A LIVELIHOOD AND SYSTEMS-BASED APPROACH FOR UNDERSTANDING DRIVERS OF ADOPTION AND DISADOPTION OF ORGANIC FARMING IN IBADAN, NIGERIA

By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

Community Sustainability – Doctor of Philosophy
Environmental Science Policy – Dual Major

2019

ABSTRACT

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Livelihood challenges such as low income, food insecurity, and poverty are prevalent among farming and rural communities in sub-Saharan Africa (SSA) and are linked to low agricultural productivity. Boosting agricultural productivity is considered pivotal to improving the livelihood conditions of farming and rural communities in SSA. Some non-governmental stakeholders and international development agencies promote organic agriculture as a pro-poor strategy to help enhance agricultural productivity and farmers' livelihoods conditions in SSA. For reasons yet to be well-understood, the adoption rates of organic farming by smallholder farmers in SSA is low. To fill these gaps, in three essays, this dissertation investigated the barriers and the factors that influence and gender the adoption of first-party certified organic leafy vegetable production (OLVP) by smallholder farmers in Ibadan, southwestern Nigeria. First, we developed a gender-aware and livelihood-based conceptual framework named TALAF, which was used to inform the second and third essays. The first essay qualitatively examined the factors that influence, inhibit and gender the adoption of OLVP. The second essay investigated the factors and contexts that motivated disadoption of OLVP in the study areas in order to generate insights about what can be done to avert or stem the phenomenon. The third essay combined participatory causal loop diagraming with network analysis to map and contrast the similarities and differences in the causal mechanisms that dynamically interact to affect the adoption of organic farming in urban and rural Nigeria. As a whole, the dissertation contributes to the literature on the adoption, disadoption and gendering of organic farming in Nigeria and Africa. Through TALAF, the dissertation offers a conceptual framework that can help untie the complexity in technology adoption decision-making contexts.

ACKNOWLEDGMENTS

A special gratitude to my advisor Dr. Laura Schmitt-Olabisi for accepting to mentor and financially support my graduate education at Michigan State University (MSU). Thanks for ensuring that I was always ahead of my program expectations and for supporting me to explore opportunities that enriched me professionally and academically. I would like to express profound gratitude to my guidance committee members, Dr. Sieglinde Snapp, Dr. Lenis Saweda Liverpool-Tasie, Dr. Robert Richardson, and Dr. Kathleen Delate, who proposed that I do my PhD at MSU.

I also would like to thank Dr. John Kerr, Dr. Maria Claudia Lopez, Dr. Wynne Wright and Dr. Stephanie White for their contributions towards my academic and professional growth. They always wanted to see me improve and make progress. A special thank you to Dr. Wynne Wright, in whose class I incubated and fleshed out the idea that birthed the conceptual framework that was used to inform my dissertation. And a very special gratitude to Dr. Gail Vander Stoep, a friend, counselor and all-time supporter of me. Words cannot always convey my appreciation for your tremendous support and advise. Many thanks. To CSUS staff members and IT guys in the college, I say thanks for offering services that make being a student in the program remarkable.

To friends and colleagues, including Obafemi Elegbede, Timothy Silberg, Awa Sanou, Thanny Hour, and Udita Sanga, it was great being in the same program with all of you. To the African family in MSU, thanks for your comradeship.

To my siblings and mother, I thank you for standing forth for me, playing my roles as the *de facto* head of the family after the passing of my father. Father, Prince Adebiyi Hamza, it is sad that you could not witness me earn my doctoral degree, despite living your life for me to have a good educational and moral foundation in life.

To my children, thanks for your emotional and spiritual support and for always asking when was I going to get done. And to the Queen of the house, Dr. Fatimah Adebiyi, thanks for placing a hold on your career, catering to the family, while I was engaged in my program at MSU.

And to God, the beginning without any beginning and with no end, I thank You for seeing me through the program successfully and for making me emerge as a better person.

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CHAPTER 1

INTRODUCTION

In sub-Saharan African (SSA) countries, which include Nigeria, smallholder-based agriculture is the primary source of livelihood, particularly in the rural areas, where most of the population are domiciled (World Bank Group, 2016; Diao et al., 2017; Davis et al., 2017; FAO, 2017). Livelihood challenges such as poverty and hunger are prevalent among farming and rural households in SSA and are largely attributed to low agricultural productivity (World Bank Group, 2016; FAO, 2017). Organic agriculture is perceived by some stakeholders as a pro-poor strategy with the potentials that can contribute to improving agricultural productivity and the livelihood conditions of rural and farming households in SSA (Bakewell et al., 2008; UNEP-UNCTAD, 2008; Bouagnimbeck, 2011; Mamuya, 2011). Specifically, it is considered that organic management practices can help build and maintain soil fertility (UNEP-UNCTAD, 2008) and replenish severely degraded soils (Edwards, 2007; Bouagnimbeck, 2011). It is also argued that organic farming can open financially rewarding differentiated domestic and international markets, with livelihood enhancing opportunities for African smallholder farmers (Harris et al., 2001, Adebiyi, 2014, Ferrigno et al., 2005; Bakewell-stone, et al., 2008). Apart from Uganda, Tanzania, and Tunisia, the adoption of organic farming by smallholder farmers in Africa has been generally low, for reasons yet to be well-investigated (Adebiyi, 2014). This may be connected to the shortage, quality limitations, and availability of organic nutrient sources on smallholder farms in SSA (Connor, 2008; Kirchmann et al., 2008, Forster et al., 2012; Lotter, 2015; the difficulty of keeping weeds under control in organic, and the competing uses of organic matter materials as fodders for animals, as materials for building construction and as fuel for cooking (Grenz and Sauerborn, 2007; Forster et al., 2012; Lotter, 2015). I am also not aware of any standalone study on the disadoption of organic farming in SSA. If well explored, such an important topic, which was only given a marginal attention by Goldberger (2008) and Sodjinou et al. (2012), can help deepen existing understanding of the factors that are limiting the adoption of organic farming in SSA. In order to contribute to bridging the existing gaps in the literature, through a Nigerian case study and by

using a livelihood and systems-based approach, this dissertation investigated the factors that are driving, constraining and gendering the adoption and disadoption of organic farming in SSA.

Over a decade ago, first-party certified organic agriculture was introduced to farmers in southwestern Nigeria by local non-government organizations, which include the National Organic Association of Nigeria (NOAN), the coordinating body for all organic stakeholders in the country. The first-party certification is a locally-focused, smallholders'-oriented and group-based quality assurance system (IFOAM, 2006; Källander, 2008). It guarantees and certifies a farm organic through a participatory and peer-review process involving a range of stakeholders such as NOAN, agronomists, and farmers. The primary objective of NOAN is to leverage organic farming as a pro-poor strategy for improving the livelihood conditions of smallholder farmers in Nigeria by increasing agricultural productivity and farmers' income in an environment-friendly manner (Atungwu et al., 2016; Oyewole, 2015). To do this, NOAN undertakes capacity building and advocacy campaigns targeted at policymakers and farmers, as a way of attracting them to organic agriculture. NOAN also believes that the inability of most smallholders in Nigeria to afford synthetic inputs such as herbicides, pesticides, and fertilizer, due to their poverty conditions will motivate them to adopt organic farming (Oyewole, 2015). Studies have also indicated a growing domestic urban market and demand for organically grown products, especially, leafy vegetables in Ibadan and some parts of southwestern Nigeria (Dipeolu et al., 2009; Obayelu et al., 2014; Omonona et al., 2014; Adenegan et al., 2016). However, the adoption of organic farming by Nigerian smallholders has been limited and disappointingly low (Atungwu et al., 2016), for reasons yet to be investigated. This may raise some concerns about the suitability of organic agriculture to smallholder farmers' socio-economic conditions, a view echoed by Tal (2018). Also, existing studies such as Atungwu et al. (2016) only either alluded to, and/or demonstrated low adoption of organic farming in Nigeria without looking at the reasons for that. Consequently, this dissertation research was undertaken to investigate the factors that influence and constrain the adoption of first-party certified organic farming in Nigeria. During the scoping study that informed this dissertation research, it was gathered that some farmers who had adopted organic farming had discontinued using the technology and this was yet to be studied. From the scoping study,

and based on insights from the literature, it was observed that adoption can be gendered by the inherent attributes of organic farming and its institutional embedding (Tovignan, 2005; Thapa and Rattanasuteerakul, 2011). Studying why farmers disadopt a technology can help understand the factors limiting adoption and the suitability of the technology to smallholder farmers' conditions (Jones, 2005; Pedzisa et al., 2015). And as rightly observed by Jones (2005), disadoption is an integral part of adoption diffusion process that is rarely studied, possibly due to the paucity of data (Pedzisa et al., 2015). Therefore, the dissertation also investigated the factors that gendered and motivated the disadoption of organic farming in my study areas. This was to help bridge existing gaps in the literature, to provide useful information for the formulation of policies/strategies to foster the development of organic agriculture and address the factors gendering its adoption.

This dissertation construed the adoption of agricultural technology as a form of livelihood activity pursued by farmers in anticipation of certain livelihood outcomes, economic and non-economic. Adoption decision-making was also considered to be shaped by the interaction of many factors, which include farmers' livelihood assets, their vulnerability contexts and institutional embedding (Adato and Meinzen-Dick, 2002; Eyhorn, 2006). It was also considered that adoption can be affected by gender-related considerations such as the differential livelihoods assets held by male and female farmers and by the attributes of a technology (Adato and Meinzen-Dick, 2002; Tovignan, 2005; Sodjinou et al., 2015). Accounting for all such factors while framing technology adoption studies can help elicit a better understanding of the factors that interact to shape adoption decisions. Therefore, this dissertation draws on a gender-aware and multidimensionally grounded conceptual framework and on a systems thinking-based methodology to help capture and untangle the factors that synchronously interact to affect the adoption of organic farming in Nigeria.

To achieve its overarching objectives, this dissertation research was conducted on farmers who were growing first-party certified organic leafy vegetables in Ibadan, southwestern Nigeria. As later explained, southwestern Nigeria is the region where organic farming was pioneered in Nigeria. Most of the organizations promoting the technology in Nigeria are in this region. Also, it is the region where organic

farming is most established in the country (Atungwu et al., 2016). My study locations in Ibadan, which include Ajibode, an urban setting, Akinyele, a peri-urban area and Elekuru, a rural location, have the highest population of organic farmers (50) in Nigeria (NOAN, pers. comm., 2016). In furtherance of its objectives, this dissertation developed and draws on a conceptual framework named the Technology Adoption Livelihoods Assets Framework (TALAF). The dissertation also draws on causal loop diagraming, a qualitative system dynamics tool, that is considered well-suited for untangling the complexity associated with decision-making (Turner et al., 2013).

The dissertation takes the form of three essays, and a livelihood-based conceptual named TALAF, which was used to inform the second and third essays. As later elaborated, TALAF builds on Adato and Meinzen-Dick's (2002) revisions to the sustainable livelihoods framework. Chapter 2 explains how TALAF was developed and outlines its underlying assumptions. The second paper (Chapter 3) is entitled, "Drivers and Constraints to the Adoption of Organic Leafy Vegetable Production in Ibadan, Southwest Nigeria: A Livelihoods Approach." This essay addresses the question, what factors influence, inhibit and make the adoption of organic agriculture to be gendered? The essay used TALAF as its conceptual framework, to guide data collection and the analysis of the findings. The essay is qualitatively-oriented as it is based on data collected through participant observations of farmers' fields, group discussions, in-depth semi-structured interviews and focus group discussions. Data was collected from (1) organic farmers (2) non-organic farmers and (3) NOAN officers and government organic desk officers in my study locations.

The third essay (Chapter 4) is entitled, "A Livelihoods Approach to Understanding Disadoption of Organic Farming: Exploratory Insights from Nigeria." It is based on qualitative data, which were collected through semi-structured interviews with the entire population of farmers in Ajibode and Elekuru, who, at different times, had disadopted, that is, discontinued practicing organic agriculture. The objective was to elicit the factors and contexts that motivated their disadoption decisions, in order to generate insights about what can be done to avert or stem the phenomenon. Through this essay, I also sought to gain insights into the factors that may be constraining the widespread adoption of the

technology by smallholder farmers in the study areas. The essay construed disadoption as a complex decision phenomenon, involving the interactions of many interdependent factors. Drawing on Rigby et al. (2001) and Lehmann and Parker (2017), this essay also considered disadoption as an integral part of adoption diffusion process and as a dynamic decisional phenomenon that can be permanent, temporary, volitional or situationally compelled.

The fourth essay (Chapter 5) applied participatory causal loop diagraming to map and contrast the similarities and differences in the causal mechanisms that dynamically interact to affect the adoption of organic farming in urban and rural Nigeria. The essay is based on the loop and network analyses of the group causal diagrams, which were created during participatory system dynamics modeling workshops with organic farmers in Ajibode and Elekuru. Chapter 6 concludes the dissertation by highlighting the major findings and their implications. Finally, the data used for this dissertation and consent procedures for study participants received ethics clearance from the institutional review board of Michigan State University. **IRB Number:** x15-1034e.

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CHAPTER 2

THE TALAF: A DYNAMIC MULTIDIMENSIONAL FRAMEWORK FOR THEORIZING TECHNOLOGY IMPACTS AND ADOPTION DECISION-MAKING

ABSTRACT

Despite the progress made following decades of investments and research on technologies that enhance agricultural productivity in developing countries, adoption by smallholders is often minimal. Existing studies indicate a limited understanding of the decision-making context of smallholder farmers. Partly, this is because most adoption studies fail to consider the complexity associated with technology adoption decision-making. This has meant a need for dynamic analytical frames, with the conceptual capability and explanatory power for disentangling the complexity in farmers' decision-making contexts. To this effect, we propose a dynamic, and multidimensional, grounded conceptual framework, named the Technology Adoption Livelihoods Assets Framework (the TALAF). TALAF is based on existing revisions to the sustainable livelihoods framework, integrating insights and concepts from Rogers' diffusion of innovations theory, utility maximization, and social learning. Envisioned to be gender-aware, TALAF incorporates concepts and variables that can help theorize and understand the gendering of technology adoption. TALAF also accounts for factors beyond livelihood assets which can shape adoption decisions. These include the perceived attributes of a technology, vulnerability and opportunity contexts, intra-household decision-making dynamics, and institutional considerations. We discuss the potentials and limitations of TALAF.

2.1 Introduction

Increasing agricultural productivity in developing countries is considered pivotal for the improvement of the livelihood conditions of smallholder farmers (Adato and Meinzen-Dick, 2002; Thirtle et al., 2003; Alene and Coulibaly, 2009). However, the adoption rates of productivity enhancing technologies are generally limited and slow in developing countries (Bationo et al., 2011; Grabowski and Kerr, 2014; Corbeels et al., 2014; Meijer et al., 2015; Adebiyi et al., 2016; Brown et al., 2017). This suggests that farmers' technology adoption decision-making process, which is characterized by non-linearity (Nguthi, 2008; Borges et al., 2015; Meijer et al., 2015), and multifaceted interactions of many factors (Fisher et al., 2000; Meijer et al., 2015) is still not well understood (Doss, 2006; Meijer et al., 2015). Analytical frameworks/decision theories such as Rogers's diffusion of innovations, utility maximization, and social learning have been used to conceptualize and elucidate how farmers make adoption decisions (Adesina and Zinnah, 1993; Nguthi, 2008). Each of these frameworks provide insights into aspects of technology adoption. Each of them also has weaknesses and omissions which limit that insight. According to Borges et al. (2015), most of the existing frameworks/decision theories tend to offer a disciplinary guided way of conceptualizing and understanding adoption decisions. For example, utility maximization mostly frames adoption from a purely economic perspective, discounting factors such as beliefs and sociological considerations. With Rogers diffusion of innovation, adoption is framed from only a sociological perspective (Scholz, 2009; MacVaugh and Schiavone, 2010), ignoring factors such as subjective norms and attitudes. Because a single theory of decision-making cannot provide a deep understanding of the complexity surrounding adoption process, the need for the development of comprehensive frameworks have been identified (Borges et al., 2015; Meijer et al., 2015). This paper is an attempt to contribute to the ongoing scholarly efforts in this direction (Borges et al., 2015; Meijer et al., 2015). This paper proposes a dynamic and multidimensional livelihoods-based analytical frame named the Technology Adoption Livelihoods Assets Framework (TALAF). The TALAF draws heavily on the sustainable livelihoods framework, and integrated theoretical concepts and assumptions embedded in the diffusion of innovation theory, utility maximization, and social learning theory. It was also recognized that the adoption and

livelihoods outcomes of a technology can be gendered (Hall and Mogyorody, 2007; Farnworth and Hutchings, 2009; Thapa and Rattanasuteerakul 2011; Farnworth et al., 2015; Parks et al. 2015). This was reflected that in the TALAF to make it gender-aware.

This paper is organized as follows. First, I discuss the theoretical approaches from which I derived some insights to develop the TALAF. Thereafter, I discuss the sustainable livelihoods framework (TALAF progenitor framework), existing modifications to it and their associated limitations. The following section introduces the TALAF, highlighting and explaining its components, the underlying theories and concepts it draws on. Next, I discuss the strengths, limitations, utility, and operationalization of the TALAF. The last section concludes the paper.

2.2 Theoretical Models/Approaches for Framing Technology Adoption

In this section, I explain the theoretical models/approaches from which I derived insights to develop the TALAF. These include Rogers' diffusion of innovation theory, social learning theory, and theory of utility maximization. I focus mainly on aspects of the theoretical approaches/models that are relevant for the objectives of this paper.

Rogers' diffusion of innovation is a classic sociological theory that views adoption as a mental process. It contends that the diffusion of an innovation will be shaped by individual innovativeness, innovation characteristics and the channels through which an innovation is communicated (Rogers, 1983). Here, I dwell only on the characteristics of an innovation, which Rogers identifies as relative advantage, compatibility, complexity, trialability, and observability. Relative advantage is the degree by which an innovation is deemed to be better off than an existing one. Compatibility is the extent to which an innovation conforms to potential adopters' values, practices, needs, and experiences. Complexity speaks to the perceived ease of use and relative difficulty of understanding an innovation. Trialability is the extent to which an innovation can be tested on a small scale to gain experience. Observability speaks to the extent to which the innovation produces outcomes that are observable (Rogers, 1995).

Adoption studies on environment-friendly technologies such as organic farming (Deffuant et al., 2002; Parra-Lopez et al., 2007; Wiegel et al., 2009; Sodjinou et al., 2015) and agroforestry (Mercer,

2004) have used Rogers' theory. Conceptually, the theory does not provide insights on some of the underlying mechanisms informing the adoption of these technologies (Padel, 2001; Deffuant et al., 2002). Rogers' framework de-emphasizes the role of structural, economic and institutional factors that shape innovation adoption dynamics (Padel. 2001), instead focusing on the attributes of innovation to explain adoption rates (Rogers, 2003). Affirming this, Parra-Lopez et al. (2007) found that institutional, structural, and social considerations exacted greater influence on the adoption and diffusion of organic olive groves in southern Spain than the factors accentuated by Rogers. Besides, the theory does not explain the effect of commodity markets on the adoption of organic farming (Fisher, 1989), or the intersection between farmers' motives/production goals and the adoption of environmentally benign technologies (Padel, 2001). This limitation may be connected to the model's conceptual supposition that for an innovation to be adopted, its relative advantages must be observable to potential adopters. This may not hold for environment-friendly technologies, as their benefits and costs to individuals are not always conspicuous (Pannell et al., 2006; Klöckner, 2015). Potential adopters may not know *a priori* the plausible benefits that an individual will derive from adopting such technologies (Deffuant et al., 2005). Also, Rogers' theory discounts the public costs and benefits associated with an innovation, stressing instead the perceived direct individual/private benefits to a potential adopter (Wejnert, 2002; Lubell et al., 2011), while the benefits of environment-friendly technologies are social (Lubell et al., 2011).

Agricultural technology adoption studies, including on organic farming, have also used utility maximization as a framework for analyzing adoption decisions (Just and Zilberman, 1983; Grogan, 2012; Peterson et al., 2012; Veldstra et al., 2014). This framework supposes that farmers will adopt a technology with the highest expected utility to maximize profit (Rahm and Huffman, 1984; Feder and Umali, 1993). The explanatory power of utility maximization theory decreases when non-financial motivations are a major component of adoption decision-making (Edwards-Jones, 2006).

Social learning theory has also been used to study the adoption and diffusion of agricultural innovations (Foster and Rosenzweig, 1995; Bardhan and Udry, 1999; Munshi, 2004). Here, the underlying idea is that farmers can learn from their own experience using a new technology (learning-by-

doing after adoption) (Moser and Barrett, 2006; Genius et al., 2013). They can also learn by interacting with or observing their neighbors/peers/extension agents (learning-from-others) to acquire information that will help inform their adoption decisions (Bardhan and Udry, 1999; Moser and Barrett, 2006; Genius et al., 2013). In both learning-by-doing and learning-from-others, adoption decisions involve updating prior beliefs about the technology to decide whether to adopt the technology, use more of it, or partially/fully disadopt the technology (Foster and Rosenzweig, 1995; Moser and Barrett, 2003). Studies have drawn on social learning theory to model the adoption of organic agriculture (Lewis et al., 2011; Wollni and Andersson, 2014). Läpple and van Rensburg (2011), and Lewis et al. (2011) found a positively significant association between adoption and social learning from neighboring organic farmers. Wollni and Andersson (2014) reported a similar finding. One major limitation of the social learning approaches is the difficulty in empirically estimating the effects of social learning on adoption decisions (Berman, 2007).

So far, I have reviewed some of the theoretical frameworks widely used in the literature to conceptualize and elucidate agricultural technology decision-making. I also touched on some of their conceptual limitations. Each of the theories focuses on certain factors that matter for understanding adoption decisions. However, they overlook other equally important variables as well. This implies that no theory in itself is able to capture the multiplicity of factors that shape farmers' decision-making. Noting this, Meijer et al. (2015) argued, "the use of a single theory in analyzing decision-making could not provide a full picture of the adoption process" (p. 4). As a result, Meijer et al. (2015) called for a "comprehensive framework which takes account of the interaction of various factors" in farmers' technology decision-making (p. 4). A much earlier study by Fisher (1989) also suggested and demonstrated a need for a comprehensive framework for conceptualizing technology adoption decision-making by integrating three theoretical frames: Rogers' adoption-diffusion theory, induced innovation, and agroecosystem models. I make a similar effort in this paper by drawing on the theories that I reviewed to propose a dynamic, multidisciplinary and comprehensive framework that can be used to study decision-making of complex agricultural technologies such as organic agriculture. Unlike Meijer et

al. (2015) and Fisher (1989), this paper's contribution is founded on the sustainable livelihoods framework and is gender-aware. I also recognized that Moser and Barrett (2006) have proposed a dynamic econometric model for estimating the multitude of changing factors that interact to influence adoption decision-making over time. But, their model seems not suitable for a small-size adoption study.

2.3 The Sustainable Livelihoods Framework

The sustainable livelihoods framework (livelihoods framework) is a people-centered framework (DFID, 1999a). It was originally developed to understand and analyze factors that affect rural livelihoods and their interrelatedness (Chambers and Conway, 1992) and to assess the impacts of development projects on poverty reduction (DFID, 1999a). The livelihoods framework holds that people's livelihoods are based on a pentagon of five capitals: natural (N), human (H), physical (P), financial (F), and social (S) (DFID, 1999a, DFID, 1999b; Pound, 2011). The capitals are rationalized as stocks of dynamic tangible and intangible assets. They can accumulate, diminish, and be combined to pursue certain livelihoods goals (Scoones 1998; DFID, 1999a; Pound, 2011). Natural capital is stocks of natural assets, which provide flows and services including provisioning, regulatory, cultural and supporting services. Human capital consists of education, knowledge, skills, health status, labor quality, and leadership potential. Physical capital includes infrastructure, such as shelter, buildings, transportation and access to information. Financial capital is the monetary resources people need to realize their livelihood goals. Social capital includes social resources such as networks, formal group membership, and capacities of local organizations (Scoones 1998; DFID, 1999a; DFID, 1999b). The five capital assets are interwoven in a dynamic web (Pound, 2011). They can change constantly, in part due to complex interactions among different components of the framework, characterized by feedback effects (DFID, 1999a, 1999b).

