, availability of the soil fertility management practice) which may either exist at the individual farmer level or at the contextual level.

7.4 Contribution to knowledge

This study contributed to the development communication literature by providing evidence that participatory communication leads to scientists' awareness of indigenous knowledge forms and improves communication competence when those knowledge forms are made to inform messaging. This is done through the appropriation of local metaphors, analogies, examples, testimonies, etc. Moreover, the outcomes of participatory communication are not inevitably positive; but dependent on the salience of a number of factors in the reckoning of scientists and farmers. Lastly, participation and transmission are not necessarily incompatible or mutually exclusive especially in the case of addressing scientific topics such as soil fertility management.

7.5 Recommendations and areas for further research

Based on the findings of this research, this study firstly recommends the continuous use of participatory communication for engaging farmers about soil fertility management. However, the study recommends the generation and use of a context friendly register which consists of metaphors, examples, proverbs and analogies which will serve as a glossary of terms and usages and serve as a reference resource for explaining soil fertility management and how it can be managed.

Secondly, participatory approaches or designs must be sufficiently elastic to embrace degrees of consultations or empowerment. In other words, for participatory communication to be effective, the nature of participation cannot be prescriptive. Rather, it must be responsive to the contextual realities and subject matter of interest.

Given that the results of this study are exploratory and can only be applicable to the studied agro-ecological zones. There is the opportunity for further research to investigate how participatory communication unfolds in other agro-ecological zones with different contextual characteristics. Thus future research may expand the subject and scope in order to give breadth to the evidence assembled in this study. Furthermore, future research might consider or combine quantitative methods or designs in order to test the durability and validity of the substantial theory generated from the findings of this study. Lastly, future research could adopt a longitudinal study design to establish the long term sustainability of the identified participatory communication dialogic tactics

Hence, it will be useful for actors such as development planners, development communicators and researchers, agricultural researchers and extension officials as well as other relevant stakeholders involved in soil fertility management work in particular and work with grass root or local level issues to be mindful of these conclusions and incorporate them in future endeavours.

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APPENDIX I- Focus Group Discussion Guide for farmers

Introduction

The ORM4Soil project has worked with farmers over the last three years with the aim of finding locally relevant solutions to soil fertility problems. Throughout the entire project, participatory communication informed interactions between scientists and farmers. This research seeks to explore your assessment of participatory communication and how it informed the decision to adopt or reject the discussed soil fertility amendments.

A. General introduction and bio-data of the respondents

1. Can you please introduce yourself? State your name, how long you have been a farmer, educational background.

B. General assessment of participatory communication, creation and adoption of knowledge on soil fertility management

2. What is your understanding of participatory communication and what does it seek to achieve in the project?
3. What do you think is expected of you in participatory meetings? (example during meetings with researchers, innovation platform meetings, field visitations)
4. Who, in your opinion, usually come across as the key actors during such meetings?
5. How did scientists explain soil fertility to you?
6. What were the processes involved in the selection of the soil fertility techniques experimented with in this area? (probe for farmers' opinions about the extent of their involvement)

C. Perceptions of participatory communication strategies in knowledge creation and adoption of soil fertility management practices

7. Do your opinions matter in this project?

8. So far, have you witnessed a situation where your suggestion or that of a colleague farmer has been used in the project? (if yes, probe for examples)
9. In your opinion, how effective are the participatory communication strategies used in this project? (probe why?)
10. Would you recommend the implementation of participatory communication in other agricultural projects?
11. What, in your estimation, are conditions that inform successful participatory communication?
12. Which of these conditions were present or absent in the ORM4Soil project? (probe for specific examples)

D. Individual and contextual factors influencing adoption of soil fertility management practices in a participatory communication environment

13. Would you ascribe your decision to adopt the soil fertility practices to the use of participatory communication? (probe answers)
14. What factors, in your opinion and by your experience, facilitate adoption of a given soil fertility management technique? (probe to find out which factors are most important)
15. What factors in your opinion, inhibit adoption of a given soil fertility management technique?
16. Any other comments?

Thank you very much

APPENDIX II - Interview guide for scientists

Introduction

The ORM4Soil project has worked with farmers over the last three years with the aim of finding locally relevant solutions to soil fertility problems. Throughout the entire project, participatory communication informed interactions between scientists and farmers. This research seeks to explore your assessment of participatory communication and how it informed the decision to adopt or reject the discussed soil fertility amendments.

A. General introduction and bio-data of the respondents

1. Can you please introduce yourself? State your name, occupation, how long you have worked in the agricultural sector, educational background.

B. General assessment of participatory communication, creation and adoption of knowledge on soil fertility management

2. What is your understanding of participatory communication and what does it seek to achieve in this project?
3. How were you able to, in your dialogue with farmers, explain soil fertility and soil fertility management?
4. What were the processes involved in the selection of the soil fertility techniques experimented with in this area? (probe for the extent of farmers involvement)

C. Perceptions of participatory communication in knowledge creation and adoption of soil fertility management practices

5. What is your general assessment of the implementation of participatory communication in the ORM4Soil project?
6. In your opinion, how effective was participatory communication in this project?

7. Would you ascribe farmers' decisions to adopt the soil fertility practices to the use of participatory communication?
8. Would you recommend the use of participatory communication in other agricultural projects?
9. What are the difficulties which emerge as a result of using participatory communication? (probe for specific examples)
10. What do you think can be done differently to overcome these difficulties?

D. Individual and contextual factors influencing adoption of soil fertility management practices in a participatory communication environment

11. What factors, in your opinion and by your experience, facilitate farmers' adoption of a given soil fertility management technique? (Which factors are more important?)
12. What factors, in your opinion, inhibit farmers' adoption of a given soil fertility management technique? (Which factors are most important?)
13. Any other comments?

Thank you very much

APPENDIX III - Observation Guide

This document is to guide the things to be particular mindful of at innovation platform meetings, field visits, community demonstrations and studio discussions.

Things to observe and note down

1. Interactions among farmers, scientists and other agricultural stakeholders. Watch/listen for cues about how all the stakeholders exchange messages about soil fertility management for mutual understanding
2. Be conscious of any side comments/discussions and probe any interesting views during the in-depth interviews
3. Explore participants' verbal and non-verbal reactions during interactions