The livelihoods framework contends that people will choose certain livelihood strategies in expectation of certain livelihood outcomes, which also feed back into their capital base. The underlying assumption is that people will engage in livelihood activities/strategies that enhance their capital assets, and simultaneously reduce their vulnerability. This implicates utility maximization as the theoretical underpinning of the livelihoods framework (Eyhorn, 2006). The livelihoods framework also espouses that

capital asset formation is affected by policies, institutions, and vulnerability contexts. Vulnerability consists of shocks (e.g. storms, flood, changes in weather conditions and economic conditions, pest diseases and epidemics), trends (e.g. population, governance, national/international trends) and seasonality (e.g. prices, production, health, labor, crops, market, credit access). An individual's vulnerability is affected by policies and institutions, and capital assets. Capital assets have influence over policies, institutions, and processes, and vice versa (DFID, 1999a, DFID, 1999b; Scoones, 2009).

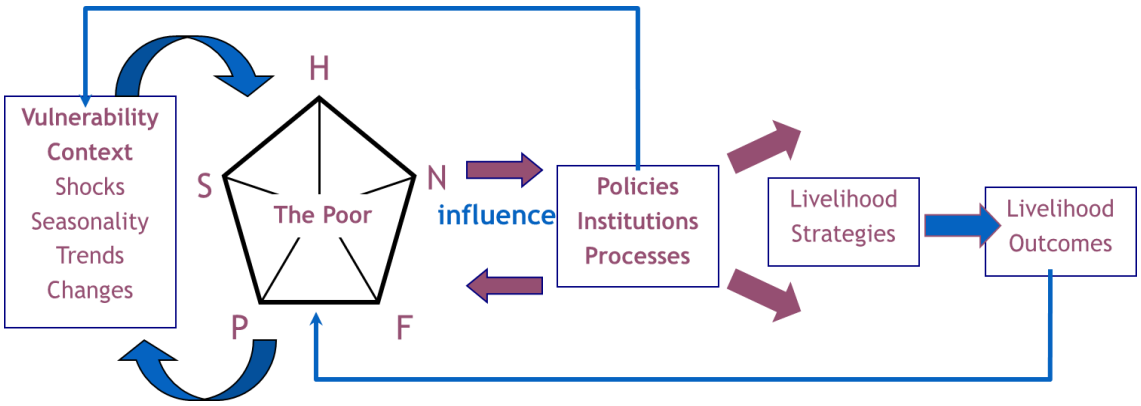

Figure 2.1. Sustainable Livelihoods Framework (DFID, 1999a)

2.4 Technology Adoption Studies and the Sustainable Livelihoods Framework

Adoption and impact evaluation studies have drawn on the livelihoods framework either as a standalone, or in conjunction with other frameworks (Eyhorn, 2006; van Dijk, 2008; Jermann, 2011, Ayuya, 2015). For example, van Dijk (2008) integrated agricultural innovation systems into the livelihoods framework to study the adoption of organic farming and sustainable rice intensification in Pondicherry, south India. The integration embedded the livelihoods framework within the broader contexts in which adoption decisions take place. Building on Wiesmann's Theory of Action and Rural Livelihoods System, Eyhorn (2006) also modified the livelihoods framework to account for missing components such as the non-economic factors that shape adoption decisions (Eyhorn, 2006). Similarly, arguing that the livelihoods framework omitted the process through which a technology is adopted or rejected, Dinh et al. (2014) modified it by drawing on Rogers' diffusion of innovations.

There are several reasons the livelihoods framework has been used either as a conceptual guide to frame adoption studies or to evaluate the livelihood impacts of a technology. First, the livelihoods framework recognizes that rural livelihoods systems are complex, as they consist of several interconnected dimensions including the social, economic, institutional, policy and vulnerability contexts, with interactive feedback effects (Alene et al., 2006; Eyhorn, 2006; Adato et al., 2007; Carpenter and McGillivray, 2012). Besides, the framework offers a systemic lens through which the multiple factors that inform the decision to adopt certain livelihoods systems can be conceptualized. Furthermore, the livelihoods framework allows for identifying, measuring and analyzing the various dimensions of the livelihood impacts of a livelihoods strategy (Adato et al., 2007). In addition, the livelihoods framework is flexible (Adato et al., 2007; Nyamwena-Mukonza, 2013) and receptive to modifications (Nyamwena-Mukonza, 2013). As demonstrated by Alene et al. (2006), Eyhorn (2006), and Dinh et al. (2014), this means that the livelihoods framework can be adapted to account for the missing dimensions that may affect the adoption of agricultural technologies, or aid in evaluating their livelihoods impacts. It also means the livelihoods framework can be integrated with other concepts (Ashley and Carney, 1999; Adato and Meinzen-Dick, 2002) and approaches (Ludi and Slater, 2008), such as Rogers' diffusion of innovation theory (Dinh et al., 2014) and agricultural innovation systems (van Dijk, 2008). The flexibility and receptiveness factor is particularly important for this study as it seeks to modify the livelihoods framework to propose an improved analytical frame that can be used to conceptualize the adoption and livelihoods impacts of agricultural technologies. To do this, I considered the conceptual limitations of the livelihoods framework.

2.5 Technology Adoption and Conceptual Limitations of the Livelihoods Framework

While the livelihoods framework has been used to understand technology adoption by households, it is not without some conceptual flaws and limitations. For example, it does not explicitly capture how gender, power, power relations, and inequality affect livelihood strategies (Adato and Meinzen-Dick, 2002; Carney, 2003; Adato et al., 2007; Ludi, 2008); however, gender intersects with technology adoption decisions (Tovignan and Nuppenau, 2004; Thapa and Rattanasuteerakul, 2011). Also, intra-household

power relations can affect access to and control over household resources which influence technology adoption (Doss, 2001; Nguthi, 2008; van Eerdewijk and Danielsen, 2015). Second, the livelihoods framework fails to account for non-economic considerations such as values, family status, and dignity, which are relevant for understanding technology adoption (Eyhorn, 2006). Third, it underplays the role of risks and opportunities, focusing instead on vulnerability contexts that affect livelihoods systems (Eyhorn, 2006). Fourth, the framework does not explicitly specify how people make livelihood strategy choices such as agricultural technology adoption decisions (Alene et al., 2006; Dinh et al., 2015). Fifth, technology/innovations are assumed to be captured under the human and physical capital elements of the livelihoods framework (Nguthi, 2008). As a result, technological innovation as a means of livelihood strategy is not explicitly visible in the livelihoods framework (Nyamwena-Mukonza, 2013; Dinh et al., 2015). Six, culture is not included in the livelihoods framework (Adato et al., 2007). Whereas, culture, which comprises traditions, social norms and values, and belief systems affect technology decision-making (Dubois, 1972; Palis, 2006; Wollni and Andersson, 2014).

Some studies have revised the livelihoods framework to address some of the omissions stated above. For example, Adato and Meinzen-Dick (2002) revised the original DFID livelihoods framework (see Figure 2.1) by including agricultural technology. Despite that, they fail to capture how technology adoption decisions are made as a form of livelihood strategy, a flaw which Eyhorn (2006) sought to address. To do this, Eyhorn (2006) replaced the five-asset pentagon at the core of the livelihoods framework with a nine-squared mandala. Eyhorn's newer framework does not include agricultural technologies as a form of livelihoods strategy pursued by rural households, nor does it account for how agriculture adoption decisions are made. These flaws were addressed by Dinh et al. (2015), whose study incorporated Rogers' thesis on the attributes of innovation and innovation-decision-making process into the livelihoods framework. However, Dinh et al. (2015) were not able to capture the role of gender *per se* and gender-related factors in the adoption of agricultural technologies.

2.6 The Technology Adoption Livelihoods Asset Framework (TALAF)

As shown above, the frameworks proposed by the studies that modified the livelihoods framework are not without some conceptual flaws in their ability to describe agricultural technology adoption. So, building on insights and flaws from those studies, I propose a new conceptual framework (Figure 2.2), named the Technology Adoption Livelihoods Assets Framework (TALAF). In developing the TALAF, I incorporated Farrington et al.'s (1999) insight that the livelihoods framework is "essentially an integrating device … relying on integration with other approaches and methods, as the context requires" (p. 10). As such, I appropriated insights from Rogers' diffusion of innovations, utility maximization, and social learning to modify the livelihoods framework. The TALAF also integrates technology adoption into the livelihoods framework. Technology adoption decisions are inextricably connected with farmers' livelihoods contexts, including their livelihood assets, vulnerability contexts, as well as their policies and institutional conditions (Eyhorn, 2006; Ayuya, 2015). The integration reveals the interconnection, enabling researchers to ask appropriate questions that can help tease out the intersection between farmers' livelihood conditions and agriculture technology adoption decision-making.

To integrate technology adoption into the livelihoods framework, I mainly expanded on the revisions by Adato and Meinzen-Dick (2002) to DFID's livelihoods framework. I took into account that Adato and Meinzen-Dick's (2002) adapted livelihoods framework assumes that technology adoption is linked to just livelihoods assets, vulnerability, and institutional contexts. They fail to explicitly capture other factors, and generally, the heterogeneous context under which adoption decisions take place. For example, adoption decisions are affected by technology attributes (Padel, 2001; Parra-Lopez et al., 2007; Goswami and Ali 2011; Moumouni et al., 2013), and by cultural norms and values (Eyhorn, 2006). Also, Adato and Meinzen-Dick (2002) did not categorically include gender and gender-related factors in adoption decisions. Therefore, drawing on existing literature, the TALAF accounts for the fact that intra-household decision-making contexts are highly complex and heterogeneous, and that access to, and control over households' resources may be gendered. It also accounts for other factors that intersect with adoption and which will allow for a gendered analysis of adoption decision-making. Among others, these include

culture, gendered division of labor, access to, and control over resources, as well as technology attributes (Tovignan, 2005; van Eerdewijk and Danielsen, 2015; Polar et al., 2017). This makes the TALAF well-suited to elicit explanations regarding gender *per se* and gender-related questions associated with the adoption and livelihoods impacts of a technology.

To further make TALAF amenable to gender analysis, the following three components of the framework were connected to *agriculture technology adoption*: (1) the five livelihoods assets (2) vulnerability context, and (3) institutional and policy context. In doing this, I recognized that male and female farmers may, for example, be exposed to different vulnerability contexts, with that likely to affect their technology adoption decisions (Meinzen-Dick et al, 2011; Johnson et al., 2006). In addition, men and women farmers may have different asset endowment and access to extension support, with that likely to gender adoption decisions (For details, see Meinzen-Dick et al., 2004, Ndiritu et al., 2014; Mulema and Damtew, 2016). By capturing such intersections, conceptually, the TALAF can help illuminate a gendered analysis of adoption decision trends under varied livelihood assets, vulnerability contexts, and institutional conditions.

Following Adato and Meinzen-Dick (2002), the TALAF also conceptualizes that farmers will draw on their *livelihood assets* to make adoption decisions, considering their *vulnerability context*s. Combining *livelihood assets* with agricultural technology as a form of livelihood activity will produce specific *livelihood outcomes*, which in turn, will feedback into *livelihood assets*. The effects that the *livelihood outcomes* will have on *livelihood assets* will impact the decision of whether to continue using or to disadopt the technology. As further shown, *vulnerability context* will be affected by *institutional and policy context*, with the latter having a two-way relationship with (1) livelihood assets, and (2) agricultural technology adoption. The framework also illustrates that *institutional* and *policy context* will have a direct effect on livelihood activities pursued by farmers, and therefore, on the *livelihood outcomes*. Taken together, the TALAF helps visualize the interconnections between technology adoption decisions, different facets of farmers' livelihood conditions, and other explanatory variables such as gender *per se* and gender-related factors.

The TALAF is characterized by double-headed arrows, connecting some component of the framework to the other. The double-headed arrows indicate the dynamic nature of the TALAF. They also foreground the role of feedback and social learning in my conception of the non-linearity of technology adoption decision-making. Here, my conception of feedbacks builds on Ngwira et al.'s (2014) definition, as "the information that is obtained about the outcomes, characteristics, and/or consequences of" adopting a technology (p. 109). As a result, I rationalized feedbacks as a learning process, taking cues from Sterman's (2014) elucidation that "learning is a feedback process" (p. 14). Here, I assumed that the adoption of a new technology will produce outcomes that feed directly to the five livelihoods asset-base, and through the latter, affect technology adoption decisions. I equally assumed that a newly adopted technology will produce outcomes that will feedback into adopters' vulnerability contexts, with the magnitude and direction of the effects likely to shape existing adoption decisions (learning by doing). I further theorized that non-adopters/disadopters may opt to adopt a technology after observing its actual livelihood impacts on adopters (learning from others). So, in constructing the TALAF, I built on social learning theory, hypothesizing that farmers will learn either from their own or other farmers' experiences to decide whether to continue use, or partially/fully disadopt the technology. The double-headed-arrows linking adoption decision-making with livelihood assets, and vulnerability contexts illustrate this process. Additionally, like its progenitor, the livelihoods framework, the TALAF is asset-based. Studies have explained the implication of this. Accordingly, Eyhorn (2006) argued that as an assets-based framework, the livelihoods framework inherently assumes that farmers will make rational choices to pursue livelihood strategies that will help increase their stock of capital assets while reducing their risks and vulnerabilities, implying that utility maximization is intrinsic to the livelihoods framework (Eyhorn, 2006). The TALAF preserves this theoretical underpinning.

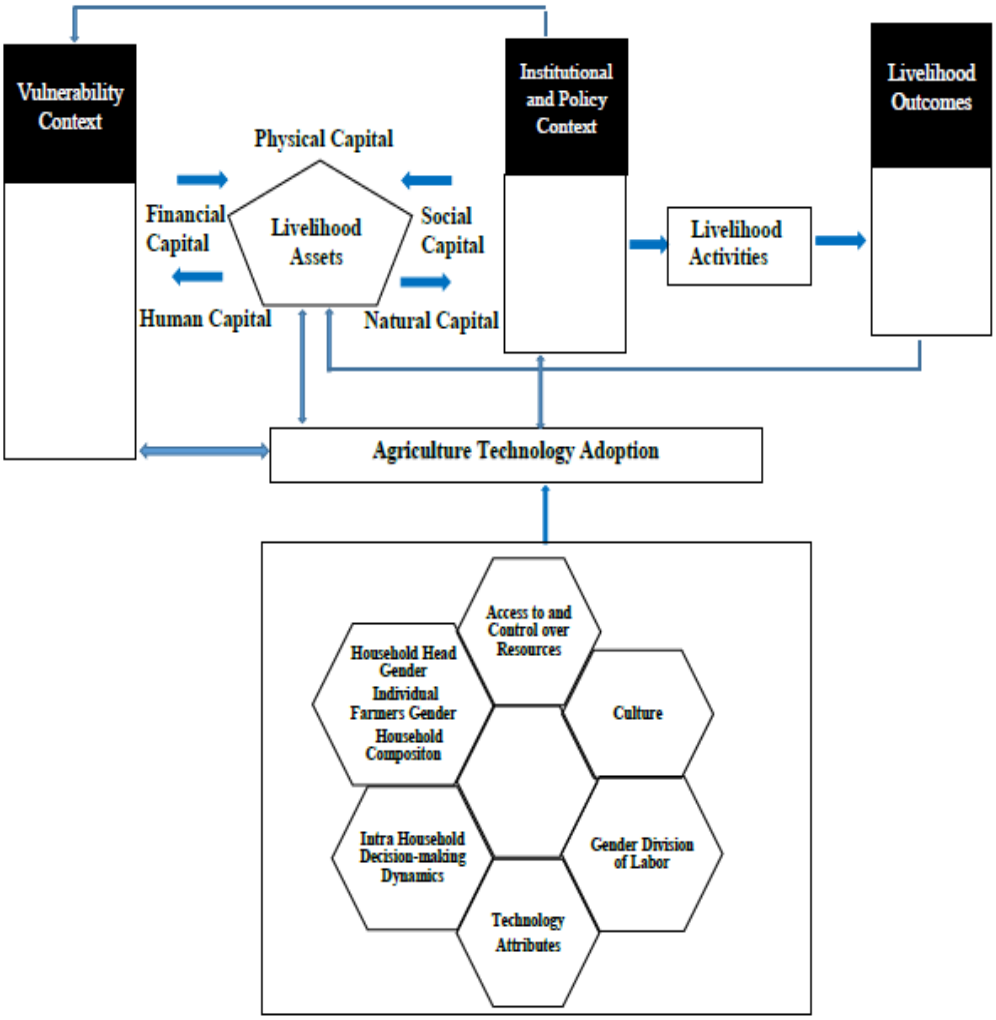

Figure 2.2 Technology Adoption Livelihoods Assets Framework (TALAF)

2.7 Conceptual Strengths, Limitations, and Utility of the TALAF

Conceptually, the TALAF has some potentials and limitations. The TALAF links technology decision-making with the broader livelihoods, opportunity, vulnerability, and institutional contexts within which farmers are situated. It also incorporates the dynamic linkage between adoption decisions and the perceived/actual livelihood impacts of a technology. As a result, the TALAF offers a heuristic and holistic tool with potentials to help disentangle the multidimensionality and complexity associated with technology decision-making. As previously shown, the TALAF builds on social learning theory, with a basis in sociology and psychology (Rogers, 2003), expected utility maximization, which was developed

by economists, and diffusion of innovation, a theory propounded by a sociologist. Individually, each of the theories emphasizes and illuminates different aspects of adoption decision-making contexts (Maertens and Barrett, 2012). For drawing on the three theories, the TALAF can help foster a profound understanding of adoption decision making contexts. Besides, the TALAF can help reveal the differential adoption of agricultural technologies by men and women, as it captures gender *per se* and gender-related factors associated with adoption decision-making contexts. Despite its potentials, the TALAF has some limitations, including failing to categorically capture the immaterial dimensions of livelihood systems.

A potential utility of the TALAF is that it can be applied to conceptualize the livelihood impacts of a technology. Here, the TALAF can be instrumented to frame questions and to inform the dimensions of the livelihood impacts of a technology to be evaluated. This is because the different components of the TALAF make it conceptually enabling to ask appropriate questions and identify important dimensions of the livelihood impacts of a technology to be assessed. Such questions may include: how does the adoption of organic farming affect farmers' vulnerability contexts, and livelihoods capital assets? A limitation of most livelihood impact assessment studies is their focus on yield and farm revenue, which are just two items in farmers' baskets of expected outcomes. Applying the TALAF to inform a technology livelihood impacts assessment can help overcome such a limitation because of its multidimensional and broader focus on factors beyond yield and economic gains. As a gender-aware framework, the TALAF can be used to elicit the perceived and actual gendered impacts of a technology.

A mixed-method research design is proposed for operationalizing the TALAF to inform technology adoption and livelihoods impacts studies. This is because the dynamic nature of the TALAF means endogeneity is a potential concern, and one way to handle that is by combining qualitative and qualitative methods (Adato and Meinzen-Dick, 2002) or by using methods that incorporate a *systems* approach (Richardson, 2011). In addition, the complex interplay of the interacting components in a multidimensional and dynamic framework such as the TALAF can are best uncovered by using mixed-methods (Eyhorn, 2006; Kiptot et al., 2007). Some components of the TALAF such as social capital and vulnerability are difficult to quantify (Grootaert and van Bastelaer, 2002; Farrington et al. (2002). And,

gender, culture and power relations are considered best elucidated using mixed-methods (Behrman et al., 2014).

2.8 Conclusions

The objective of this paper was to develop a comprehensive framework that can be used to conceptualize and disentangle the complexity associated with technology adoption decision-making. This was achieved this goal by building on Adato and Meinzen-Dick's (2002) adaptations to the livelihoods framework to propose a new dynamic, and multidimensional analytical frame, the TALAF. I integrated insights from three theories, including Rogers' diffusion of innovation, social learning theory, and utility maximization to develop the TALAF. The TALAF can help untangle the multifaceted interactions of that factors that influence adoption decision-making. It can also be applied to conceptualize and understand how a technology and its impacts can be gendered.

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CHAPTER 3

DRIVERS AND CONSTRAINTS TO THE ADOPTION OF ORGANIC LEAFY VEGETABLE PRODUCTION IN IBADAN, SOUTHWEST NIGERIA: A LIVELIHOOD APPROACH

ABSTRACT

Nigeria, the seventh most populous country in the world, is plagued by livelihood challenges such as poverty and food insecurity, which are more pervasive among farming households and rural communities. Organic farming is being promoted by some domestic non-organizations as a means of addressing the problem of poverty and food insecurity among farming households and rural communities in the country. Promoters considered organic farming not only well-suited to smallholder farmers' socio-economic conditions in Nigeria but also that it can help improve their livelihood conditions through increased agricultural productivity and farm income. However, the adoption of the technology by smallholder farmers has been underwhelming, for reasons yet to be studied. Using a livelihood-based framework called TALAF and through a case study of farmers in Ibadan, Oyo State, this study qualitatively explored and provide insights into the factors that influence, constrain, and gender the adoption of organic farming in Nigeria. Overall, it was found that a mix of factors, which include institutional considerations, farmers' livelihood assets and vulnerability contexts, their livelihood activities, as well as gender-related variables shaped adoption decision-making. The policy implications of the findings were outlined.

3.1 Introduction

Agriculture provides employment for about 70% of Nigeria's workforce (Barungi, 2014; IFAD, 2015), and it is the primary source of livelihood for 84-90% of the country's rural population (World Bank, 2014), 80% of whom are living below the poverty line of less than $1.25 a day (IFAD and Tartagni, 2015). A major issue with agriculture in Nigeria is generally low productivity. This has been largely attributed to factors such as low soil fertility (Phillip et al., 2009), soil erosion (Junge et al., 2008), soil degradation (Phillip et al., 2009), and continuous cultivation of farmlands with relatively low to no fertilizer use (Phillip et al., 2009). Livelihood challenges such as food insecurity and poverty are highest in the agricultural sector (Phillip et al., 2009), and they are largely ascribed to generally low agricultural productivity (Manyong et al., 2005; Phillip et al., 2009).

It has been suggested that organic agriculture (OA) can contribute to improving agricultural productivity in Nigeria, farmers' income, and their livelihood conditions (Faturoti et al., 2012; Faturoti and Madukwe, 2012; Alawode and Agegund, 2015). A survey-based study of 471 export-oriented smallholder farmers in Osun, Ekiti, Ondo and Rivers States, Nigeria, reported cocoa yield increase with the adoption of organic farming. The study also reported increased farm income, which arose from increased organic cocoa yield per hectare and reduction in production cost from not having to use synthetic farm inputs such as fertilizers and pesticides (Faturoti et al., 2012). Compared to their conventional counterparts around the University of Ibadan, Oyo State, organic leafy vegetable farmers recorded higher yields, higher benefit-costs ratio and net return, and lower production costs (Ogundipe, 2012). Citing fertilizer costs, in Akinyele Local Government of Oyo State, Nigeria, Alawode and Agegunde (2015) suggested that growing leafy vegetables and maize organically could be more profitable than producing them conventionally. Studies on leafy vegetable farming systems in southwestern Nigeria demonstrated the positive impacts of the practices at the core of OA on soil productivity (Makinde, 2015; AdeOluwa and Akinyemi, 2014; Moyin-Jesu, 2015), yield, (Alimi et al., 2006; Alawode and Abegunde, 2015; Moyin-Jesu, 2015), profitability and income of smallholder leafy vegetable farmers (Alimi et al., 2006; Alawode and Abegunde, 2015). OA is said to be compatible with smallholder farmers' socio-

economic situation and the predominant traditional agronomic practices (mulching, cover cropping, intercropping, crop rotation, etc.) in the country (Adebayo and Oladele, 2014; Solomon and Okolo, 2008), factors which can help foster its adoption. There is a growing domestic market for organic products, especially leafy vegetables in southwestern Nigeria (Dipeolu et al., 2009; Obayelu et al., 2014; Omonona et al., 2014; Adenegan and Fatai, 2015; Bello and Abdulai, 2015; Oyawole et al., 2016; Adenegan et al., 2016). Nonetheless, some studies have questioned the feasibility of organic farming for African smallholders because of crop residue limitations and quality concerns, difficulty in keeping weeds under control, and competing uses of organic matter materials as fodders for animals, as materials for building construction and as fuel for cooking (Grenz, and Sauerborn, 2007; Forster et al., 2012, Lotter, 2015).

As of 2015, Nigeria had 5,021 hectares in certified organic food production (Lernoud and Willer, 2017). This represents only 0.01% of Nigeria's ~ 34.2 million hectares under cultivation (Daramola et al., 2007; Lernoud and Willer, 2017) and evidently alludes to the low standing of OA in the country (Atungwu et al., 2016). Except for two gray articles (Hagensen and Atungwu, 2010; Johnson, 2011), the reasons for the low adoption status of OA in Nigeria have not been studied. Existing studies have mostly focused on market for organic farm produce (Adenegan and Fatai, 2015; Bello and Abdulai, 2015; Oyawole et al., 2016), and farmers' perceptions of practices, which are related but not unique to OA (Oyesola and Obabire, 2011; Adesope et al., 2012). Therefore, using a livelihood-based analytical frame called Technology Adoption and Livelihood Assets Framework (TALAF) and a mix of qualitative data collection techniques, I investigated the factors fostering and constraining the adoption of OA in Nigeria. By adoption, I mean farmers who have adopted and are still practicing participatory guaranteed systems (PGS) certified OA. The PGS is a locally-focused, smallholder farmers'-oriented and group-based quality assurance system that guarantees and certifies a farm organic through a participatory and peer-review process involving a range of stakeholders such as agronomists, farmers, and even consumers (IFOAM, 2006; Källander, 2008). NOAN worked with stakeholders in the Nigerian organic farming sector to develop the PGS in January 2014 (NOAN, pers. comm. 2015), and it is being used to certify a farm and products as organic in Nigeria (Atungwu et al., 2016).

This study is delimited to southwestern Nigeria, as this is the part of the country where OA is widely promoted and most established, yet with low adoption rates (Atungwu et al., 2016). This study also limited its focus to organic leafy vegetable production (OLVP), because of the market potential for organic vegetables in southwestern Nigeria (Dipeolu et al., 2009; Phillip et al., 2010; Obayelu et al., 2014; Omonona et al., 2014; Adenegan and Fatai, 2015; Bello and Abdulai, 2015; Oyawole et al., 2016; Adenegan et al., 2016). Besides, OLVP is the major organic cropping system in southwestern Nigeria (Biodiversity International and TECOBIC Nigeria Ltd., 2014; Ayanfeoluwa et al., 2015a, 2015b). Considering factors such as differential leafy vegetable farming experience, and livelihood assets endowments, organic manure availability/quantity, it was anticipated that the proportion of land in OLVP would vary, for reasons such as differential farming households' assets. The anticipated and observed impacts of the adoption of OLVP on farmers' livelihood conditions can also influence adoption extent (Ehyhorn, 2006). So, this study explored the factors that determine adoption extent of OLVP in my study areas. By adoption extent, I mean the proportion of a farmer's cultivated field that is allocated to OLVP (Thapa and Rattanasuteerakul, 2011).

Some studies indicated that women dominate leafy vegetable production in southwestern Nigeria (Owombo et al., 2012; Amujoyegbe et al., 2015; Agbonlahor et al., 2016), as men are mostly committed to cash crop production (Owombo et al., 2012). Women engage in leafy vegetable production to help meet households' food and nutritional security needs (Torimiro et al., 2014; Adeyemo et al., 2015; Amujoyegbe et al., 2015), as their primary or supplementary source of income, and for financial empowerment (Ayanwale and Amusan, 2014; Agbonlahor et al., 2016). It has been posited that OA offers empowerment space for women farmers (Thapa and Rattanasuteerakul, 2011) and that women influence its adoption (Jansen, 2000; Tovignan, 2005; Thapa and Rattanasuteerakul, 2011). Being labor intensive, OA may increase women's workload (Bakewell-Stone et al., 2008), with that likely to gender its adoption. Therefore, I also explored the role of gender and gender-related constraints such as differential access to information, as well as control over household resources in the adoption of OLVP in southwestern Nigeria. Based on my study objectives and conceptual framework, I addressed the following questions:

i. What are the factors that influence and constrain the adoption of OLVP among smallholder farmers in southwestern Nigeria?;
    a. Who are the adopters of OLVP and what are their motivations?
    b. How are adoption decisions influenced or constrained by farmers' livelihood assets the perceived attributes of OLVP and by farmers' livelihood activities?
    c. How are adoption decisions influenced by farmers' vulnerability contexts, policies, and institutions, as well by the perceived/actual impacts of OLVP?
    d. What role do gender and gender-related factors such as gender division of labor play in the adoption process?
    e. What factors determine the adoption extent of OLVP in southwestern Nigeria?
    f. What are the barriers and challenges to the adoption of OLVP and how can they be mitigated?
ii. What policy and strategies can be used to foster the adoption of OLVP in Nigeria?

The rest of the paper is structured as follows. Next, is a review of the literature on agricultural technology adoption decision-making. This section begins with a broad literature review on the nature of adoption decision-making context. This was to provide a context for my delineation of adoption as a decisional phenomenon that is inherently complex and to provide a grounding for the conceptual framework that informed this study. Thereafter, I reviewed adoption studies that are specific to organic farming, focusing on the drivers and constraints to the adoption of the technology. In the following section, I present the conceptual framework that I used to inform my construction of technology adoption as a livelihood activity choice made by smallholder farmers within a complex and dynamic decision context. Next, is the methods section, then, the presentation, discussion and implications of the findings of this study. The last section concludes the paper by highlighting its major findings.

3.2 Literature Review on Technology Adoption

3.2.1 *Delineating and characterizing adoption decision-making*

Adoption decision-making is said to be characterized by non-linearity and complexity (Eyhorn, 2006; Straub, 2009; Farmer et al., 2014; Meijer et al., 2015; Olabisi et al., 2015). According to Meijer et al. (2015), the complexity is due to the non-linear interactions of extrinsic and intrinsic variables that inform adoption decisions, and the difficulty in teasing out the interdependencies of the mediating variables. Extrinsic variables include farmers' characteristics, innovation attributes and the characteristics of the external environment, which include geographical setting, societal culture, and political conditions. Intrinsic variables are knowledge of the innovation, perception of the innovation and attitude towards the innovation, all of which are shaped by extension and communication.

To disentangle the complexity, Meijer et al. (2015) proposed a comprehensive framework that captured the interactions between the extrinsic and intrinsic variables and adoption decisions. Nazziwa-Nviiri et al. (2017) attributed the complexity to the interactions of several push and pull factors associated with adoption decision-making. These included institutional and access-related variables, agroecological factors and farm household characteristics. To Fisher et al. (2000) and Dinh et al. (2015), the complexity exists partly because the livelihood impacts of a technology cannot be determined *a priori*, and sometimes not even after its adoption. Framing adoption from a behavioral change viewpoint, Straub (2009) argued it is a complex decision-making process because it is mediated by cognitive, affective (emotional) and contextual factors, which no one theory can account for. Others ascribed the complexity to the embedding and intersection of adoption decision environment with gendered norms and culture, differentiated access to, and control over resources, and heterogeneous intrahousehold decision-making dynamics (Nguthi, 2008; van Eerdewijk and Danielsen, 2015; Beuchelt, 2016). Adding a new insight, Olabisi et al. (2015) contended that adoption decision contexts are not only complex but are also inherently dynamic, as farmers' choices and the decisional criteria informing their choices are not static; they may change from year-to-year. van den Broeck et al. (2013) and Pedzisa et al. (2015) espoused the same thoughts.

However, unlike Olabisi et al. (2015), van den Broeck et al. (2013) and Pedzisa et al. (2015) used adoption intensity to operationalize their construction of the dynamic nature of adoption decision context (more details later). Contrasting Meijer et al. (2015), Olabisi et al. (2015) used agent-based modeling (ABM) to tease out the dynamic complexity associated with adoption decision-making. To deal with the complexity, Eyhorn (2006), Nguthi (2008), and Dinh et al. (2015) proposed livelihood-based multidimensional frameworks, which integrated technology attributes, the various facets of rural livelihood systems and their institutional embedding.

A central theme of the above discussion is that adoption decision-making context is inherently dynamic and complex, as it is influenced by multiple factors, which are characterized by interdependencies and non-linear behavior (Straub, 2009; Meijer et al., 2015). This implies a need for tools that can help capture and disentangle the dynamic complexity. From the review, this could be done by using systems modelling tools such as ABM (Olabisi et al., 2015), or multidimensional comprehensive analytical frameworks that account for different factors that intersect with decision-making to inform adoption studies (Eyhorn, 2006; Dinh et al. 2015; Meijer et al, 2015). Appropriating insights from the foregoing, I construed technology adoption as a dynamic livelihood strategy choice made by farmers within a complex and multi-factorial decision environment, by drawing on their livelihood assets, mediated by their institutional and vulnerability contexts. To be able to capture and disentangle the complexity of the decisional phenomenon, akin to Dinh et al. (2015) and Meijer et al. (2015), I developed a comprehensive and multi-dimensionally dynamic gender-aware framework to inform the conception of this study, data collection, and analysis. I also draw on the literature that used adoption intensity to embody the dynamic characterization of technology adoption process as a non-static discrete choice made by farmers (Moore et al. 2016; Pedzisa et al., 2015; van den Broeck et al., 2013). Adoption intensity can be measured as the proportion of land allocated to a technology in a cropping system and in a given growing season (Ngwira et al., 2014; Thapa and Rattanasuteerakul, 2011), or as the number of and extent of use of certain practices in the component suites of a technology (Pedzisa, 2015; Moore et al., 2016;

Kunzekweguta et al., 2017). For this study, adoption intensity is defined as the proportion of a farmer's cultivated land allocated to PGS-certified OLVP.

3.2.2 *Motivations, drivers and constraints to the adoption of organic farming*

The motivations to adopt organic farming can be broadly categorized as economic and non-economic (Karki et. al., 2011; Grogan, 2012, Peterson et al., 2012). To some farmers, especially those who had to go through an expensive certification process, their motive was profit maximization (Koesling et al., 2008; Peterson et al., 2012). To others, it was the expectation of better market prospects (Karki et. al., 2011), making better profit through accessing higher prices or premium for their organic produce (Padel, 2001; Eyhorn, 2006; Karki et al., 2011), and observed access to easier and better markets (Karki et. al., 2011). Other economic motives include cutting production cost through savings on synthetic inputs (Padel, 2001), stabilizing farm income, increasing the market share of farm produce (Sierra et al., 2008) and ensuring the economic survival of a farm (Cranfield et al., 2010). Non-economic motivations range from environmental, to health considerations and organic as a lifestyle, for religious, ideological and philosophical reasons (Rigby et al., 2001). Environmental motivations may be related to land stewardship/ responsible land management (Devitt, 2006), soil fertility and degradation problems, mitigation of soil erosion and the environmental concerns associated with the use of synthetic farm chemicals (Karki et. al., 2011; Grogan, 2012, Peterson et al., 2012). Health reasons range from personal to food quality concerns (Cranfield et al., 2010), and growing healthy and safer foods without pesticides for household, farm workers and public consumption (Lohr and Salomonsson, 2000; Karki et. al., 2011; Thapa and Rattanasuteerakul, 2011; Grogan, 2012; Riar et al., 2017). Closely related to this, is the motivation to produce and sell "good food," a qualification used to describe organic crops (Devitt, 2006). As indicated by Peterson et al. (2012) and in the literature generally, the decision to adopt organic by farmers were based on multiple economic and non-economic motives (Lohr and Salomonsson, 2000; Padel, 2001; Cranfield et al., 2010; Grogan 2012). However, women are more likely than men to be motivated by health considerations (Grogan, 2012).

Comparable motives underpinned the adoption of organic farming in some African countries. For example, the expectation of a stable income (89.3%) and acceptable farm income (75%) vis-à-vis premium prizes for organic products were the major motivations for the adoption of organic cotton production in Djidja District in South Benin. Only 35.5% cited health considerations, with 1.5% attributing their decision to the negative environmental effects of farm chemicals used in cotton production (Moumouni et al., 2013). Elsewhere in Benin, the desire to be financially independent, income diversification, indebtedness and health issues, which resulted from the use of synthetic chemicals to produce cotton influenced the decision of smallholder farmers to adopt organic farming (Sodjinou et al., 2015). Similar findings were reported by Tovignan and Nuppenau (2004). In contrast, the prospect of secured markets was the main motivation for the adoption of organic fruit and vegetable production in eastern, central southern and northern Tanzania, where also, 6.1% alluded to the expectation of better prices for their organic farm produce as a factor in their decision-making. There was no mention of health motives (Mamuya, 2011). With the motives lumped into broad categories, as in Benin, monetary/economic motives became the primary factor that shaped organic farming adoption decision in Tanzania (Mamuya, 2011). Bakewell-stone et al. (2008) reported similar findings, but unlike Mamuya (2011), they found that human health concerns related to the use of synthetic inputs was a factor that motivated the adoption of organic farming in Tanzania. In Uganda, the motivations ranged from farmers' own and family health concerns over the use of synthetic farm chemicals to concerns for the environment and the perceived profitability of organic farming. Economic motives trumped other factors (Johansson, 2012). In all these cases, adoption motivations arise from a multitude of factors. As shown, the relative importance of the individual motives may vary with different contexts and countries. The review also shows that unlike in developed countries (Cranfield et al., 2010; Peterson et al., 2012), economic/financial motivations but not environmental concerns were the foremost motive driving the adoption of organic farming in African countries.

The connection between farmers' livelihood assets and the decision of whether to adopt organic farming is well-documented. Sarker et al. (2009) and Ayuya (2015) reported that households with large

family size (human capital) were more likely to adopt organic vegetable farming. Sodjinou et al. (2015) reported a comparable finding and added that drawing on family labor is a way smallholder farmers make up for organic agriculture labor intensity, as they may be too financially constrained to hire waged labor. Schneeberger et al. (2002) identified additional labor needs and lack of knowledge (human capital) about organic farming as barriers to its adoption, findings which are consistent with Johansson (2012), Mamuya (2011) and Tress (2001). Goldberger's (2008) Kenyan study also reported labor shortage (human capital) and lack of animals (physical capital) as constraints to the adoption of organic farming. Distance to available market for organic produce (physical capital) was a major adoption constraint in Texas (Lau et al., 2010), while financial burden associated with organic farming certification was the issue in Denmark (Tress, 2001). Adoption decision in India (Eyhorn, 2006) and Uganda (Johansson, 2012) was shaped by natural capital consideration, as farmers felt that the practices at the core of organic farming would help restore their depleted soil fertility. The reverse was the case in Kenya (Goldberger, 2008) and Tanzania (Mamuya, 2011), as some farmers ascribed their decision not to adopt organic farming to the infertility of their soils, which they argued, will do well without applying synthetic fertilizer (Mamuya, 2011). Large land ownership and savings from off-farm income generating activities influenced the adoption of organic farming in India (Lukas and Cahn, 2008). In Kibwezi region Kenya, which is drought prone due to its semi-aridity, lack of water (natural capital) from different sources including rain constrained the adoption of organic farming. Membership of a farmers group (social capital) influenced the adoption of organic farming in Uganda. However, in India, the status and image (social capital) vis-a-vis the fear of being looked down upon by family members and fellow farmers inhibited the adoption of organic farming as it was considered old-fashioned and dirty (Eyhorn, 2006). As in Kenya (Goldberger, 2008), lack of money (financial capital) to buy synthetic farm inputs prompted some Tanzanian smallholder farmers to adopt organic vegetable and fruit production (Mamuya, 2011).

Farmers' vulnerability contexts have also intersected with their adoption decisions. For example, in Uganda, perceived vulnerability to food and financial insecurity dissuaded smallholder farmers from adopting organic farming. Disallowing farm chemical use was equated with the cultivation of a small area

of land, and the possibility of not producing enough food or earning enough money to meet livelihood needs (Johansson, 2012). Anticipated and observed vulnerability of organic crops to pest infestation, weed problems and diseases, and the likelihood of those leading to yield loses, crop failures and financial losses discouraged the adoption of organic farming (Tress, 2001; Schneeberger et al., 2002; Sierra et al., 2008; Lau et al., 2010; Nandi et al., 2015). Elsewhere, in Benin and India, decreasing yield in conventional cotton cropping systems leading to financial loses (Eyhorn, 2006; Sodjinou et al., 2015), increasing susceptibility of conventional cotton to pests and diseases, and the need to reduce indebtedness from production losses and investment in farm chemicals motivated the adoption of organic farming (Eyhorn, 2006).

The characterization of organic farming as a low-cost technology for excluding the use of synthetic farm chemicals (Sodjinou et al., 2015), and its attributive labor-intensive and time-consuming nature have been identified as factors affecting its adoption (Johansson, 2012). Farmers' non-farm livelihood activities may constrain (Fairweather, 1999; Saoke, 2011) or foster the adoption of organic farming. In Kibera slum, Nairobi, Kenya, the issue was the preoccupation of smallholder farmers with time-demanding off-farm livelihood activities, which left them no time for practicing organic farming (Saoke, 2011). Institutional factors also mediate organic farming adoption decision-making. For example, adoption decision has been motivated by access to technical and financial support (Rigby et al., 2001), and by access to information and extension support (Johansson, 2012). Institutional considerations have also constrained the adoption of organic farming. These include lack of supportive institutions and policy for organic farming (Panneerselvam et al., 2012; Veisi et al., 2017), certification requirements and its associated cost (Mamuya, 2011; Niemeyer and Lombard, 2013), a lack of rewarding marketing and well-developing distribution marketing channels for organic produce (Sierra et al., 2008), limited or no extension access (Sierra et al., 2008; Veisi et al., 2017) and poor consumer awareness about organic products (Veisi et al., 2017). Gender *per se* (Thapa and Rattanasuteerakul, 2011), and gender-related factors such as differential access to, and control over production resources affect organic farming adoption decisions (Tovignan and Nuppenau, 2004; Sodjinou et al., 2015).

3.3 Conceptual Framework

The above discussion shows that adoption decision-making is a complex, non-linear, context-specific and dynamic decision phenomenon, which is influenced by dynamically interacting and interdependent factors. The review also reveals that the adoption of organic farming is motivated by a complex web of context-dependent economic and non-economic considerations. Further, the review shows that organic farming adoption decision-making is mediated by many factors such as farmers' livelihood assets, their vulnerability contexts, and by institutional considerations such as extension support and produce market. For this study, I delineated the adoption of organic farming as a livelihood activity choice made by smallholder farmers within a complex, multifaceted, and dynamic decision environment of their embedding in anticipation of certain livelihood outcomes. I also recognized that factors such as the gendered nature of farmers' livelihood and intrahousehold decision-making contexts and technology-specific attributes can constrain the adoption by women farmers (Nguthi, 2008; van Eerdewijk and Danielsen, 2015; Beuchelt, 2016; Polar t al., 2017). Therefore, this study draws on a gender-aware livelihood framework named TALAF, which accounted for the intersectionality of the multidimensional the factors that are associated with adoption decision-making (Adato and Meinzen-Dick, 2002; Bravo-Monroy et al., 2016).

The TALAF was developed by drawing on existing modifications to the sustainable livelihood framework (SLF) (Figure 3.1). At the core of the TALAF (Figure 3.2) is a pentagon of five capital assets. These are human, natural, financial, social and physical capital assets, and they are considered to be imperative to the livelihood pursuits of farming households (Adato and Meinzen-Dick, 2002). To develop the TALAF, I integrated into the original SLF, factors beyond livelihood assets, which as shown in the literature can affect and gender technology adoption decision-making. Among others, these include factors such as intrahousehold decision-making dynamics, culture, gendered division of labor, access to, and control over resources, as well as technology attributes (van Eerdewijk and Danielsen, 2015; Polar et al., 2017).

My underlying assumption is that farmers' decisions about whether to adopt a technology as a livelihood choice will be made by drawing on their livelihood assets base, in anticipation of certain livelihood outcomes. As earlier shown, this comprises a complex mix of economic and non-economic outcomes such as improved soil fertility status, improved household food and nutritional security, expanded marketing opportunities, increased farm income, and enhanced health conditions. I further supposed that farmers' adoption decision-making will be mediated by their vulnerability contexts (e.g. fluctuation in prices and market opportunities, farm's declining profitability), the institutional factors of their embedding and their livelihood activities (farm/off-farm) (Adato and Meinzen-Dick, 2002; Eyhorn, 2006).

As earlier alluded to, I also supposed that factors such as household composition, technology attributes, access to, and control over resources, gendered division of labor and culture will intersect with farmers' adoption decision-making. Here, I appropriated insight from our literature and Rogers' diffusion of innovation claim that the adoption of a technology can be affected by its attributes (Rogers, 1983). Also, I took clues from the literature on factors that gender the adoption of a technology by men and women (e.g. Doss and Morris, 2000; van Eerdewijk and Danielsen, 2015). Consistent with this study's definitional delineation of adoption decision-making as a dynamic phenomenon, I further assumed that the decision to continue using a technology, to intensify or scale down the extent of use of the technology (adoption intensity) will be affected by the technology livelihood outcomes including on a farmer's livelihood assets and vulnerability contexts. In the TALAF, I captured this process by using double-headed arrows, connecting one component of the framework to the other. The double-headed arrows foreground the role of feedbacks and learning in this study's conception of technology adoption decision-making. Here, my conception of feedbacks builds on Ngwira et al.'s (2014) definition, as including "the information that is obtained about the outcomes, characteristics, and/or consequences of" adopting a technology (p. 109).

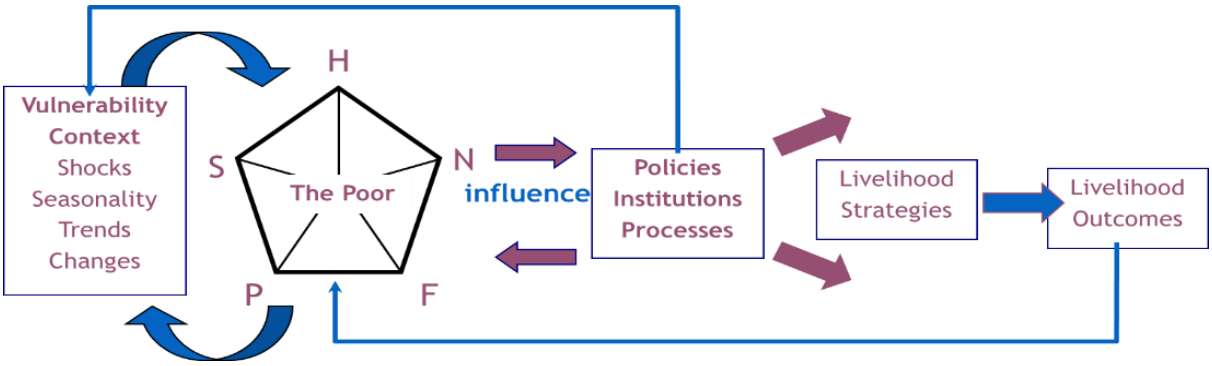

Figure 3.1. Sustainable Livelihood Framework (DFID, 1999a)

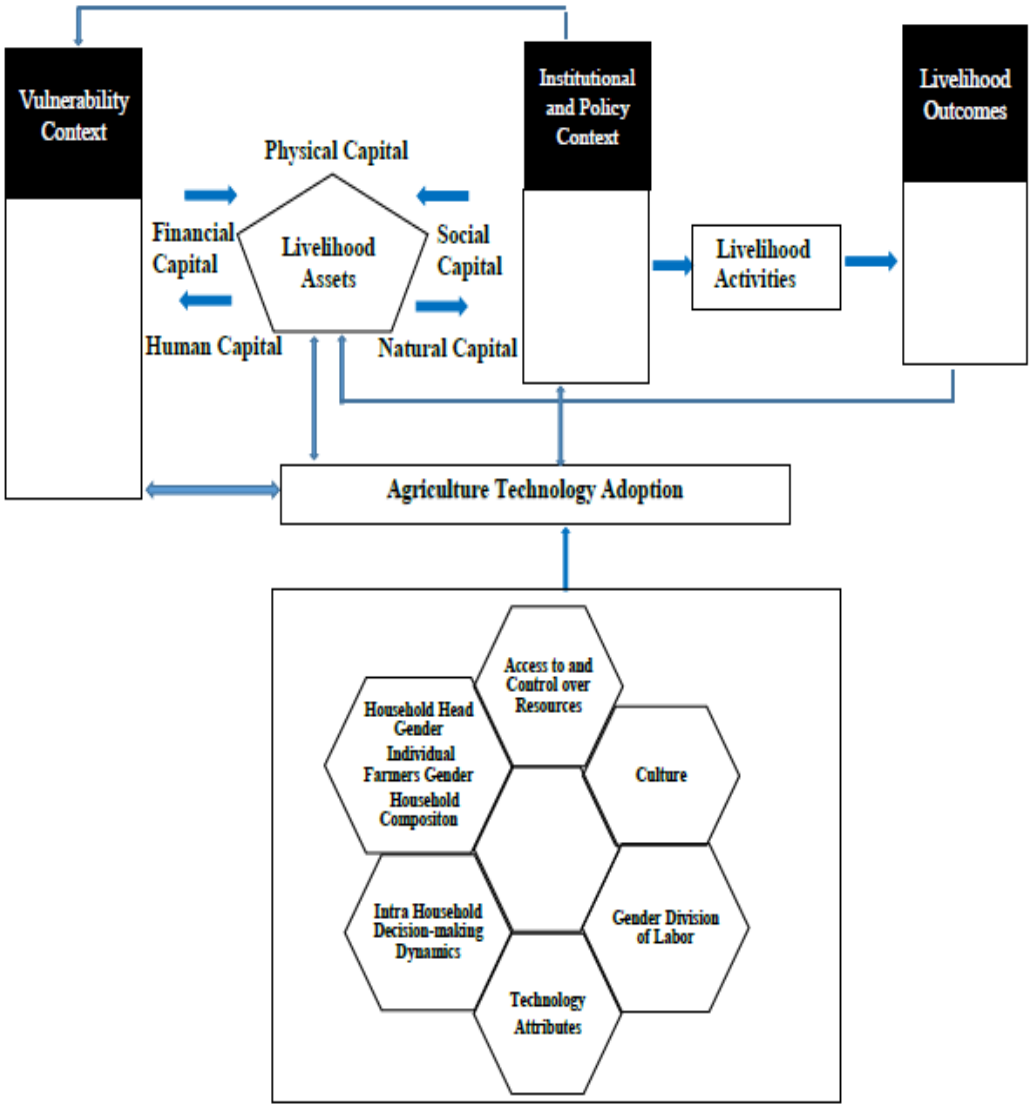

Figure 3.2. Technology Adoption Livelihood Assets Framework (TALAF)

3.4 Methods

3.4.1 *Study sites*

This study took place at Ajibode, Akinyele and Elekuru, Akinyele Local Government, the three areas where PGS-certified OLVP takes place in Ibadan, Oyo State Nigeria. Located in the humid tropics (Momin, 1995), Ajibode, like Akinyele and Elekuru, lies within a tropical rainforest vegetation zone (Momin, 1995), now a derived savannah (Momin, 1995; Oyetunji et al., 2003), due to activities such as

farming (Momin, 1995). Ajibode, Akinyele and Elekuru experience between 1200mm-1600 mm mean annual rainfall (Oyetunji et al., 2003), and a bimodal rainfall pattern (March/Early April-October/mid-November) (Alayande et al., 2012; Oshunsanya and Adeniran, 2014), with a brief dry spell in August (Vanlauwe et al., 2005).

At Ajibode, an urban area, PGS-certified OLVP takes place along the bank of River-Ona, on a stretch of land behind the University of Ibadan Botanical Garden. River Odo-Ona (henceforth Ona), a 55 km^2 long river, runs in the north-south direction (Momin, 1995). At Akinyele, PGS-certified OLVP occurs in a peri-urban setting, on an 'abandoned' land in a place called Olope, beside a dam locally referred to as PW-Dam. At Elekuru, a rural setting and the remotest of my study sites, PGS-certified OLVP takes place across different swampy areas.

Figure 3.3. Map of study sites (Ajibode, Akinyele and Elekuru)

3.4.2 *Respondent selection*

The data for this study was gathered from four categories of respondents. These were (1) adopters, (2) non-adopters, and (3) NOAN officers and government organic desk officers in my study areas. Adopters

are farmers that have adopted and are still practicing PGS-certified OLVP. Non-adopters are leafy vegetable farmers who had never adopted certified OLVP. They grow their leafy vegetables using synthetic inputs.

Respondents' selection for this study started with familiarization visits to the three study sites and NOAN's office at the University of Ibadan, during which the lists of the adopters of PGS-certified OLVP were collected. The adopter's lists obtained from NOAN and my study sites were cross-checked and merged. This was done together with the leaders and members of the organic farmers' groups in my study areas. From the merged lists for Ajibode and Akinyele, some adopters were purposefully selected for semi-structured in-depth interviewing. The selection criteria included gender, age, the year of adoption of organic farming, marital status, and the positions held in the organic farmer groups in both places. The gender criterion was to help understand how the adoption of OLVP in my study areas may be gendered. The year of adoption was to help ensure that respondents have a rich information on the issues to be discussed. Age consideration was to reflect the heterogeneity of the age group of adopters' population, especially in Ajibode, and the possible differences in the value-orientation, which may have informed adoption decisions. The inclusion of the leaders and ordinary members of the organic farmers group in Akinyele and Ajibode, was to help capture disconfirming opinions on issues such as the challenges associated with the adoption of OLVP in my study areas. All the four adopters in Akinyele were selected for data collection. Non-adopter's selection was based on snowball sampling. Adopters in Ajibode and Elekuru helped identify non-adopters, who in turn introduced me to other conventional leafy vegetable farmers in their areas.

3.4.3 *In-depth semi-structured interviews and focus groups*

Across my study sites, semi-structured in-depth interviews were held with 15 adopters and 9 non-adopters. These included 10 male and 5 female adopters, as well as 8 male and 1 female non-adopter (See Table 3.1 for respondents' breakdown). Where possible, the female spouses of male respondents were interviewed. The interviews were structured to reveal the motivations, household-decision making dynamics, institutional and vulnerability factors, and other underlying considerations that shaped

respondents' adoption decisions about OLVP. The interviews also probed the barriers and gendered issues affecting the adoption of OLVP, with non-adopters asked under what conditions they would re-consider their decisions about OLVP. Care was taken to ensure that adopters spoke to factors that influenced their decision at the time they adopted OLVP. Five gender-differentiated and two mixed-sex focus groups were also held with adopters (n=38), and non-adopters (n=11) in my study areas. Of the 49 farmers who participated in the seven focus groups, 22 were males and 27 were females (See Table 3.2 for participants' breakdown). The focus groups explored how reproduction, production, the sexual division of labor, and the labor-intensive nature of organic farming affected its adoption. The constraints limiting the adoption of OLVP in my study areas and the interplay of vulnerability and institutional issues with adoption decisions were further explored.

Table 3.1. Breakdown of adopters, non-adopters, and experts interviewed

	Adopters			**Non-Adopters**			**Experts**	
Location	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**NOAN**	**Gov.**
Ajibode	6	3	3	3	2	1	3	2
Akinyele	4	4	0	0	0	0	0	0
Elekuru	5	3	2	6	6	0	0	0
Total	**15**	**10**	**5**	**9**	**8**	**1**	**3**	**2**

Table 3.2. Participants by gender in focus group discussions (FGDs)

Group	**Location**	**Participants in FGDs**	**Total**	**Female**	**Male**
Adopters	Ajibode	Male only	5	0	5
Adopters	Ajibode	Female only	15	15	0
Non-Adopters	Ajibode	Mixed	5	3	2
Adopters	Akinyele	Male only	4	0	4
Adopters	Elekuru	Male only	7	0	7
Adopters	Elekuru	Female only	7	7	0
Non-Adopters	Elekuru	Mixed	6	2	4
TOTAL			**49**	**27**	**22**

3.4.4 *Participant observations, field visits, and group discussions*

Participant observation visits were undertaken to gather further information required to address my research questions. Accordingly, to obtain on-farm dynamics information, I visited adopters and non-adopters' farms in Ajibode as a participant observer. I helped with their farm operations, discussed their on-farm challenges, paid attention to their on-farm social-capital bonding relational dynamics, and who was doing what farm operations. Detailed notes were taken on the above. Two of the participant

observant field visits to the organic farmers morphed into group discussions, enabling us to gather multiple views on pest and weed infestation, and other difficulty issues in OLVP. Thrice, observational visits were undertaken to Elekuru market, during which the marketing aspects of organic and conventional farming were explored. The issues discussed were used to inform the focus groups in Elekuru.

3.4.5 *Expert interviews and data analysis*

Five expert interviews were conducted to gain deeper insights into the institutional factors fostering and limiting the adoption of organic farming in my study areas and to explore some of such issues raised by farmers. These included 3 officers of NOAN, the organic desk officers at Oyo State Agricultural Development Program, and the Federal Ministry of Agriculture, Oyo State Directorate. The expert interviews and two individual interviews were conducted in English. All other interviews and focus groups were conducted in Yoruba, the native language spoken in the study areas. The interviews conducted in Yoruba were translated verbatim to English, first by a research assistant, and later by me to establish reliability of the transcriptions. All the interviews and focus group discussions were recorded, transcribed verbatim, coded manually and electronically using NVivo, together with the field notes. I drew on thematic analysis and this study's conceptual framework for my coding and data analysis.

3.5 Findings

This section presents the findings of this study by discussing the factors that shaped respondents' decision whether to adopt organic farming or not. The findings are organized around the components of TALAF, based on the themes that emerged from the coding of my data (see Table 3.4).

3.5.1 *Drivers of adoption decision*

3.5.1.1 *Livelihood assets*

In this study, the knowledge of organic farming and the potential concerns with farm chemicals are a specific form of human capital asset that influenced the adoption of OLVP. Specifically, from the FGDs and individual interviews with adopters, the awareness and knowledge of the probable human health adverse effects of weed killers and pesticides (*human capital*) emerged as a factor that underpinned all

respondents' adoption decision. Adopters became aware of the concerns with farm chemicals after organic was introduced to them by NOAN and the promoters of the technology. Twelve out of the fifteen adopters that were interviewed (80%) also alluded to the knowledge of their forefathers' agriculture (human capital) as a factor that profoundly stimulated their adoption decision. They recalled that their forefathers lived a healthy and long life, linking that to how they grow their foods without using any synthetic inputs. They drew on that to make sense of why organic farming may be healthy and contribute to the longevity of life as claimed by its promoters, with that feeding into their adoption decision. As to this, one respondent recounted: "*we figured out that what our forefathers did from time immemorial is what organic farming is based on. That was why we joined them to adopt organic farming so that we can live long like our forefathers* (AK4, Akinyele). Equally, three respondents stated that their adoption decision was shaped by their personal experiences (*human capital*) growing cassava and yam with and without applying farm chemicals. Prior to their awareness of organic farming, they observed that their yams grown without chemicals tasted better and had a longer shelf life, ascribing the perceived differences to the effects of farm chemical residues on their yams. The experience shaped their adoption decision, a view which a 36-year old adopter from Elekuru captured thus: "*We already had two farms. I have two farms, one where I apply chemicals and a yam farm where I do not apply chemical. The yams that I grow without chemicals were always sweeter. We that had tasted the products grown with and without chemicals knew that both were different. That informed my adoption decision*" (EL1, male, Elekuru). Moreover, all interviewed adopters stated that access to information and knowledge of organic farming (human capital) emboldened them to adopt the technology, with only one respondent citing personal ill-health issues (EL4, female, Elekuru).

Social capital played a pivotal role in facilitating the adoption of organic farming in my study sites. As to this, existing reciprocal relationship of trust, social bonding, and religious social capital all combined to make respondents in Elekuru to become aware of organic farming and acquire the information that influenced their adoption decision. This is because the NOAN officer who introduced organic to Elekuru and helped respondents to acquire some knowledge about the technology was

motivated by his ties to the place. He shares not only a religious identity and place of worship with the adopters in Elekuru but he also once lived with them in the same village for some years as a trusted acquaintance. All of that enthused the atmosphere of reception and trust that strongly influenced the decision of some respondents in Elekuru to adopt organic farming: "*we trusted him and what he brought to us because we shared the same faith with him and because he once lived with us in this village* (EL7, Elekuru male-only FGD). Another added: "*many factors influenced our decision. The person who introduced organic to us was at a time living in this village. He was staying with one of us when he was at the university as a student. So, we have an existing relationship with him. That was why he introduced organic farming to us. He also educated us about organic farming, following which we started it little by little. More, importantly, we were attending the same church* (EL3, Elekuru). A female respondent in Elekuru (EL4) also alluded to the interpersonal relationship of trust and respect (*social capital*) with a religious leader in her adoption decision. Two male respondents also stated that their social status and not wanting to be left out of the population of adopters in Elekuru in their adoption decision. Family ties (1 respondent) and the relation of trust between fellow farmers who were promoting organic farming (6 respondents) influenced adoption in Akinyele and Ajibode. Equally, but with a slight contrast, three male respondents in Ajibode alluded to a tie with some affiliates of NOAN, including a Professor of Agronomy as a means through which they became aware of, were trained and motivated to adopt organic farming.

Financial capital constraint vis-à-vis difficulty finding money to buy chemical fertilizer, herbicides, and pesticides at the start of the growing season influenced the decision of four female farmers to adopt OLVP. Finally, adoption intensity was linked to the lack of money to hire labor (all interviewed 5 female respondents), available household labor (6 respondents), personal physical capacity (3 female respondents) and limited knowledge of organic farming (1 respondent), and land availability (5 respondents, in Ajibode).

3.5.1.2 *Vulnerability context*

Three male respondents from Akinyele and one from Ajibode averred that their adoption decision was shaped by livelihood activity-induced vulnerabilities (schematically captured in Figure 3.4). They

were not making good and stable income from their primary livelihood activities. So, they became indebted and financially constrained (livelihood outcomes). This negatively affected their household financial condition (financial capital) such that they could not cater to their personal, household and children schooling needs. They adopted OLVP so as to salvage their households from being vulnerable to financial, food and social insecurity: "*my vulnerability before I started organic farming was lack of money. There was no food at home. There was no way out that I could cater to the responsibilities on me. Debt was piling up. I was worried and asked God, how was I going to deal with my life. I was selling cow, with no headway. […]. That was what prompted me to start my organic leafy vegetable farm. And as they say, once you take food out of poverty, poverty is dealt with*" (AK3, male, Akinyele). Another added: "*people were looking down us as poor people* […] *because my jobs were not generating any reliable income. I thought that if I do organic agriculture it would reduce my financial problems and indebtedness. Children that needed money would be sorted out.*" (AJ2, male, Ajibode). In Ajibode, a married female adopter also cited personal financial insecurity ascribed to her tailoring work as a decisive factor in her adoption decision.

Market-induced vulnerabilities largely shaped adoption decision in Elekuru, and of one respondent apiece in Ajibode and Akinyele. To this effect, participants in female-only FGD in Elekuru unanimously indicated that incidents of income loss, which they were experiencing because of adverse prices and market insecurity for their conventional leafy vegetables were vulnerability issues they sought to overcome by adopting or advising their husbands to adopt OLVP: *There were occasions that our farm produce was not selling well in Elekuru market. We were losing money. We were told that organic produce will sell at higher prices than the produce grown with chemicals. That was the reason I became an organic farmer and why others advised their husbands to do organic farming* (EL12, female farmer).

Furthermore, during Ajibode female-only FGD, social and financial vulnerability was identified as a pivotal to why they adopted OLVP. Majority of the female adopters in Ajibode were concerned about being looked down upon by their husbands as contributing nothing to their households. "*We didn't want to be looked down upon by our husbands. Adopting organic agriculture* was to *enable us to help*

ourselves, to save us from being belittled and financially vulnerable (AJ11, female farmer). Finally, most adopters indicated that perceived vulnerability to ill-health issues, which may arise from using chemicals to grow their foods contributed to why they adopted OLVP.

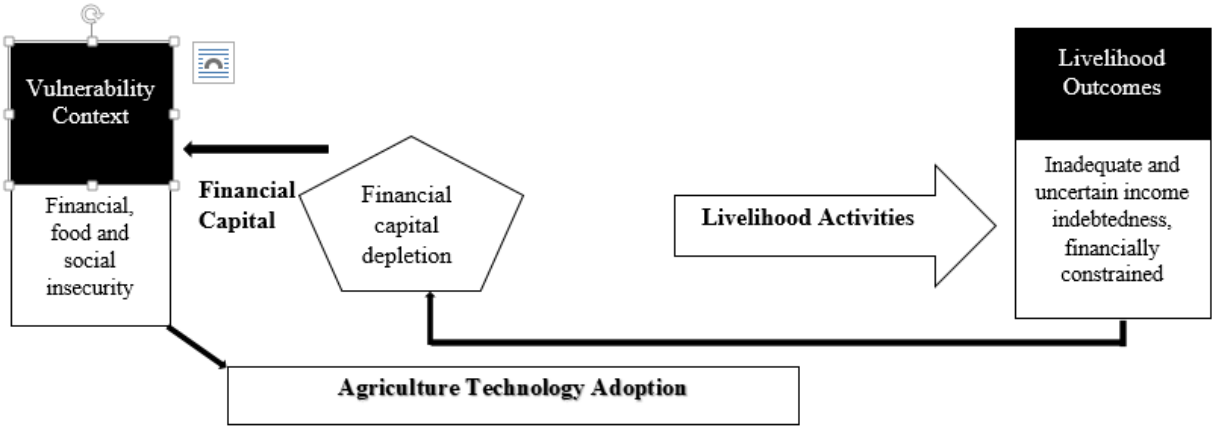

Figure 3.4. Schematic representation of the overlap between livelihood activity, vulnerability, & adoption

3.5.1.3 ***Institutional and policy context***

Support for extension and training, and markets for organic products are the *institutional and policy context* factors that strongly influenced adoption in this study. All interviewed adopters participated in at least a training that was organized by NOAN before and after they adopted organic farming. But, only five respondents explicitly stated that the training and extension technical support that they received through NOAN influenced their adoption decision. Through the training and extension support, respondents acquired some technical know-how on organic production techniques (*human capital*) and developed the conviction which emboldened them to start and continue using the technology: *Access to extension support was one of the reasons I started organic farming. The training they did for us made me confident and become more dedicated to doing organic farming*" (AJ4, female). Another corroborated: *my decision to start organic cannot be divorced from the on-farm and off-farm training and technical support provided by NOAN through Mr. W* (alias) *because it increased my understanding of organic farming*. (AJ6, male). Also, all respondents pointed to the prospect of organic 'premium' market access as a key factor in their adoption decision: "*the promise of special markets for organic was a factor in my decision to start farming organic. The reason is that before one plant anything, one must think of a ready*

market for one's produce. … We were given assurance that there will be ready markets for our organic produce (AK1, male). Finally, at different times four respondents in Elekuru increased and decreased their cultivated land in OLVP due to market availability. One specifically mentioned the opening of an organic shop in Ajibode in 2015 made him to increase his acreage in organic: "*I increased my land in organic vegetables to 0.5 acres in 2015 because they started Ajibode organic market. I later reduced it when the markets for our organic products were not moving*" (EL1, Elekuru).

3.5.1.4 *Livelihood activities*

Eleven (73%) of the 15 interviewed adopters were combining farming with at least one off-farm livelihood activity (Table 3.3). Of those, four male respondents (3 from Akinyele, 1 from Ajibode) stated that issues related to their primary livelihood activity (automobile repair/carpentry/livestock trading) were a major reason they adopted OLVP. They were struggling with irregular and low consumer patronage. This made them penurious for the most time, a problem they sought to overcome by adopting organic farming. Two married female farmers from male-headed households in Ajibode also expressed a link between their adoption decision and livelihood activities. Of the duo, one was combining tailoring with conventional vegetable farming (AJ3), while the other, a 35-year mother of four was trading in petty grocer and provision items as her other livelihood activity (AJ4). The income from their farm and off-farm livelihood activity were not good enough for them. They adopted organic farming believing that it availed them the prospect of making sufficient income to help meet their personal needs and support their households: "*The money I was making from my provision business and especially vegetable farm and was not always sufficient for me. That was a major reason I started organic farming. I thought that there was no way that I will not make a good money from my harvested organic vegetables*" (AJ4, female). Two respondents, which included a married male (AJ6) and a female adopter in Ajibode (AJ4) adopted organic farming in order to make money to respectively strengthen an existing livelihood activity/start a new one.

Table 3.3. Livelihood activities of interviewed adopters

Livelihood activities	% of total respondent	Number of respondents	Distribution across study areas		
			Ajibode	Akinyele	Elekuru
Farming only	27	4	Nil	Nil	4
male		2	Nil	Nil	2
female		2	Nil	Nil	2
Farming and off-farm	73	11	6	4	1
male		8	3	4	1
female		3	3	Nil	Nil

3.5.1.5 ***Livelihood outcomes***

Livelihood outcomes refer to the motives and goals underlying the decision to undertake a livelihood activity (Herberg, 2007; Nguthi, 2008). They also include the tangible and intangible outcomes and benefits anticipated to be achieved through a livelihood activity (DFID, 1999a, 1999b). So, this section explains the rationale that motivated the adoption of organic farming. The interplay between adoption intensity and the perceived livelihood outcomes of the adoption of OLVP is also discussed.

From the individual interviews and FGDs with adopters, three broad themes emerged as the primary reasons that motivated the decision to adopt OLVP: economic/financial motivations; health-food safety motivations and longevity of life; and soil-environmental health benefits. Health-food safety motivation was merged with the desire for the longevity of life because both motives were closely enrolled by respondents. Overall, adopters' underlying motivations intertwined with their livelihood conditions, desire for a healthy living and society, their understanding of organic farming and how the technology was pitched to them by NOAN, and to some extent, to their religious beliefs.

All of the fifteen interviewed adopters identified economic and health-related motivations as decisive in their adoption decision, with only three respondents mentioning soil-environmental health benefits (e.g. "*I adopted organic agriculture to improve my soil health and make our environment healthy, as poisonous ingredients won't be transported to the environment, nor pollute our water. This is because we are not using poisonous ingredients in organic*" AK1, male, Akinyele). Similarly, all but two adopters explicitly expressed a desire for long-life as an integral of their underlying motivations (e.g. *"The main*

reason I adopted organic is that eating healthy food will make someone to stay healthy and live long" EL2, male, Elekuru). Ten (67%) out of the 15 interviewed adopters cited economic motivations as their main goal for adopting OLVP. The remaining five adopters (33%, all males) highlighted health-food safety motivations as their main underlying goal. The economic/financial motivations that adopters alluded to mainly revolve around earning high and profitable farm income through access to high price paying markets for organic produce: (e.g. "*I started organic farming mainly because we were told that it was pricier and highly profitable*" AK4, male, Akinyele) This expectation was influenced by how organic was pitched to adopters by NOAN. It was said that the food choices of urban elites were shifting from conventional to organic produce and that they were willing to pay more for organic for its perceived quality and health attributes. By gaining access to the emerging markets, adopters expected to earn profitable farm income that will enhance their financial capability to cater to their personal and household livelihood needs: (e.g. "*I started organic to make good money from the markets where people pay more for organic produce*" EL4, female, Elekuru).

Health-wise, the goal of all adopters was a desire for long-life and improved personal and household health status by growing and consuming healthy foods and protecting themselves from health problems that may arise from food safety concerns: Underpinning this desire is the perception that synthetic farm inputs, especially, inorganic pesticides and herbicides are poisons with harmful effects of use to human health and food safety risks. On this basis, adopters ascribed the rise of many diseases and lower life expectancy in the country to the chemicals used in growing foods. So, they resolved to keep themselves and households safe from agrochemical induced ill-health issues from food production and consumption that can shorten their lifespan: (e.g. "*There are many reasons that made me adopt organic farming. It gives us the opportunity to ensure that we will grow and harvest what will contribute to my household well-being and keep us healthy. There won't be poison in what we produce*" (AJI, male, Elekuru). In addition, all but two adopters explicitly specified that the desire to help cultivate a healthy society by growing and making safe and healthy foods available to consumers was intrinsic to their underlying motivation for adopting OLVP. The opinions from the FGDs with adopters was not any different: (e.g. "*I*

became more interested in organic farming because of people so that I can assist them to be living fine" AJ2, male, Ajibode). This specific motive was shaped by a two-tiered consideration, including the notion that the benefits of growing foods that will make people live longer and stay healthy are a morally and socially sacrosanct responsibility that trumps profit-making. To some adopters, growing safe foods for public consumption was indicative of their faithfulness to God. They equated growing foods organically as farming in God's way because it excludes the use of chemicals that cause harms: (e.g. "*Organic foods are natural foods grown the way God created what we eat. But in modern time, we no longer follow the directives of God. We are always in a hurry for quick results. Organic farming is safer and healthier, […] Adopting organic gives me the assurance that one is growing healthy foods for the society and …doing agriculture as God desires*" EL5, female, Elekuru).

Regarding adoption intensity, three respondents (2 males, 1 female) from Ajibode expanded their land under OLVP because they were making profitable and increased income: "*In the second year, we increased it to 2 acres straight because what realized in the first year was convincing enough. Because there was demand for my organic leafy vegetables and we were making good and steady income*" (AJI, male); "*before I adopted organic farming, it was not exciting for me to expand my farm size. Now that I am making more money from organic farming, I have expanded and always wish to have a bigger organic vegetable farm*" (AJ3, female).

3.5.1.6 *Technology attributes*

When organic farming was introduced to adopters, it was generally viewed as a low-cost technology for excluding the use of synthetic inputs. This perceived attribute largely influenced four female adopters to adopt organic farming as they considered its exclusion of synthetic inputs well-suited to their financial situation: "*I was so happy when he told us about organic farming because as a person it was a little difficult for me to get money to buy fertilizer. I was happy that I didn't have to worry about buying fertilizer anymore. I thought to myself that the money to be spent on fertilizer will be used in buying seeds* (AJ3, female, Ajibode). Also, because of the reasons hitherto elucidated, the perceived health attributes of organic farming were cited by all interviewed adopters as a contributory factor to its adoption, with 87%

(13 out of 15) mentioning its compatibility with their forefathers' agricultural tradition: "*I adopted organic farming because I considered it is good and similar to what our forefathers did* (AK2, male Akinyele). In addition, most respondents were motivated to adopt OLVP because of its perceived relative economic advantage vis-à-vis the prospects of attracting higher prices compared to conventionally grown vegetables: *We started organic because we thought that we could make more money from it by getting better prices for our vegetables compared to what we were doing* (EL3, Elekuru).

3.5.1.7 *Culture*

Almost all the adopters considered organic farming as the agricultural heritage, which their forefathers passed down to them, but which is almost lost to the modernization of agriculture by using chemical inputs. That made organic attractive to them for adoption. They valued and ascribed a culture of good food and healthy eating with their forefathers' farming heritage. In their view, that is also inherent in organic farming because of its exclusion of synthetic inputs and emphasis on healthy living. By adopting organic farming, four adopters sought not to only revive the farming heritage of their forefathers, but also, to promote the culture of healthy food, which according to them, people should strive for: *We also thought that organic agriculture is the heritage that our forefathers, which our fathers bequeathed to us; but we have neglected and almost forgot it. We resolved that it was better that we go back to organic to reclaim what our forefathers taught us, which we have been forgetting. That is one of my reasons for doing organic farming* (EL1, male Elekuru). Table 3.4 summarizes some of the various factors that interacted to influence respondents' decision to adopt OLVP in this study.

Table 3.4. Some of some the factors that facilitated the adoption of organic farming in this study

TALAF Component		Caused/Facilitated by	Related to
Livelihood Assets – human financial, and social capital	Awareness/knowledge of organic farming and of ill-health with farm chemicals - *human capital*	Contact with the promoters of organic; Extension access/technical support *institutional*	*Social capital* - e.g. family ties, church membership, relationship of trust with fellow farmers and the promoters of organic
	Experiential knowledge - *human capital*	Awareness of the ill-health issues with farm chemicals	Knowledge of forefather's agriculture; experience growing some crops with(out) chemicals
	Difficulty getting money to buy chemicals – women	financial situation	cost of chemical inputs
	Social status in the community		Religious/community leadership
Vulnerability context	Indebtedness, financial problems, food insecurity	Off-farm livelihood activities not generating stable and good income	
	Farm income losses	Market insecurity/adverse prices for conventional produce - *institutional*	
	Social insecurity (women)		Financial situation; spousal household relations
	Susceptibility to sickness		Ill-health with farm chemicals
Institutional and policy context	Training/extension technical support on organic farming	NOAN; social capital ties	
	Organic 'premium' market opportunity		
Livelihood activities	Farm and off-farm livelihood activities		Insufficient income from livelihood activities
Livelihood outcomes (expected)	Economic motivations – e.g. raise money, obtain profitable income, gain access to 'premium' markets		Access to high price-paying markets for organic *(institutional*)
	Health-food safety motivations – improved personal, family and societal health condition; food-safety concerns; longevity of life		Awareness of perceived health benefits of organic/ill-health issues with farm chemicals (*human capital*)
	Improved soil heath, prevent environmental pollution		Exclusion of synthetic inputs

Table 3.5. (cont'd)

TALAF Component		Caused/Facilitated by	Related to
Technology attributes	Low-cost	Exclusion of synthetic inputs (*institutional*)	Women financial situation
	compatibility with forefathers' agriculture, perceived health benefits		
	Relative profitability		Access to high price-paying markets for organic *(institutional*); exclusion of synthetic inputs
Culture	Forefather agricultural heritage		Notion of ideal agriculture, good and healthy food; Organic farming attributes/perceived health benefits

3.6 *Factors in non-adopters' decision-making*

3.6.1 *Livelihood assets*

Livelihood asset factors related to human and social capital were obvious obstacles to adoption. Accordingly, four respondents cited limited awareness and lack of knowledge about organic farming (*human capital*) as a barrier to adoption. A similar opinion was expressed by some discussants during Ajibode and Elekuru FGDs with non-adopters. This constraint was linked to lack of access to extension officers, who could have educated them about how organic farming can be economically viable. Among the four respondents, two further alluded to household labor limitation (*human capital*) as a major factor that deterred them from going organic. Of the duo, one has a household size of nine and the other, seven. They ascribed the household labor constraint to their household size and the fact that their children were not always available to support their farm work due to their educational commitments. From the FGDs in Ajibode and Elekuru, five female farmers from male-headed households stated that they did not adopt organic because they lacked the physical capacity (*human capital*) for the work in organic farming: "*when I heard about organic farming, that people are not allowed to use chemicals on organic farms, I said it*

will be a difficult and physically challenging work. I said I cannot do it … because as a woman I do have the power to manage an organic farm (EC11, Elekuru FGD). Another noted: "*the reason we did not adopt organic farming is that the type of work in it is beyond our physical capacity as women. It is no easy task"* (AJC6, Ajibode FGD). Finally, social capital constraint vis-à-vis with the membership of different church groups influenced the non-adoption decision of a male respondent in Elekuru: *"I did not care or commit to adopting organic farming at all when I first heard about it because, first of all, I was not attending the same church as those who introduced it to me*" (EC3, Elekuru).

3.6.2 *Vulnerability context*

Most of the interviewed farmers (67%, 6 out of 9) cited perceived vulnerability to poor yield and financial loss as their primary reason for not adopting organic farming. For disallowing chemical pesticides, respondents opined that organic farming will amplify their vulnerability to insect pest problems than they were facing by growing their leafy vegetables conventionally. That was also because they did not believe that organic pest control measures can address their insect pest problems: "*a major challenge we are facing is insects. We have to use chemicals over and again to get rid of the insects. You have toured our farms and have seen that insects have eaten a lot of our leafy vegetables, despite using chemicals. If we do not apply chemicals to deal with the insects, instead, using neem, how do we survive without losing all the crops and becoming indebted. That is why we are not doing organic farming*" (AJC2, 45-year old, Ajibode). The perceived vulnerability to yield and financial losses that were cited by respondents is also related to the barring of synthetic fertilizers and herbicides in organic. About this, five respondents (3 from Ajibode, 2 from Elekuru) held that their leafy vegetables would neither establish nor grow well without using chemical fertilizer because their farms are in waterlogged areas: "*because we are growing our Corchorus on the bank of a stream, the water that is logged in our soil does not allow our crops to grow fast and develop on time. So, we need to apply fertilizer. That constrained us from doing organic* (EC4, Elekuru). Besides, in Ajibode two respondents felt that adopting organic farming will expose them to avertible losses from harmattan and occasional heavy downpour during the dry season

that causes their soils to be waterlogged: *when harmattan starts, the vegetable seeds that we sow may not grow. … That is a debt. After sowing our seeds, it may start raining. … The water may stay afloat on our soil … making our soil to be waterlogged. … Those are part of the reasons I did not do organic farming, for if I am not allowed to apply fertilizer my crops will not establish on time. But if I apply herbicide and fertilizer, and if it rains, even if there would be harmattan, the chemicals would have helped my crops to establish and grow faster. So, I won't have to suffer big losses* (AJC2, Ajibode).

Perceived vulnerability to hunger and marketing problems also inhibited adoption. Specifically, two non-adopters from Ajibode linked their decision to perceived susceptibility to hunger, which may arise from the length of time it will take organic leafy vegetables to mature for harvest: "*The fear of hunger is linked to why I did not do organic farming because I was like it takes time to prepare land and harvest for sales in organic. And if one's leafy vegetables are not ready for harvest by the time they will be profitable, one can be in debt and hunger*" (AJC1, Ajibode). Three respondents from Elekuru were concerned that if they were to adopt organic farming, their existing marketing problems will worsen: *one of our worries is that we may not get market for our organic produce. We do not always get buyers and good prices for our vegetables grown with chemicals. I was afraid that the problem will worsen if I do organic farming*" (EC3, male, 40 years old). In Ajibode, vulnerability to market losses that may arise from the quality of the leaves of vegetables being undermined by the insect pest problems in organic constrained two respondents from going organic.

3.6.3 *Institutional and policy context*

From the FGDs and individual interviews with non-adopters, the dearth of specialized/high price paying markets for organic produce was unanimously identified as the foremost obstacle to adoption. In Ajibode, non-adopters stated that they sell on the same markets as organic farmers, citing that as a disincentive to adoption: "*the main reason we did not adopt organic is that there is no market for organic produce. Organic farmers take their produce to Bodija where we take our own nonorganic produce to as well. So, if one is to do organic farming, it makes no economic difference with what I am doing*" (AJC1, Ajibode FGD). In Elekuru, adoption was constrained by a dearth of reliable access to high price paying

markets for organic in urban locations and lack of demand for organic in Elekuru periodic rural market: "*market is the most important reason we did not do organic. People that patronize Elekuru market will not buy organic because they do not understand the reasons those who buy organic buy it at certain prices. They do not understand the health benefits in organic. The market in town for organic is not also guaranteed*" (EC7, female, Elekuru FGD). Lack of government and institutional financial support to hire labor and access organic inputs (3 respondents), distrust in the organization promoting organic (1 respondent), lack of extension support/information provision about organic (5 respondents) and certification rules barring burning and the use of synthetic inputs (5 respondents) are other key obstacles to adoption.

3.6.4 *Livelihood outcomes*

From the FGDs and individual interviews with non-adopters, seven respondents averred that the yield and income that they will make from OLVP strongly dissuaded them from adopting the technology. Their desire was for a quick, high and profitable leafy vegetable yield, which as they argued, would require applying synthetic inputs. Their construction of a high and profitable yield embraces a yield that is high enough to maximize profit. It also includes leafy vegetables with broad and shiny green leaves that will attract and oblige retailers and consumers to pay well for their produce. They felt that may not be possible with organic farming. In arriving at this determination, some of them compared the yield and income that they were making from the sales of their conventional leafy vegetables with what they thought that organic farmers were making. Despite their marketing and production challenges, they felt that they were making higher income and so, decided against adopting OLVP: "a*nother reason for my decision is that, I have seen their farms before and they were not as good as the farms of those of us that are not doing organic. We cannot compare their yields and profit to mine. If I do organic farming, I won't be able to make the yield and money that I want to achieve on my farm on time. I do not think there is anything that anybody can produce without chemicals that can make farms to generate a high profit* (AJC2, Ajibode FGD); "*If chemicals are not applied to a farm, there is no way our crops will turn out good. There is no way they can do well*" (AJC7, woman, Ajibode FGD). Another respondent noted: *because I will not be*

able to have a good and high harvest that can fetch me a lot of money, that is the reason I did not adopt organic farming (EC2, Elekuru). In contrary, from the FGD and individual interviews with non-adopters in Elekuru, six farmers asserted that it was possible to make higher profit from OLVP compared to what they were making as conventional farmers. However, they were yet to adopt OLVP because they had not seen adopters in Elekuru make steady and higher income from organic: "*I heard and know that the money from organic, the price of for organic produce in the town is higher, but I am yet to see people make that money regularly. So, for now I am sticking to what I am doing now as I am making a good sales* (EC1, Elekuru). Another added: "*when people starting getting regular good prices and making regular profit from their organic leafy vegetables, then I know that the gains in organic farming have started manifesting. Then, I can do adopt organic farming*" (EC5, Elekuru FGD).

3.6.5 *Technology attributes*

All but two out of the nine respondents (78 %) that were interviewed considered organic to be physically exacting, difficult and burdensome and highlighted that those attributes shaped their decision not to adopt the technology: "*because weed killers are not allowed, I thought that it was going to be too demanding and straining for me to do organic farming. That is one of the reasons I did not join them to do organic farming* (EC6, Elekuru). As the quote indicated, mostly, the characterization was in relation to bush clearing and weeding in swampy soils without chemicals, which according to AJC2, "*amounts to purposely punishing oneself*." It was argued that weed killers, which were outlawed in organic help to reduce the burden in land clearing in swampy soils. Among the respondent, four further related their depiction of organic as burdensome to the difficulty they thought that they would face finding money to hire labor for the work in organic. During the FGDs in Ajibode and Elekuru, female discussants particularly emphasized that the main factor which deterred them and many women from adopting organic was its perceived difficulty and physically demanding nature, arising from the prohibition of burning and the use of chemicals, particularly, weed killers: "*The reason some women are not adopting organic is because it is a very tough work; it is a tough work. When I heard about organic, that people*

are not allowed to use chemicals on organic farms, I said it will be a difficult work. I cannot do it. That is the reason I did not adopt or join the organic farmers group because the work in organic is difficult (EC11, focus group). Moreover, six respondents viewed organic farming as a high-risk and low crop yield technology, labor-demanding, and time-intensive, attributes that contributed to their non-adoption decision. To them, organic is a high-risk and low crop yield technology because it was considered highly susceptible to yield and income losses from insect pest infestation. They considered organic farming as a low crop yielding technology due to its vulnerability to insect pest attack and because it disallows the use of synthetic fertilizer and pesticides. Their characterization of organic as a high-cost technology was because they felt that it will cost more to meet the labor requirement in organic compared to burning and buying chemicals for weeding and land preparation on a conventional farm. They also averred that pesticide reduces the total labor manpower needed for farm operations and the cost of hiring labor, thereby reducing production cost. Besides, organic was viewed as only well-suited to small-scale farming, an attribute which discouraged three male respondents from adopting the technology: *"anyone doing organic farm cannot cultivate 10% of my farm size. They dare not and if they do, the person will incur losses and that is a major factor in my decision not to do organic*" (AJC1).

3.6.6. *Gender division of labor, intrahousehold decision-making dynamics*

A major finding from the FGDs with female adopters in Ajibode and the non-adopters in Elekuru is that domestic division of labor and men decision-making authority over women can discourage female farmers from adopting organic farming. In my study areas, women farmers in male-headed households were solely responsible for preparing meals for the family and for other time-consuming daily domestic chores. Inferring from their personal experiences, some female farmers stated that the time-consuming nature of organic farming may conflate with the performance of such domestic chores by women, thereby constrain their adoption decision: "*women handle house chores all alone. To combine that with organic will be too tasking because organic farming by itself requires a lot of work. For that reason, many women are not adopting organic farming* (EC11, female farmer, Elekuru FGD). Similarly, another stated, "*some women are not doing organic because a woman will do house chores, they will work on organic farm,*

there will not be no time left for them to do other things because organic consumes time" (EC7, female farmer, Elekuru FGD). As further evidence suggests, that may also be informed by the intrahousehold decision-making authority of men over women regarding how long they can work on their farms. As illustrated below, men, as the main decision-making authority in the household have an expectation of the time women should return from their farms to prepare dinner for the family. By adopting organic farming, women may not be able to comply with such a time-bounded expectation, with that likely to degenerate into a conflict situation. In order to forestall such a domestic conflict, women farmers may decide not to adopt organic farming: *From personal experience, one challenge that I observed is that when a woman is engaged in organic farming and the husband is not, at a stage during the growing season, one would have to go to farm around 4 pm/6pm to work till late in the night. When it is 7 pm, he will call you, asking why you are staying that long on the farm. Do you want to pass the night over there? You are not supposed to stay that long? A crisis may start from there. That, in my opinion, is a particular challenge that is preventing some women from doing organic farming* (AJC11, Ajibode female-only FGD). A summary of the major factors that interlocked to influence the decision of respondents not to adopt organic farming are captured in Table 3.5.

Table 3.6. Some of the factors that inhibited the adoption of organic farming in this study

TALAF Component		**Caused by/Related to**
***Livelihood Assets* - human and social capital**	Limited awareness/knowledge of organic farming	Lack of extension access about organic (*institutional*)
	Household labor limitation	Family size/ children education - *household composition*
	Limited physical capacity for manual weeding and land clearing in organic – women	Technology attribute- exclusion of chemicals in organic; domestic gender division of labor e.g. cooking
	Church membership	Different church affiliation
Vulnerability context	Perceived susceptibility to yield and financial losses, and hunger	Insect pest problems; exclusion of chemicals in organic *(institutional*); farm location in swampy areas (*natural capital*); harmattan and occasional heavy rainfall in dry season; dearth of markets for organic *(institutional*);
	Perceived susceptibility to hunger	Duration for organic crops to mature for harvest and sales
Institutional and policy context	Dearth of organic 'premium' markets; Organic market access/marketing problems – Elekuru	Conventional and organic farmers selling on the same markets; poor consumer awareness of organic, especially in rural Elekuru
	Lack of extension support	
	Prohibition of burning/chemical in organic	NOAN PGS certification rules
	Lack of financial support to hire labor/access organic input	Labor need/cost in organic; perception that organic is not economically rewarding; limited household labor
	Distrust in the organization promoting organic	
Livelihood outcomes	Low crop yield, low/ unprofitable income in organic	Exclusion of chemicals in organic; dearth/lack of market for organic produce *(institutional*); desire for quick and high income; higher yield and income from conventional farming
	Lack of observable economic benefits from organic farming	Income, profit, and price obtained by organic farmers for their produce; market access by organic farmers
Technology attributes	Physically challenging, labor and time-intensive	Exclusion of chemicals in organic *(institutional*); gendered domestic role by female farmers
	High-risk (Income/financial losses); low crop yielding technology	Vulnerability of organic crops to insect pest attack; exclusion of farm chemicals
	high-cost	Labor need and labor cost in organic; exclusion of weed killers
Gender division of labor	Domestic role play by women e.g. cooking	Intrahousehold gender relations via decision-making authority of men over women's time; organic as time-intensive; lack of time due to domestic roles

3.7 Discussion of Findings

With reference to existing literature and TALAF, this section discusses some major findings of this study and their implications. Recommendations for policymakers and extension agents on what can be done to address some of the factors constraining the adoption of OLVP in the study areas were also offered. As summarized in Tables 3.4 and 3.5, prominent among the multiple and diverse factors that affected adoption in this study were livelihood asset related. Specifically, and consistent with Constance and Choi (2010), Thapa and Rattanasuteerakul (2011), we found that farmers who had better access to information and knowledge of organic production techniques, about its financial and health benefits, and who were well-informed about the likely ill-health issues from chemical pesticides and herbicides adopted organic farming. In relation to TALAF, this finding highlights the linkage between human capital and adoption decision-making. More importantly, the finding underscores a need for exposing farmers to information about organic farming and human capital capacity building training that will enable them to acquire knowledge that can motivate them to adopt the technology. This is consistent with the opinions expressed by NOAN and OSADEP officers that were interviewed. In particular, respondents identified a need for capacity building training in organic pest, weed, crop, and soil health management; provision of information on how organic farming could fetch farmers, higher prices and increase their stock of financial assets through increased productivity and profitability. This becomes imperative given that lack of knowledge about the economic viability of organic farming and its production techniques inhibited adoption in this study.

One more livelihood asset in TALAF, which played a bigger role in driving adoption in this study were different types of social capital, which include family ties, reciprocal relationship of trust and respect, shared religious belief and place of worship and information exchange relations. In part, this finding was because the social capital assets helped foster positive attitudinal disposition towards organic farming, social acceptance, and trust in the technology. Also, and in relation to TALAF, the finding was because the social capital assets linked farmers to the institution (NOAN) and persons through which they acquired the information, knowledge and technical support that motivated them to adopt organic farming.

The trust and knowledge helped offset doubts about the technical and financial feasibility of the technology, which otherwise could have inhibited adoption. The finding aligns with Badu-Gyan et al. (2018), who found that cognitive social capital, which included the relationship of trust with family, community and church members, influenced the adoption of certified organic farming in Ghana. Overall, the finding implies that existing social capital that adopters have such as ties with non-adopters, farmers' associations and religious formations can serve as a means of disseminating information and knowledge about organic farming and for aiding institutional linkages that can spur adoption in the study areas.

The finding that the social status of two respondents influenced adoption in Elekuru conforms to Eyhorn (2006) and Risgaard et al. (2007), who found that some farmers adopted organic farming because of their status in the community. In line with Kaup (2008), but in variance with Lassen and Oelofse (2018), this study found that that experiential knowledge as a form of human capital mediated farmers' decision to adopt organic farming. In this context, experiential knowledge refers to the knowledge acquired by farmers from observing the distinctions, albeit subjective, in the attributes of their crops grown with and without synthetic inputs. The finding may mean that expert-based information about organic farming may not be adequate to foster adoption. Thus, where possible, it seems imperative to identify and broadly frame issues around explicit farmers' experiential knowledge when promoting organic to farmers. This may enable them to contextualize, relevantize, and trust expert information, with that likely to motivate adoption. The finding on household size (human capital) partly agrees with Kisaka-Lwayo (2007) and Sarker et al. (2009), which reported that relatively large households were more likely to adopt organic farming. But the finding of this study showed that large family size may neither imply family labor availability nor adequacy for the additional labor required in organic. This is because as this study found, factors such as household members' engagement in educational activities may constrain their availability for farm work. This finding implies that farmers may need more than their available household labor to adopt organic, with that implying not having the financial capital to hire the extra labor may be an obstacle to adoption. Together, and from a TALAF stance, the findings reinforced the claim that farmers will draw on their livelihood assets to decide whether to adopt organic farming or not.

Eyhorn (2006) suggested that emotional attachment to forefathers' agriculture and the perception that what they practiced was organic farming could motivate adoption. However, in this study, it was the desire for a healthy living and long-life, and to reawaken and mainstream the culture of good and healthy food that motivated some respondents to reconnect with their forefathers' agricultural and food legacy by adopting organic farming. As shown by the findings, adopters objectified the agricultural legacy of their forefathers as a symbol of good farming, healthy food, healthy living and long-life. They further considered organic farming to be based on their forefathers' agricultural legacy and its associated ideals of good farming and healthy food. By this, organic farming became inputted with cultural significance that made it attractive for adoption. Noticeably, this was prompted by respondents' awareness of the ill-health issues associated with what they called chemical agriculture and the perceived health benefits of organic farming. This finding provides empirical support for TALAF's claim that adoption can be mediated by cultural factors. It further suggests that paying attention to how cultural factors such as indigenous agricultural norms and belief systems intersect with organic farming in the study areas can help stimulate adoption. Equally, the finding implies that as a form of human capital embodied in TALAF, the tacit knowledge of agricultural systems/traditions that are related or similar to organic farming in the study areas may influence farmers to adopt the technology.

As conceived in TALAF, the concern that organic farming could worsen farmers' vulnerability conditions emerged as a major barrier to adoption. First, and akin to Sierra et al. (2008), Lau et al. (2010), and Nandi et al. (2015), this study showed that adoption was largely constrained by perceived vulnerability to pest-induced yield and financial losses, which may result from the prohibition of synthetic pesticides in organic. The finding also relates to respondents' lack of knowledge and conviction about the efficacy of organic pest control techniques. According to TALAF, this connotes a lack of human capital, which again, can be addressed by providing training for farmers on organic pest management. The obstacle can also be assuaged if it is observable to non-adopters that insect pest pressure is less of a problem on the organic farms in the study areas. This is because I observed that some non-adopters drew on the production problems on the organic farms nearby them to inform their adoption decision. Second,

this study also found that perceived vulnerability to yield and financial losses from harmattan and occasional heavy precipitation during dry season hindered adoption. This finding is associated with the swampiness of respondents' farms. As a result, and from TALAF perspective, this can be regarded as an obstacle to adoption that was posed by respondents' natural capital asset. This finding may also be related to lack of awareness and knowledge of suit of practices in organic farming such as composting, cover cropping, crop rotation and its amenability to context suited practices, which can help reduce vulnerability to crop and financial losses from weather vagaries and waterlogging (Eyhorn, 2006; Muller, 2008; IFOAM, 2009). Overall, the findings suggest that increased attention to human capital building training aimed at reducing vulnerability to yield and financial losses in organic farming, while enhancing and sustaining productivity can help spur adoption.

The finding that the perceived suitability of organic farming to the existing non-farm livelihood activities of adopters influenced adoption is somewhat consistent with existing literature. For example, Bravo-Monroy et al. (2016) suggested that farmers whose on-farm livelihood activities were not competing for time for their farm work were more likely to adopt organic farming. This fairly conforms to this study's findings, which found a link between adoption and the circumstances of some respondents' off-farm livelihood activities which left them with a lot of idle time. Tovignan and Nuppenau (2004), as well as Singh and Maharjan (2017) also reported that income from off-farm activities stimulated the adoption of organic farming. This study found otherwise, as a lack of reliable income from off-farm activities made many respondents to adopt organic farming. In accordance with TALAF, this finding was also because the respondents felt that organic farming offered them the prospect of improved livelihood conditions through increased and profitable farm income (*financial capital*). So, the finding suggests that farmers whose livelihood activities make them financially vulnerable may more likely adopt organic farming if it guarantees them a prospect of earning good and stable income.

In tune with the studies that were reviewed, the findings of this study showed that adoption decision-making was associated with a multiple of intertwined motives, ranging from economic/financial to market, environmental, food-safety as well as personal, family and community health considerations. In

line with Johansson (2011), Karki et al. (2011), and Mamuya (2011), economic/financial considerations related to the prospect of access to financially rewarding markets was the foremost factor that enticed most respondents to adopt OLVP. This finding was expected given the socio-economic status of the respondents and the fact that the dearth of rewarding markets for farm produce is a major challenge facing farmers in my study areas. Also, adoption was considerably influenced by food-safety-health motivations. This finding is consistent with Tovignan and Nuppenau (2004), Bakewell-stone et al. (2008) but conflates with Mamuya (2011) Tanzanian study, which stated that the adoption of organic farming was not influenced by health reasons. The finding is related to respondents' awareness of the concerns surrounding the chemical pesticides and herbicides that are widely used by farmers in the study areas. These include Lindane (Gamalin-20), Attack, Warrior, Karate (lambda-cyhalothrin), Atrazine, Roundup, Forceup and Paraquat, which according to some studies can cause health hazards (Thongprakaisang et al., 2013; Nicolopoulou-Stamati et al., 2016). The finding was also because before organic was introduced to adopters, some of them had experienced skin, eyes and throat irritation, nausea, and headache after spraying herbicides and pesticides. Together, the findings suggest that accentuating only the economic livelihood benefits of organic farming to farmers may not be sufficient to stimulate adoption. The potential non-economic benefits of organic farming also matter in adoption decision-making and should, therefore, be emphasized when introducing the technology to farmers in the study areas.

The finding that some farmers who were satisfied with the livelihood outcomes of growing their leafy vegetables conventionally on their financial condition were opposed to organic farming is consistent with Mamuya (2011). As observed by Mamuya (2011) and demonstrated by the findings of this study, such farmers may not see any reason for them to adopt organic farming. Also, Karki et al. (2011) reported found a positive association between the decision to adopt organic farming and its associated derivable economic benefits. The results of this study further suggest that organic may be less attractive for adoption by farmers who considered it not attributively amenable to relatively big farms. Similar findings were reported by Khaledi et al. (2010) and Mamuya (2011), who found that the likelihood of adoption of organic farming decreases with increasing farm size. On one hand and in relation to TALAF, the finding

indicates that the adoption of organic farming in the study areas is likely to be affected by farmers' natural capital asset vis-à-vis their farm size and the fact that is organic is best-suited to small-scale farming. On the other, the finding implies that targeting organic at farmers that are cultivating relatively large farms may decrease the likelihood of adoption. This submission is further bolstered by the fact that respondents with relatively big farms were particularly concerned that adopting organic farming will increase their production cost due the number of labor they would need to hire for land preparation and weeding.

Studies have identified the inability to find and obtain profitable prices and secure dependable markets that can make organic farming economically viable as a major constraint to adoption (Tovignan and Nuppenau, 2004; Sierra et al., 2008; Karki et al., 2011; Nandi et al., 2015). Correspondingly, this study revealed that market as *an institutional and policy context* in TALAF was very important in stimulating and discouraging the adoption of OLVP in my study areas. Specifically, in Ajibode, the market disincentive to adoption was that conventional and organic farmers were selling on the same markets, with conventionally grown leafy vegetables attracting better prices. One explanation for this finding is relatively low consumer awareness of organic farming in Ajibode and the fact that the despite its potential for growth, the market for organic in Ibadan is still small and underdeveloped (Obayelu et al., 2014; Adenegan and Fatai, 2016). In Elekuru, the constraint was the lack of stable access to lucrative markets for organic in urban locations and the inability to find buyers for organic product in Elekuru rural market. The finding pertains not only to the remoteness of Elekuru but also to transportation and telecommunication constraints, which made it difficulty connecting Elekuru organic farmers to notify them of the demand for their organic produce in urban locations. The finding was also related to the reliance of Elekuru organic farmers on NOAN to access the lucrative markets for organic in urban locations, a role which NOAN lacks the capacity to discharge effectively. As suggested by respondents and affirmed by NOAN officers, the market constraints implicate a need for increased consumer awareness creation; expansion of existing pricier markets for organic in Ibadan and creation of newer ones in the rural areas; building the capacity of the organic farmers group in Elekuru to facilitate market linkage with buyers in urban locations.

Another *institutional and policy context* in TALAF that had a major impact on adoption was lack of extension and information access about organic farming. This result is similar to IFAD (2003), which reported that absence of extension during transition discouraged farmers from converting to organic farming. This finding elucidates why some respondents cited lack of information and knowledge about organic farming as an obstacle to adoption. Addressing this constraint may require boosting the capacity of organic farmers to facilitate training and offer technical support for farmers on organic production methods. This is because NOAN and the government establishment supporting organic farming in the study areas have a shortfall of manpower for organic technical support provision and extension service delivery. The finding on lack of financial support to hire labor or access organic inputs is partly related to the dearth of lucrative markets that can make organic farming economically viable and self-sustaining without any financial support. Nevertheless, the finding suggests that institutional credit access or financing support for organic farming may be necessary to enable farmers to overcome financial obstacles to adoption. Related findings were reported by Sarker et al. (2010) and Sierra et al. (2008) who found that the inability to access credit and financial support constrained the adoption of organic farming. Overall and in relation to TALAF, the findings indicate a pathway through which *institutional and policy context* factors (e.g. extension and financial support) could help create the livelihood assets (in this instance, knowledge and money -human/financial capital) necessary to facilitate the adoption of organic farming.

This study found mixed evidence about gender and the adoption of organic farming. In agreement with Jansen (2000) and Tovignan (2005), generally, this study found more female adopters than males. Akin to Moumouni et al. (2013) and Thapa and Rattanasuteerakul (2011), this study further revealed that women farmers were more likely than men to adopt organic farming based on the perception that organic is a low-cost technology that is well-suited to their financial capital condition. This is because compared to their male counterparts, female adopters experienced greater financial difficulties buying chemical inputs to grow their leafy vegetables. Discussants during the FGD with female adopters in Ajibode also suggested that many female conventional leafy vegetable farmers in the area were facing the same financial hurdle buying chemical inputs. Conversely and as envisioned in TALAF, this study also showed

that domestic gender division of labor and intrahousehold decision making authority of men over women time could discourage women from adopting organic farming. The findings were related to women situatedness in male-headed households, patriarchal gender cultural norms, and the attribute of organic farming as a time-consuming technology. In addition, this study revealed that the physically demanding nature of organic farming may discourage women more than men from adopting the technology. This finding which is related to the exclusion of synthetic herbicides in organic and women's domestic role play, is, from a TALAF perspective, also illustrative of women limited physical capacity for the arduous work in organic and their lack of financial capital to hire labor. Together, these findings provide empirical justification for TALAF underlying proposition that gender-related and technology-specific factors could gender technology adoption decision-making.

As anticipated in TALAF, this study showed that the multifaceted interplay of many factors, such as farmers' livelihood assets, their vulnerability contexts, and livelihood activities and gender-related variables simultaneously shaped adoption decision-making. The findings reflected most of the factors and the causal linkages which were theorized in TALAF as responsible for shaping and gendering adoption decision-making. Nonetheless, the findings of this study indicated that some respondents' primary livelihood activities influenced their adoption decision-making, a linkage that is not captured in TALAF. That some respondents adopted organic farming because producing safe foods for public consumption was to them indicative of their faithfulness to God implies a direct linkage between livelihood outcomes and adoption decision-making. This linkage is also missing in TALAF. Aside the omissions, the results of this study suggest that TALAF has the ability to inform a comprehensive understanding of the multiple factors that interact to influence adoption decision-making. However, more studies are required to affirm the conceptual capability and reveal the limitations of TALAF in relation to adoption decision-making.

3.8 Conclusions

This study used a livelihood framework to qualitatively explore the factors that motivated and constrained the adoption of OLVP in Ibadan, Nigeria. It was found that adoption was not just about

profitability, as multiple economic and non-economic motivations undergirded adopters' decision-making. These include the desire for improved market access and farm income; the need to solve existing financial problems; a desire for a long and healthy life, family and society; and, an expectation of improved soil and environmental health. So, policies intended to encourage the adoption of OLVP in my study areas should account for the complexity of the motivating factors. Access to information and the acquisition of the knowledge of organic production techniques, as well as awareness of the ill-health issues that may arise from chemical pesticides and herbicides, were pivotal to the adoption of OLVP. Respondents' cultural construction and sense-making of organic farming as based on the farming heritage of their forefathers also contributed to the adoption of the technology. Institutional factors such as lack of extension support, the dearth of niche/financially rewarding markets for organic and low consumers' awareness about organic products emerged as obstacles to adoption. It was also found that some specific livelihood assets at the core of TALAF were instrumental to the adoption decision-making. For instance, adoption was hindered by the financial inability to hire labor (financial capital), household labor constraint and limited knowledge about organic farming (human capital). Adoption was also constrained by the perception of organic farming as a high-cost and high-risk technology that will lead to yield and financial losses due to its vulnerability to insect pest infestation. The findings also call attention to the factors that could gender the adoption of OLVP in my study areas. These include domestic role play by women and men's decision-making authority over women's time. Overall, the findings of this study have broader implications for the promotion of organic farming in Ibadan and Nigeria and utility of TALAF.

APPENDICES

APPENDIX A: Themes from individual interviews and focus group discussion with adopters representing factors that shaped respondents' decisions to adopt organic farming

Livelihood asset themes	**Sub-themes**	**Number of Respondents Raising Themes During**	
		Individual Interviews	**FGD**
Human Capital	Awareness/knowledge of ill-health issues from farm chemicals	15	
	Awareness/knowledge of organic farming	15	
	Knowledge of forefathers' agriculture	12	
	Experiential knowledge growing crops without chemicals	3	
Social Capital	Relationship of trust, social bonding, religious social capital	2	3
	Family ties	1	
	Relationship of trust (between fellow farmers)	6	
	Social status in a community	2	
	Ties with NOAN officer	3	
Financial capital	Difficulty getting money to buy farm chemicals	4	
Vulnerability Context	**Sub-themes**	**Individual Interviews**	**FGD**
	Livelihood activity-induced vulnerability (indebtedness, financial problems, food insecurity)	5	
	Market-induced vulnerabilities (farm income loses)	2	7
	Social insecurity		9
	Susceptibility to sickness from farm chemicals	15	
Institutional and policy context themes	**Sub-themes**	**Individual Interviews**	**FGD**
	Training/extension technical support	5	
	Organic 'premium' market	15	
Livelihood outcome themes	**Sub-themes**	**Individual Interviews**	**FGD**
Economic/ financial motivations	Financial gains/profitable income	15	
	Gain 'premium' market access	15	
	To raise money	1	
Health-food safety motivations/ Longevity of life	Improved personal and household health status	15	
	Food safety concerns	15	
	Keep the society healthy	13	
	Longevity of life	15	
Soil-environmental health benefits	To improve soil health	2	
	To prevent environmental pollution	3	
Technology attributes themes	**Sub-themes**	**Individual Interviews**	**FGD**
	Low-cost technology	4	
	Perceived health attributes	15	
	Relative profitability	13	
	Compatibility with forefathers' agriculture	13	
Culture	Revival of forefathers' agriculture heritage	4	

Individual interviews (n=15); Focus group discussion (FGD) (n=38)

APPENDIX B: Themes from individual interviews and focus group discussion (FGD) with non-adopters representing factors that constrained the adoption of organic farming

Livelihood Assets	**Sub-themes**	**Number of Respondents Raising Themes During**	
		Individual Interviews	**FGD**
Human Capital	Limited awareness/knowledge of organic farming	4	
	Household labor limitation	2	
	Limited physical capacity for tasks in organic		5
Social capital	Membership of different church	1	
Vulnerability context	**Sub-themes**	**Number of Respondents Raising Themes**	
	Perceived susceptibility to pest-induced yield and financial losses	6	
	Perceived vulnerability to yield and financial losses from waterlogged soils	5	
	Perceived susceptibility to weather-induced yield loses	2	
	Perceived vulnerability to hunger	2	
	Perceived vulnerability to marketing problems	3	
Institutional and policy context	**Sub-themes**	**Number of Respondents Raising Themes**	
	A dearth of organic markets/organic marketing problems	9	11
	Lack of extension support/limited information about organic	5	
	Prohibition of burning and chemicals	5	
	Lack of financial support to hire labor/access organic input	3	
	Distrust in the organization promoting organic farming	1	
Livelihood Outcomes	**Sub-themes**	**Number of Respondents Raising Themes**	
	Perceived reduction in yield and income from organic	3	4
	Satisfaction with income from conventional farm	5	
	Lack of observable of observable economic benefits from organic farming	3	3
Technology attributes	**Sub-themes**	**Number of Respondents Raising Themes**	
	Physically challenging and burdensome	7	
	labor and time-intensive	6	
	High-risk technology	6	
	High-cost technology	6	
	Low yield technology	6	
	Not suitable for big farms	3	
Gender division of labor	Domestic role play by women		5
Intrahousehold decision-making dynamics	Husband control over women farmers' time		6

Individual interviews (n=9; Focus group discussion (FGD) (n=11)

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CHAPTER 4

A LIVELIHOOD APPROACH TO UNDERSTANDING DISADOPTION OF ORGANIC FARMING: EXPLORATORY INSIGHTS FROM NIGERIA

ABSTRACT

The objective of this paper was to develop a narrative rich understanding of the contexts and factors that motivated the disadoption of organic farming in Ibadan, Oyo State, Nigeria. This paper draws on a livelihoods framework called TALAF and conceptualized disadoption as a dynamic livelihood strategy choice made by farmers to temporarily or permanently refrain from using a technology. I conducted in-depth interviews with the entire population of disadopters in Ibadan and drew on thematic analysis and TALAF to code and analyze my data. It was found that that the interactions of multiple factors captured in TALAF shaped respondents' disadoption decisions. Findings also indicate that unmet expectation of earning profitable farm income and dearth of a reliable access to pricier markets for organic products in urban location contributed to disadoption in rural Elekuru. Disadoption was also associated with limited physical capacity for weeding and land preparation in organic, as well as lack of institutional financial support to hire labor and access production inputs. Vulnerability to financial and yield losses, which resulted from insect pest infestation and market access problems also contributed to disadoption. The findings of this study also suggest that disadoption can be gendered by factors such as domestic role play that makes organic difficulty for women to practice than men. There was evidence for re-adoption, thereby affirming this study's delineation of disadoption as a dynamic behavioral phenomenon that is not inherently permanent in nature. As a whole, the information from this paper can guide policymakers and promoters of organic in Ibadan regarding what can be done to alleviate disadoption in my study areas.

4.1 Introduction

Increasing effort is being made by some national non-governmental actors, in conjunction with some international development agencies, to promote organic farming in Africa, in order to boost agricultural productivity, rural economies and smallholders' livelihood condition (Bakewell-Stone et al., 2008; UNEP-UNCTAD, 2008; Bennett, and Franzel, 2013; Adebiyi, 2014). Promoters of organic farming considered it well-suited to small-scale farming, which dominates African agriculture. They also consider organic farming to be compatible with the existing traditional farming practices among smallholders in Africa. Further, advocates believe that organic agriculture offers African smallholder farmers an entry point to differentiated markets, especially in the developed world, to boost their income through rewarding premiums for their organic products (Walaga, and Hauser, 2005; UNEP-UNCTAD, 2008; Ton, 2013; Altenbuchner et al., 2016). However, questions have been raised about the appropriateness of organic agriculture as a means of increasing agricultural productivity and farmers' livelihood conditions in Africa (Kirchmann et al. 2008; Kirchmann et al. 2009; de Ponti et al., 2012; Lotter, 2015). Policy makers and researchers have joined in the emergent discussion as well, with existing studies mostly focused on issues such as the profitability and market potential for African organic produce, as well as income/yield effects and conversion to organic farming in Africa (Bolwig et al., 2009; Dipeolu et al., 2009; Kleemann and Abdulai, 2013; Ayuya et al., 2015; Chiputwa et al., 2015; Girma and Gardebroek, 2015; Adenegan and Fatai, 2016; Bello and Abdulai, 2016). Little to no attention has been given to the disadoption of the technology by African smallholders. As observed by Pedzisa et al. (2016), disadoption is an integral part of adoption which takes place over time. If given deserved attention, this little studied but important missing piece can help deepen our understanding of the future of organic agriculture in Africa and yield insights about the factors slowing its adoption (Koesling et al., 2012). This research is an effort to fill this void, through an in-depth narrative-rich exploratory qualitative study of farmers who have disadopted certified organic farming in Ibadan, Oyo State, Nigeria.

The introduction of organic farming to Nigeria is fairly recent, dating back to June 2004, when a university-based non-profit project known as the Organic Agriculture Project in Tertiary Institutions in

Nigeria (OAPTIN) was established (Atungwu et al., 2016; Hegensen and Atungwu, 2010). The OAPTIN conducts outreach within Nigerian tertiary institutions and undertakes advocacy aimed at fostering support for the adoption and consumption of organic products in the country (Aiyelaagbe, 2013). In 2008, a more representative body, the Nigerian Organic Agriculture Network (NOAN) was formed. The NOAN is the national umbrella body that coordinates and links all organic agriculture stakeholders in Nigeria and it is located in the Department of Agronomy, University of Ibadan, Nigeria. The NOAN seeks to improve the quality of urban and rural livelihood in Nigeria by promoting and facilitating the adoption and development of organic agriculture in Nigeria (NOAN, 2018). Through its activities, NOAN has facilitated the adoption of organic farming in some parts of Nigeria. However, the development and adoption of organic agriculture by farmers is most pronounced in southwestern Nigeria. Possibly, this is because the organizations that are promoting organic agriculture in Nigeria are concentrated in the southwestern part of the country (Atungwu et al., 2016). Further, most of the farmers practicing certified organic farming in Nigeria, are in Ibadan (NOAN, pers. comm., 2018). Specifically, they are in Ajibode, Akinyele, and Elekuru Ibadan, the study areas for this research, and there are about 50 of them. During a field work that informed this study, it was discovered that some of the farmers who adopted certified organic farming in Ibadan have disadopted it. The motivations, contexts, and factors that promoted adopters' decision to disadopt certified organic farming are not known and are yet to be studied or reported in the literature. Therefore, I undertake this in-depth exploratory qualitative research to understand and shed insights into the contexts, decision-making process, and rationale that motivated the disadoption of organic farming in Ajibode and Elekuru, Ibadan.

I build on a livelihood framework called TALAF to shape my conceptualization and analysis of the factors and contexts associated with the disadoption of organic agriculture. I developed the TALAF to understand how technology (dis)adoption decisions are connected to farmers' livelihood assets, vulnerability, and institutional contexts. This study is important for a few reasons. One, organic farming is in its infancy in Nigeria, with low adoption rates, contrary to the anticipation of its promoters (Atungwu et al., 2016; Bello and Abdulai, 2016). Findings from my fieldwork indicated that about 12% of the

population of adopters in my study area have disadopted certified organic farming in at least one farming season. This trend may have bandwagon effects such as spurring further adopters to refrain from practicing organic agriculture, and/or, discourage potential adopters from adopting the technology (Moser and Barrett, 2006). Two, understanding the context and factors that informed disadopters' decisions can provide useful insights to promoters regarding what could be done to address the issues which are deterring the adoption and stimulating disadoption of the technology (Pedzisa, 2015). Three, insights from this study can motivate further related research in African organics and help deepen the conversation about the seeming appropriateness of organic agriculture as a means of boosting agricultural productivity and enhancing the livelihood of smallholders. In addition, this study provides insight into how the disadoption of organic agriculture can be gendered. This study also contributes to synthesizing existing literature on the disadoption of organic farming with a view to drawing attention to the complexity of the phenomenon and to provide a grounding for the analysis of my findings.

This study is qualitatively-oriented because the goal was to construct context-rich information about the circumstances of disadoption in my study areas. Qualitative approaches can reveal context-rich understanding and inform insights (Darnhofer et al., 2005), capable of unravelling the complexity and interconnectedness of factors associated with disadoption decisions (Koesling et al., 2008). Moreover, qualitative approaches are good for developing exploratory insights to set directions for further research, especially for topics that have yet to receive attention in the literature (Bernard, 2017). The population of disadopters in my study areas is seven. That makes qualitative approach suitable for this study. A shortcoming of qualitative-oriented studies, which this work also shares, is that their findings cannot be generalized (Bernard, 2017).

The rest of this paper is organized as follows. The section following this undertakes a literature review on disadoption of agricultural technologies. Here, I delineated adoption as a concept and undertook a review of the terms used in the literature to describe discontinuing the use of a technology by farmers. I identified a broad range of factors that drive farmers to disadopt practicing certified organic agriculture and how disadoption is gendered. I demonstrate the paucity of literature on the disadoption of

organic farming in Africa, to further accentuate the significance of this study. Next, I present the livelihoods framework upon which the design and analysis of the findings of this study are based. Afterward, is the methods section, followed by the presentation, discussions, and implications of the findings of this study. Thereafter, I conclude the paper, highlighting the major findings from this study.

4.2 Literature Review on Disadoption

Disadoption has been described as an intentional decision taken to permanently cease or reduce the intensity of use of a valued and adopted practice, behavior, product or any other thing such as an agricultural technology (Lehnmann and Parker, 2017). The authors underscored *intent* and *permanence* as necessitating conditions for a phenomenon to qualify as disadoption. Questionably, Lehnmann and Parker (2017) argued that a behavioral cessation not intended to be permanent is a suspension, not a disadoption. This conflates with studies which either recognized or indicated that a disadopted technology or behavior can be re-adopted (Jabbar, 1998; Qaim, 2005; Stone et al. 2007; Harris et al., 2008; Kiptot, 2008; Rahim et al., 2008; Mutingi, 2013; Pedzisa, 2016; Tamimie et al., 2017), a phenomenon regarded by Xu et al. (2017) as a win-back. Duck (1982) offers a more profound, but a slightly different definition to Lehnmann and Parker (2017) by construing disadoption, "as a process of ending a relationship, as separation, termination, dissolution, withdrawal, disengagement, divorce, break-up, discontinuity, decline, exit, and rejection" (Cited in Adarsh, 2016, p. 8). To Loevinsohn et al. (2013), disadoption is "the process of reversion to the pre-existing technology following a relatively short period of adoption" (p. 3). This definition renders disadoption as a process and as a time-bound phenomenon. Analogously, Adarsh et al. (2016) regarded disadoption as, "an integral of part of an innovation diffusion process, not a separate process" (p. 9). This implies that disadoption can take place at any time in the life of a technology, a position that conflates with Loevinsohn et al. (2013).

Some common threads run through the above descriptions and definitions of disadoption. One is that disadoption is both a conscious decision/choice and a process. This has methodological implications for framing disadoption research, as they can be designed to focus on disadoption decision-making criteria (see, for example, Harris et al., 2008; Koesling et al. 2012), disadoption decision-making processes, or

both, as in Darnhofer et al. (2005). In this study, my focus is on decision criteria and the associated decision-making contexts that informed the disadoption of organic farming in Ibadan. Two, the above discussion also suggests that as a behavioral phenomenon, disadoption may be static or dynamic. Static, in that, as suggested by Lehnmann and Parker (2017), a behavior or a technology can be disadopted permanently. Dynamic, in that disadoption is a non-linear and a reversible decisional phenomenon, as a disadopted technology can be re-adopted (Qaim, 2005; Kiptot, 2008; Mutingi, 2013). I considered the dynamic construction in framing this study, and in the questions posed to respondents. Three, the definitions, especially by Duck (1982) and Lehnmann and Parker (2017) incorporated some of the terminologies employed in the literature to connote disadoption. These include "withdrawal" (Madelrieux and Alavoine-Mornas, 2013), "reversion" (Rigby et al., 2001; Sahm et al., 2012), "de-registering" (Sierra et al., 2008; Koesling et al., 2012), "abandonment" (Frederiksen and Langer, 2004; Läpple, 2010; Pedzisa et al., 2015), "exit" (Gambelli and Bruschi, et al., 2010), "ceasing" (Flaten et al., 2010), opting out (Ferjani et al., 2010), and "opting/dropping out" (Eyhorn, 2006). As observed by Adarsh et al. (2016), each of such terminologies associated with disadoption, "is worthy of investigation in its own right" (p. 8). While terminologies may be used interchangeably in describing disadoption, their contexts of use may, or may not necessarily be the same. For example, Eyhorn (2006) used "opting out" to describe farmers who either quit organic farming or were excluded from organic farming in India, for defaulting from the organic standards they were meant to comply with. Rigby et al. (2001) used "reversion" to refer to farmers who have disadopted certified organic, reverting instead to conventional farming or quitting farming completely. Similarly, albeit with some difference, Flaten et al. (2010) used "ceasing" to qualify disadoption of organic farming in Norway, with ceasing including the following: (1) deregistered, still farming by organic principles, (2) deregistered, farming using conventional practices, and (3) deregistered, stopped farming.

Appropriating insights from the varied contexts of use of the terminologies, therefore, for this study, I defined disadoption as discontinuing or refraining from certified organic farming, instead, reverting to conventional farming, quitting farming completely, or still farming by organic principles but without

certification. I further recognized that disadoption can be a decision intended to be permanent or temporary, even situationally compelled. I reflected this in my selection of respondents for interviewing and while discussing my findings.

4.2.1 *Disadopting organic farming: reasons and state of the literature*

The literature on disadoption in African organics is sparse. I did not find a single study which exclusively addressed the discontinuance of organic farming in Africa. Disadoption featured marginally in Goldberger's (2008) Kenyan study of non-certified organic farming practices and in Sodjinou et al.'s (2012) research on export-oriented organic cotton production in Benin. Both studies merely provided percentages of disadopters, with only Goldberger (2008) offering shortly worded reasons for the discontinuance. As mentioned earlier, existing studies mostly explore the motivations for the adoption and rejection of organic farming, its profitability, market potentials and livelihood impact on African smallholders. Hitherto, organic farming is relatively underdeveloped in Africa (Adebiyi, 2014), with unmet potential for expansion (Issaka et al., 2016). This underscores a need for greater attention to disadoption trends, as such studies may help develop a deeper understanding of the slow and low uptake of organic farming in Africa, and what can be done to address that. There is an emerging literature on disadoption of organic farming in Europe, the US, and some developing countries, which I draw upon in this section, together with Goldberger's (2008) Kenyan study.

The underpinning factors stimulating the disadoption of organic farming are complex, multidimensional, and intertwined. But for convenience, they can be broadly categorized as economic/financial, market and marketing, social, production/management techniques, organic certification and standards, informational as well as institutional-related (Rigby et al., 2001; Sierra et al., 2008; Sahm et al., 2012; Madelrieux and Alavoine-Mornas, 2013). Financial issues, partly informed by lower sales, and turnover, were a common factor for the disadoption of organic farming by Norwegian farmers (Koesling et al., 2012), a finding supported by Flaten et al. (2010). In the UK, unmet financial expectations, which included a reduction in profit margin, and the inability to make a profit to offset high production costs informed disadoption. These included difficulties finding markets for organic produce,

disappointing premium prices, which made organic farming operations unprofitable, and distance from wholesalers (Rigby et al., 2001; Harris et al., 2008). Income losses and an insecure market for organic produce encouraged disadoption in Western Greece (Alexopoulos et al., 2010). However, in Ireland, lack of access to organic markets had no significant effect on disadoption (Läpple, 2010). Income losses, however, prompted by the inability to break even, following the expiration of government subsidy programs and failure to get higher prices that could offset organic production costs, stimulated disadoption in France (Madelrieux and Alavoine-Mornas, 2013). Market considerations and price were associated with disadoption decisions in California (Sierra et al., 2008). Sham et al.'s (2012) review paper also alluded to economic reasons, and the failure to break even despite receiving premium prices, as factors that instigated the disadoption of organic farming in the US and Europe.

Social, technical, and financial considerations with organic standards and certifications have also played a part in the disadoption of organic farming. In both the UK and France, negative experiences and deteriorated relationship with certification bodies and inspectors contributed to disadoption decision. Specifically, the issues included discordance with the certification and inspection process, apathetic nature of inspectors regarding strict compliance to certification standards (Australia), and increased certification costs, despite declining prices for organic produce (Rigby et al., 2001; Harris et al., 2008; Madelrieux and Alavoine-Mornas, 2013). The burden of paperwork/record keeping, standards interpretation, difficulty fulfilling certification requirements and certification costs were the primary reasons for discontinuing organic farming in California, USA (Sierra et al., 2008). Related factors, as were in UK, France, and California, also counted in Austria, Denmark, and Switzerland (Sahm et al., 2012). Certification costs (Flaten et al., 2010) and proposed changes to organic certification standards in Norway, requiring additional investment, also precipitated disadoption (Koesling et al., 2012).

Technological attributes pertaining to the agronomic and management aspects of organic farming have also contributed to its disadoption. This includes difficulty managing severe weed infestation on organic farms (Rigby et al., 2001; Harris et al., 2008; Koesling et al., 2012), a problem, which in the case of the UK, was attributed to lack of experience on organic weed management (Rigby et al., 2001). A

Norwegian study further associated low yields in organic systems, including yield loses caused by weed infestations and unmarketable low-quality yield with a disadoption decision (Flaten et al., 2010). The time-consuming nature of organic farming (Sierra et al., 2008; Harris et al., 2008), and its labor intensiveness/high work load (Harris et al., 2008; Flaten et al., 2010; Koesling et al., 2012) which means increased labor costs (Harris et al., 2008) also informed disadoption decisions. In the UK, Harris et al. (2008) disadoption was associated with vulnerability to risk and incidence of financial losses, due to factors such as disease outbreaks, as well as the misjudgment of the management intensity and the supposed closeness of organic farming to pre-existing farming systems before adoption. In Kenya, the main reason for disadoption was that labor-intensive organic farming was consuming the time for non-farm income activities, meaning that non-farm livelihood activities could prompt disadoption decisions (Goldberger, 2008). This conforms to Irish and Western Greek studies, which reported a positively significant effect between having a non-farm livelihoods activity and the likelihood of disadopting organic farming (Alexopoulos et al., 2010; Läpple, 2010).

Institutional considerations other than those mentioned earlier have also contributed to disadoption decisions. These include the termination of subsidy support programs for organic farming (Alexopoulos et al., 2010), bureaucracy and complications associated with organic certification standards (Flaten et al., 2010), and unpredictable organic farming policy (Flaten et al., 2010); Disadoption has also been linked to factors that are not related to organic farming. These are farmers' ill-health (Madelrieux and Alavoine-Mornas, 2013); cessation of family labor/associates helping with organic farm work (Madelrieux and Alavoine-Mornas, 2013); family commitment (Harris et al., 2008); discomfiture of family members and associates with organic farming (Koesling et al., 2012; Madelrieux and Alavoine-Mornas, 2013); perceived lack of societal support for organic farming (Koesling et al., 2012); indebtedness not related to organic farming (Harris et al., 2008); and being deregistered from organic for joining another stewardship group (Harris et al., 2008).

Studies have also demonstrated a connection between disadoption, gender, social and human capital. Rigby et al. (2001) reported that female organic farmers are more likely than their male counterparts to

disadopt organic farming, a finding that is consistent with Gambelli and Bruschi's (2010). The likelihood of disadoption of organic farming increases with the age and educational level of a farmer level, as well as membership of a producer group/association (Rigby et al., 2001; Gambelli and Bruschi, 2010). Positively significant association between disadoption and organic farm size has also been reported (Gambelli and Bruschi, 2010). The likelihood of disadoption however, decreases with membership in an organic producer association, membership in a cooperative, and explicit motives for adopting organic, including health (Rigby et al., 2001). Disadoption also seems to be farming system dependent. For example, the probability of disadoption is higher on an organic vegetable farm, compared to organic olive farms, a result attributed to higher agronomic and technical difficulties for the former (Gambelli and Bruschi (2010).

4.3 Conceptual Framework

The literature review above indicates that disadoption is a dynamic phenomenon. It also shows that the disadoption of organic farming cannot be explained by one single overarching factor. It is a complex phenomenon that is associated with many factors, which, as argued by Koesling et al. (2012) and shown above, are intertwined. These include agronomic, economic, institutional, farmers' vulnerability context, cultural, technical and technological attributes. Further, the review demonstrates that there is an intersection between disadoption, gender, and livelihood capital assets (human capital, social capital, and farmer livelihoods' strategies). Understanding disadoption decisions therefore requires a dynamic analytical framework that can help capture and untie the complexity and interconnections among the various interacting factors associated with the phenomenon. This is something that none of the studies reviewed above have done. For this reason, and based on insights from my literature review, this study draws on a gender-aware livelihood framework named the Technology Adoption Livelihoods Assets Framework (TALAF).

I developed the TALAF by building on Adato and Meinzen-Dick's (2002) revisions to the sustainable livelihoods framework (SLF). The TALAF consists of the pentagon of five capital assets, which are not only pivotal to the livelihood of farming and rural households, but also to their decision-making about

technology adoption and disadoption (Adato and Meinzen-Dick, 2002; Eyhorn, 2006). These include human, natural, financial, social and physical capital assets. The TALAF also integrates farmers' technology decision-making context into the original SLF (Figure 4.1). The TALAF (Figure 4.2) also recognizes that decision-making about a technology, be it adoption, disadoption, or re-adoption, can be gendered. Further, factors other than livelihood assets that can affect technology adoption and disadoption decisions are also included in the TALAF. These include the technology's perceived attributes, intrahousehold decision-making dynamics, access to/control over resources, farmers' vulnerability context, as well as institutional and policy context factors (e.g. produce markets, extension support) (Adato and Meinzen-Dick, 2002; Dinh et al., 2014). This is consistent with the findings from my literature review, which show that the attributes of organic farming as a labor-intensive technology and farmers' vulnerability vis-à-vis ill-health conditions influenced disadopters' decision-making.

My underlying assumption is that farmers' technology decision-making is a dynamic livelihood strategy choice, made within the contexts of their livelihood capital assets, in anticipation of certain livelihood outcomes. Such outcomes may, for example, be to help improve their soil fertility, financial capital, health, or even to lessen certain vulnerability conditions. I further assumed that the decision whether to continue using the technology, intensify or reduce the scale of its use, disadopt it permanently or temporarily, will be partly affected by its actual livelihood outcomes. In addition, I reasoned that disadoption decisions can be affected by other factors, such as the institutional and policy context that mediated farmers' choice of the technology and their livelihood as a whole. These include institutional factors such as the existence of a niche market for organic produce, permitted and disallowed practices codified in organic certification standards, consumer awareness, as well as the organizational leadership of organic farmer groups. I applied the framework to guide the questions that I posed to interviewees and in generating deductive and inductive codes for the analysis of the findings of this study. I framed questions that sought to elicit the interconnection between different components of the TALAF and disadoption decisions.

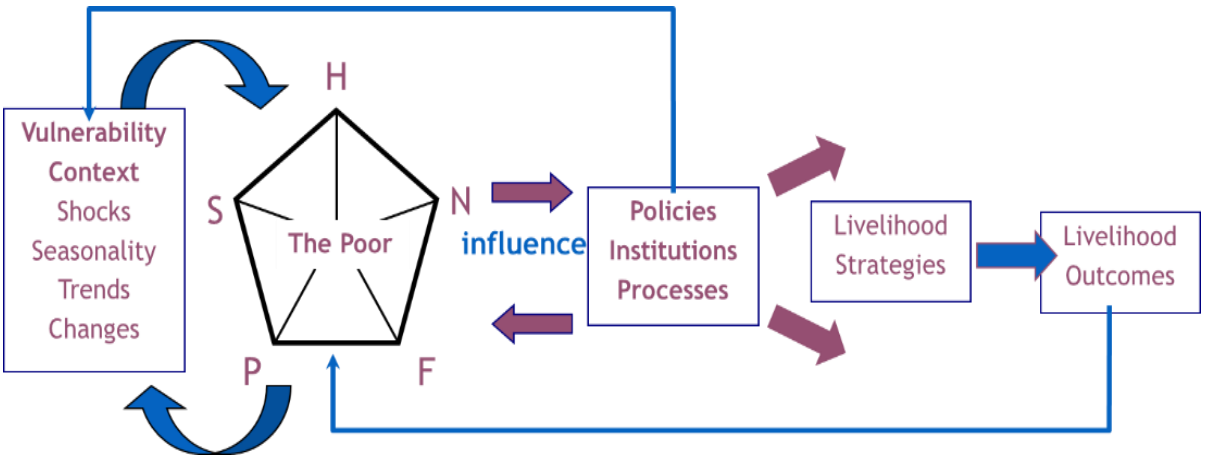

Figure 4.1. Sustainable Livelihoods Framework (DFID, 1999a)

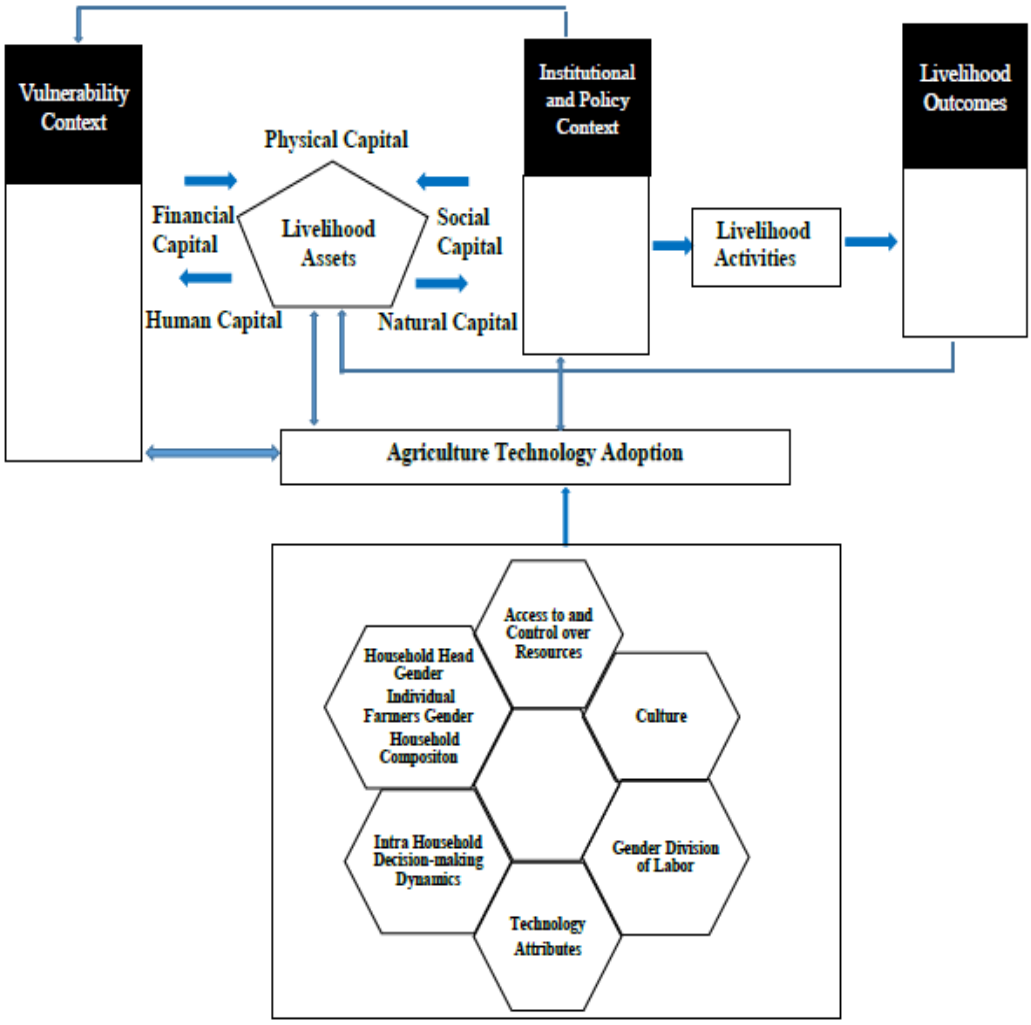

Figure 4.2. Technology Adoption Livelihoods Assets Framework

4.4 Methods

4.4.1 *Study areas*

This study took place at Ajibode and Elekuru, Akinyele Local Government, Ibadan, Oyo State, southwest Nigeria. Participatory guaranteed systems' (PGS) certified organic leafy vegetable production takes place in three areas in Ibadan. These are Ajibode, Akinyele, and Elekuru. However, this study was limited to Ajibode and Elekuru as there was no evidence of disadoption in Akinyele. Ajibode is located around longitude E 3.53' and latitude N 7.27', and Elekuru around longitude E 3.82' and latitude N 7.59'. Ajibode, like Elekuru, lies within a tropical rainforest vegetation zone (Momin, 1995). They experience

between 1200mm-1600 mm mean annual rainfall (Oyetunji et al., 2003), and a bimodal rainfall pattern (March/Early April-October/mid-November) (Alayande et al., 2012; Oshunsanya and Adeniran, 2014), with a brief dry spell in August (Aiyellari et al., 2002). At Ajibode, an urban area, PGS-certified organic leafy vegetable production (OLVP) takes place along the bank of River Odo-Ona, on a stretch of land behind the University of Ibadan Botanical Garden. River Odo-Ona (henceforth Ona), a 55 km^2 long river, runs in the north-south direction (Momin, 1995). In Elekuru, a remote rural setting, PGS-certified OLVP takes place across different swampy areas.

Figure 4.3. Map of study areas (Ajibode and Elekuru)

4.4.2 ***Data collection***

The main data for this study was collected between November-December 2016. Familiarization visits were made to Ajibode, Akinyele, and Elekuru, following the scheduling of appointments with the leaders of the organic farmers' groups in the three locations. Concurrently, a meeting was scheduled and held with the leadership of NOAN in their office, which is located in the Department of Agronomy, University of Ibadan. The list of the certified organic farmers in Ajibode, Akinyele, and Elekuru was secured through

the meeting with NOAN. The list from NOAN was cross-checked and merged with the list of organic farmers developed during the familiarization visits and meetings held with the organic farmers in Ajibode, Akinyele, and Elekuru. One outcome of the meetings was the identification of the names and contacts of disadopters of PGS-certified organic farming among their members. Individual meetings were scheduled and held with disadopters in Ajibode and Elekuru, the two places which recorded disadoption. Individual meetings were held with the disadopters to explain study objectives to them, seek their consent to be interviewed, schedule their interviews and to update the list of disadopters.

During 2016, six disadopters were interviewed, with each interview lasting about 40-60 minutes each. The interviewees included two farmers from Ajibode (female) and four from Elekuru (2 males, 2 females). The spouse of a male interviewee in Elekuru was also interviewed. Also, one of the interviewed disadopters in Ajibode had re-adopted organic farming as of 2016. I conducted another site visit between October -December 2017, during which he followed up with the disadopters which were interviewed in 2016, and to find out if there were newer cases of disadoption. One additional instance of disadoption was recorded in Elekuru, with a disadopter interviewed in Ajibode observed to have re-adopted organic farming in 2017. Both were interviewed to find out the motivations for the shifts in their disadoption and re-adoption decisions. The interview questions were semi-structured and were conducted in Yoruba, the native language that is spoken in the study area. The interview questions drew on the TALAF, my research objectives and from insights in the literature. Questions were asked about interviewees' livelihood activities, farming systems, farm and household size, educational status, vulnerability context. They were asked to tell their stories/motivations for adopting and dis-adopting organic farming, and for their re-adoption decisions, where necessary. The questions and the interviews were structured such that respondents could tell the stories of the circumstances of exits and where possible, re-entry into organic farming. All the interviews were recorded, transcribed, coded manually and electronically using NVivo. I drew on thematic analysis and TALAF, my study's conceptual framework for my coding and data analysis.

One limitation of this study is its small sample size. It means that the findings of this study cannot be generalized to the organic farming population in Nigeria. That said, the sample size for this study is the entire disadopters in my study areas, and they constitute about 12% of the population of adopters of organic farming in Ibadan, Oyo State Nigeria. This implies that the findings of this study can help enthuse a rich understanding of the drivers of the disadoption of organic farming in Ibadan. They can also reveal issues that should be given attention in order to lessen or mitigate further disadoption in my study areas. This is the first standalone disadoption study on organic farming in Nigeria and Africa. This means, regardless of my small sample size, the findings can be drawn upon to frame further research agendas on the topic and to start conversations about the problem issues in organic farming that need attention to enhance its adoption rates.

4.5 Findings

This section presents the findings of this study by discussing the factors that led to the disadoption of organic farming in my study areas. The findings are organized around the components of TALAF, based on the themes that emerged from the coding of my data.

4.5.1 *Livelihood assets*

The disadoption decision of five out of seven respondents (~72%) was shaped by some specific livelihood asset constraints. These include land insecurity (natural capital), financial inability to hire labor (financial capital), physical capacity limitations and inadequate knowledge of organic farming (human capital). Among the respondents was a female farmer in Ajibode (DisA2), a married mother of four, who combines tailoring, her primary livelihood activity, with about 0.2 acres in organic leafy vegetable farming. During her pregnancy and because of postpartum stress, DisA2 did not have the physical capacity (human capital) to manage her organic farm. As a result, she discontinued organic farming for a year. Her disadoption decision was also influenced by the fact that none of her household labor (human capital), which included her husband and four children was able to help with her organic farm: “there was no one to help me with my farming work after I put to bed” (DisA2). Specifically, because of what she attributed to the demanding nature of her husband’s job as a realtor, he had no time to help with her farm

work. Two of her children, aged 14 and 12 years, who would sometimes help with weeding, manuring, and watering on her organic farm were also not available because of schooling and the artisan training that one of them was undergoing. More importantly, DisA2 had no cash (financial capital) to hire labor to help take care of her organic farm after she delivered a baby. The farm income she generated the growing season before her delivery was used to supplement what she received from her husband to attend to her personal needs as a nursing mother and those of her baby.

Financial constraint (financial capital) was a key factor in the decision of the second respondent (DisA1, female, unmarried) in Ajibode to discontinue organic farming. To cater to her livelihood needs, DisA1 was drawing primarily on the income from her organic farm, supplemented by the earnings from a poorly paid teaching job in an elementary school, occasional catering work and the financial support from her parents. The farm income DisA1 generated during 2014/2016 growing season was used to secure her academic diploma and for some personal needs. So, she had no money to buy seeds for planting at the start of 2015/2016 growing season, thereby, causing her to discontinue organic farming that year. To some extent, land insecurity, a natural capital constraint, also fed into her disadoption decision. While making effort to raise money to start her farm during 2015/2016 growing season, a fellow organic farmer encroached on her farmland by allocating a part of it to another person. The development demoralized and dissuaded her from continuing with her organic farm during 2015/2016 growing season.

> I did not have enough money […] to buy seed to start my organic farm work. By the time I was ready to start my farm for the year it was too late, as it had started raining. In addition, the farmer that was beside my plot cheated me. The farmer took over my plot. The person brought in someone who took over a part of my plot, therefore preventing me from the normal area of land I was meant to be cultivating. […] To prevent a crisis from happening between me and them, I had to let go organic farming for the year […]. But the major reason that I stopped organic farming that year was that I did not have money to start my farm work" (DisA1).

Of the five disadopters in Elekuru, three alluded to human capital constraints in their disadoption decision. Among the trio, two also indicated that financial capital constraint was a factor in their decision to discontinue organic farming. One of those whose disadoption decision was largely affected by both human and financial capital constraints was a 40-year old widow and a mother of six children, who had about 0.7 acres in organic leafy vegetable farming (DisE4). Three of her household labor aged between 13-17 years would support her for weeding on her organic farm. Depending on her physical capacity and financial ability, she would hire between 1-3 people for weeding and to support her to prepare her organic farm for cultivation: "*while men can clear bush off their farm on their own and can handle hoes, me, I cannot clear bush off my farm on my own. I have to hire labor to do that because I really don't have the strength. To make ridges, I also have to hire someone*. "*I don't have the strength to weed all of my farm by myself. […]. I am only able to weed the little that I have the strength to do. […] We would be done weeding some part of my organic farm with some left to be done, only to realize that we do not have time any longer to get it all done and further that weeds have almost taken over the place my farm. I would have to hire someone to help me to help remove the weeds on my farm*" (DisE4). Because of her limited physical capacity (human capital) to undertake laborious tasks and because she had difficulty raising money (financial capital) to hire labor for weeding, she discontinued farming organically. "*If I do not have money, I will worry about how I will use my hands to clear the weeds on my farm* […]" and "*because of my strength, I have resolved I am not doing organic farming again*" (DisE4). Although not a major factor, limited knowledge about how to manage pests on her organic farm also informed why DisE4 discontinued farming organically.

As with another female respondent (DisE3) in Elekuru, inadequate knowledge about how to control and stop the rotting of her organic crops and prevent them from being devoured by insects was a major factor in her disadoption decision. When asked about the main reasons she stopped doing organic farming, DisE3 stated: *"insects were eating organic crops and they were* rotting … *I did not know why my crops were rotting away, […] because I did not have enough knowledge about organic farming*." Human and financial capital constraints were major factors in the decision of a male respondent in

Elekuru (DisE1) to discontinue organic farming, a year after adopting and practicing the technology. DisE1 co-manages his organic farm together with his wife, who is also a farmer. They neither had the physical capacity (human capital) to continue to weed manually without chemicals nor the financial capacity (financial capital) to continue to hire labor for land preparation and weeding on their organic farm: "*we no longer have the power to manage and weed our farms again. We didn't have money to hire people to help us to clear and weed our farm the time we were supposed to do so*" (DisE1).

From the above discussion and as shown in Table 4.1, a general picture is that financial inability to either hire labor or buy seed for planting emerged as the most mentioned primary factor in the disadoption decision of respondents. It was mentioned by 4 out of the seven disadopters (57%) investigated in this study. Next, is human capital constraint related to limited knowledge of organic farming, household labor constraint, and limited physical capacity to understand weeding and land preparation on an organic farm. The knowledge deficit cited by some respondents is likely because NOAN was only able to organize occasional technical training about organic farming and little follow-up extension (institutional factor) to organic farmers after adopting the technology. Land insecurity (natural) as a driver of disadoption only featured once, and it was in Ajibode. The discussion also indicated that there were some variations in the contexts within which the identified livelihood assets influenced respondents' disadoption decisions.

Table 4.1. Livelihood asset themes in respondents' disadoption decision

Themes	Sub-themes	Number of Times Mentioned by Respondents
Human capital constraint	household labor constraint	2
	limited knowledge of organic farming	2
	physical capacity for weeding/land preparation	3
Financial capital constraint	To hire labor	3
	To buy seed	1
Natural capital	land insecurity	1

4.5.2 *Policy and institutional contexts*

Market for organic products emerged as a major institutional factor that undergirded the disadoption decision of a majority of the respondents (See Table 4.2). Neither of the two disadopters from Ajibode cited market as a factor in their disadoption decision. This may be related to the locational advantage of

Ajibode in an urban center and very close to the University of Ibadan, factors, which, as suggested by the two respondents from Elekuru availed them access to daily market outlets and educated elites for the sales of their organic produce. However, four out of the five disadopters (80%) in Elekuru, a remote rural setting, cited market for organic produce as foremost factor in their disadoption decision. When organic farming was pitched to them in Elekuru by a NOAN officer, it was said that by adopting the technology, they would be able to access financially rewarding and differentiated new market opportunities for their produce in urban centers. With that in mind, respondents from Elekuru adopted organic farming. None of those expectations actually materialized. NOAN was only able to irregularly collect a small fraction of Elekuru organic farmers' produce for sales in the urban locations where they were pricier. Requests through NOAN that Elekuru organic farmers should supply their organic produce for sales at pricier markets were sometimes not honored. Because a dearth of dependable access to financially rewarding markets in urban locations was causing them financial loses, they decided to disadopt organic farming.

> The reason I stopped organic farming is that we were encouraged to do it but we did not have people to buy our organic farm produce. We used our energy to do organic farming without having people to buy and markets to sell our organic farm produce […] Second, we put effort into farming to have food to feed our family, but we would be told to supply a small amount of our organic produce […] We will not have people to buy the remaining" (DisE2, male).

> We didn't get market for and were not able to sell our organic produce […] Mr. X doesn't take our organic farm for sales in town all the time. Even, when he requests for our organic farm produce today, it may take another 3 days before he would request for another rounds of supply. Before it gets to the turn of others who were yet to supply, the organic farm produce of those waiting on the supply queue would have become spoilt (DisE4, female farmer, widow).

NOAN's inability to guarantee Elekuru organic farmers a steady and reliable access to high price paying markets in urban locations made them resort to selling their organic produce at Elekuru market at unprofitable prices. This contributed to the disadoption decision of four respondents in Elekuru.

> The market for our organic produce in Elekuru was not moving. […] the market for organic farm produce was not moving at all in Elekuru and the prices we were selling were not good for me and that was why I said I was tired of doing organic farming (DisE4, female/widow).

Conflict-induced market access constraint was the main reason a female respondent disadopted organic farming in Elekuru. She had a conflict with her pastor, who played a cardinal role in the introduction of organic farming to Elekuru and has some leverage over the medium through which the organic produce from the village gets sold in urban locations. The pastor took an action that led to her organic produce from not being collected for sales in high price paying markets in the urban center. This made DisE5 incur financial and yield losses as she could not find market for her organic produce, most of which were left to rot away on her farm.

> The reason I stopped doing organic farming is, firstly, […], I cultivated a farm full of organic African spinach *(Spinacia oleracea).* I called Mr. X (alias) that my African spinach was ready for harvest. I was told to harvest the vegetables, hand them over to our pastor in Elekuru to give to X as they were both living in the same compound. When I harvested the vegetables and handed them over to my pastor, both of us had a disagreement. He punished me […]. My pastor told Mr. X not to collect the supply of my organic farm produce. […] All of my organic leafy vegetables got spoiled. They got spoiled completely. Even my organic peppers got spoiled. I didn't have a place to sell them. I sold them for anyhow price. That discouraged me" (DisE5, female/widow*).

A lack of institutional financial support is another factor that fed into the disadoption decision of three respondents. This includes DisE1, who cited a lack of institutional financial support to hire labor for their organic farm (two respondents) and to access free organic inputs (one respondent), either from NOAN or the government, as another major factor in his disadoption decision. Although not a major factor in their decision-making, two respondents, one from Ajibode (DisA1) and another from Elekuru (DisE2) respectively indicated they would not have discontinued organic farming were there to be an institutional credit access or financial support for hiring labor.

> One of the reasons I stopped organic farming was because […] we were in organic farming without any support […] We were looking up to NOAN and the government to support us but we did not receive any support … They ought to provide us with the money to hire labor that can help us with our farm because we alone and even our strength is not able to manage our organic farms. … The other reason is that there was a time we attended an organic farming training at the University of Ibadan, during which they recommended for us a particular organic botanical formulation for insects. We requested that they should allow us to go test the effectiveness of the botanical formulation, but they didn't give it to us. If they had given us to test it, I would have tested it to see if it would have worked effectively. That could have emboldened me to still be practicing organic farming (DisE1, male).

> If they had provided us with money to hire labor to do organic farming, the challenge that drove me out of organic would have been easy for us (DisE2, male).

> It was because of the lack of financial support that I did not do organic vegetable production in 2015. If someone or NOAN had borrowed me money that year to start my organic vegetable that year, I wouldn't have stopped doing organic (DisA1, female).

Table 4.2. Institutional factors that affected disadoption decision

Themes	**Sub-Themes**	**Number of Times Mentioned by Respondents**
Institutional	Organic market access/marketing problems	4
	Institutional support to hire labor	2
	Institutional access to free organic input	1
	Institutional credit access	1

4.5.3 *Vulnerability contexts*

Most of the respondents (71%) said that as organic farmers, they were vulnerable to yield and financial losses, a factor which directly and remotely impacted their disadoption decisions. All of the said respondents were from Elekuru and this includes a widow (DisE5) who was solely responsible for managing a family of four. As previously explained, due to a conflict motivated reason, DisE5 lost access

to high price paying market for her organic produce. So, she became vulnerable to yield and financial losses, a development that remotely affected her disadoption decision. Similarly, albeit, with small contrast, another female respondent (DisE4) experienced vulnerability to yield and financial loses, and indebtedness, which was not only market-related but also a primary reason in her decision to discontinue organic farming. Unlike DisE5, the vulnerability experienced by DisE4 arose from the inability of NOAN to guarantee an unfailing and steady pricier market access for the organic produce of DisE4 "*I was not making money as my organic crops got rotten and spoiled. If they were able them to sell for us in town, the sales will bring us money that will be more than what we make from selling our organic produce here at Elekuru. But we don't get to have a market to sell our leafy vegetables, I became discouraged as all the organic crops that I grow … I had no place to sell them to. … They got spoiled and I became broke. So I stopped organic farming*" (DisE4). Two male respondents (DisE1and DisE2) suggested that vulnerability to yield and financial losses, which was caused by both insects and lack of market for their organic produce was a remote cause of their disadoption decision. Lastly, yield loss from insect pests and rotting of organic crops was a primary reason DisE3 opted out of organic farming. In this instance, yield loss was due to limited knowledge of insect pest management in an organic system. Overall, the vulnerability issues mentioned by respondents were mostly related to the dearth of financially rewarding markets for the sales of their organic produce. This further highlights the primacy of the dearth of rewarding market access to the disadoption of organic farming in Elekuru.

4.5.4 *Livelihood outcomes (expected)*

There were indications linking disadoption decision in Elekuru and a subsequent re-adoption of organic farming by the two respondents in Ajibode to their expected livelihood outcomes of the technology. A foremost reason respondents adopted organic farming was to experience improved livelihood condition through increased farm income from improved market access and by obtaining higher prices for their organic produce. Respondents from Elekuru specifically anticipated that organic farming would offer them better financial rewards (higher utility), compared to the unsatisfactory income from their conventional farms: "*We were like the present chemical agriculture that we are doing has not*

been producing results that were satisfactory. We felt maybe adopting organic farming will help produce better results. That was why we started organic farming" (DisE5, widow*). Conversely, a majority of the disadopters in Elekuru (80%) specified that their anticipated livelihood outcomes for adopting the technology never manifested, primarily due to the dearth of access to rewarding markets for their organic produce. They claimed that their financial situations deteriorated as they were not making profitable returns from organic farming, a key factor in their disadoption decision. By adopting organic farming, one female disadopter in Elekuru expected to be gifted free money as an outcome. The expectation may be connected with a story that the de facto women leader of their farmers group was used to being gifted money as "honorarium" for attending meetings/programs organized by NOAN. The expectation failed, with that contributing to why she disadopted organic farming.

> There were no financial gains in organic farming. Despite the energy we invested into it, we were not making money out of it because there was no market for organic…. That was why I asked him to stop organic farming (DisE1 spouse, farmer).

> We were told there was money in organic farming and that organic crops would be pricier than the food crops grown with chemicals. That was the reason we accepted to do organic… We stopped because we were not making money out of it (DisE2, male); I was so happy that he stopped because we did make any money from organic farming (DisE2 spouse, farmer).
>
> When we were told of organic farming, my goal was to get something good out of it. I wanted to make money out of it. That was why I adopted organic farming. When I was practicing organic farming, the "food was not getting done very fast. And I taught they wanted to give us money. But I did not see any money. So I opt outed out (DisE3, widow).

The two disadopters in Ajibode suggested that their livelihood conditions, which included their financial, physical, and social capital assets improved with the adoption of organic. Their disadoption decision was not connected to the livelihood impacts of the technology but instead was a primary reason they re-adopted the technology.

> I am into farming for financial reasons. I have been making money from my organic leafy vegetable… Last year that I did not do organic farming, it affected me. When it was the time that I usually harvest my vegetables. I usually gift out my organic vegetables to some relatives of mine. This was to enable them to experience organic produce. When it was time for harvesting, they all came to me that they had not received organic vegetables from me. They asked me if there was a problem. I felt bad about it. I was pained that I was not able to gift them vegetables for that year. This year I have told all of them that I was back to my organic vegetable production. They were all happy again (DisA1, female).

> The reason I started organic vegetable production was that I anticipated that I will be making more money rather them stay put with tailoring work. I expected that money will be coming in from both ends and the money will be used to address my needs. The level of the money issue that I had has reduced since I adopted organic farming. It was the money that I made from my organic farm that I used to buy my tailoring machine, phone, a lot of things, including clothes, shoes and related items. That was why I adopted and came back to organic farming after the birth of my baby (DisA2, female).

4.5.5 *Technology attributes*

Disadopters in Ajibode and Elekuru characterized organic farming as a burdensome, physically demanding, labor-intensive and time-consuming technology. The characterization was mainly informed by the institutional codification barring burning and synthetic inputs as some of the requirements to be fulfilled before a farm can be certified organic by NOAN. The five disadopters from Elekuru disliked that weeding/land clearing that ought to be done within a day or some hours by burning and spraying synthetic weed killers not only took longer on their organic farms but was also physically draining. It was said that disallowing burning and synthetic herbicides led to increased labor need and labor cost in organic. Three female disadopters noted that susceptibility to insect pest attacks affected the attractiveness and marketability of organic leafy vegetables in Elekuru rural market.

> Organic farming is burdensome and physically demanding for me. It contributed to why I stopped it" (DisE3, widow farmer).
>
> "They told us not to burn bush in organic farming. That was burdensome. If we were to use chemicals, we don't overwork ourselves. But we have to overwork ourselves with organic farming. I was concerned that when I cannot apply chemicals, how I will manually remove weeds on my organic farm. I will weed and weed for one week and I cannot do it alone. The worries discouraged me" (DisE4, widow, farmer).

The characterization of organic farming as a physically demanding, labor-intensive, burdensome and time-consuming technology explicitly intersected with the disadoption decisions of two of three female disadopters in Elekuru. Insight from the data suggests that the characterization might have played a role in the disadoption decision of the male disadopters in Elekuru. In addition, compared to their male counterparts, female respondents, especially in Elekuru placed greater emphasis on organic as being tedious and physically imposing on them. This may be because unlike the males, the female respondents were combining organic farming with routine reproductive responsibilities such as cooking and providing care for their households. In other words, the females were spending their time and dissipating their labor and energy on organic and reproductive activities. That probably explains why two female disadopters (DisE3 and DisE4) in Elekuru explicitly indicated that experiencing organic as a physically challenging and burdensome technology fed into their disadoption decision. This may also be connected to the situatedness of DisE3 and DisE4 as widows, as that suggests that they may be without a male adult who could have assisted them with the clearing of bush on their organic farms. This point was implied by DisE4 in one the supporting quotes cited earlier, wherein she stated that as a woman it was difficult for her to clear the bush on her organic farm or make ridges on her own. Drawing on her experience as a widow while practicing organic farming, DisE5 disclosed thus: *"had it been that I was with my husband for a long time if I did not do my organic farm, a man that I am married to will help me with it. It was a big difficulty for me when I was not married that I was the only one doing my farm work*".

4.5.6 *Culture*

Gradient of unequal social and power relations seemingly fostered by religio-patriarchal cultural norms was a decisive factor that caused DisE5 (widow*) to disadopt organic farming. As earlier stated, the main reason DisE5 disadopted organic farming owed to the conflict that she had with her pastor, a revered person in their faith-based community in Elekuru. The conflict had nothing to do with organic farming. As DisE5 noted: "*he used organic farming to punish me so that I can feel the pains of offending him*," and "*he said that he has the authority to tell Mr. X to stop accepting my organic farm produce*." The authority that was leveraged and alluded to by the pastor draws on religio-patriarchal cultural norms of the community that confer on religious leaders, who were mostly men, the power to evoke and authorize sanctions. The same cultural norm was at play when DisE5 was de-membered from Elekuru organic farmers group: "*our pastor asked them to remove me from the organic farmers group, because he said I offended him. Even the money of the group that was with me, our pastor said that they should collect it from me.* Voicing her powerlessness over the conflict situation that was mediated solely by men, DisE5 noted: "b*ecause they have power and can prevail over me, I gave up by succumbing*".

4.5.7 *Household head gender, farmers' gender, household composition, gendered division of labor*

As shown in Table 4.3, two of the disadopters (29%) were males and their household heads, while the remaining five (71%) were females. Among the female disadopters, two were from male-headed households (MHHs), while the remaining three were the de jure heads of their households, due to the death of their husbands. One of the two female disadopters from a MHH is single and the other is married. There is no evidence linking disadoption to the gender of the farmer and household head. Instead, the two female disadopters from MHHs indicated that they were provided moral support to do and continue organic farming by their household heads, whose livelihood activities were non-farm based.

However, the disadoption decision of some of the respondents may be related to their household composition. One of those is DisA2. Hitherto, it was elucidated that the absence of DisA2's household labor to help with her organic farm after she delivered of a baby was a factor in her disadoption decision.

This seems related to her household composition. The only male adult in her household was her husband. As previously stated, his livelihood activity constrained the availability of his labor to support DisA2 organic farm work. Due to their ages (newborn, 6 years old), two of DisA2's children could not support her organic farm work. Her remaining two children (14 and 16 years) were not able to support her farm work for reasons including schooling commitments. Further, to the exception of DisA2 and her husband, no other member of her household was earning income that DisA2 could have used to hire labor for her organic farm when she was nursing her baby. As with DisE4, a widow and de jure household head, the death of her husband (a farmer) deprived her of a male adult who could have been assisting with land preparation and weeding on her organic farm, tasks which she found physically exhausting. Conceivably, that sheds further insights into why DisE4 explicitly stated that experiencing organic farming as a physically draining technology was a factor in her disadoption decision. That may also be related to the fact that out of her seven household members four were not able to support her organic farm work due to age constraint and because two were educating elsewhere in the city. The remaining three who were helping with her organic farm were time poor due to their school commitment. As a result, she had to rely on hired labor, but had financial difficulty doing so. In addition, other than her, none of the household members was earning income that she possibly could have drawn upon to hire labor for her organic farm. Physical capacity constraint as a factor in DisE1 disadoption decision may be related to insufficient adult labor in their household. Only two of his five children (15 and 16 years) were old enough to support their farm work. Even, the two children could only do very little because they of their school engagements.

Further, evidence from the interviews indicated that unlike the males who were exclusively engaged in farming, female respondents were combining farming with reproductive roles and responsibilities in their households. There is a suggestive evidence that such a gendered domestic role play was incidental to the disadoption decision of two female farmers in Elekuru. This is because, as earlier explicated, women's domestic role play impacted why organic farming was more difficult for them than men. It was through this pathway that gendered domestic roles of women contributed to disadoption in Elekuru. In addition, drawing on her personal experience and that of some female organic farmers from MHHs, a female

disadopter in Ajibode suggested that the competition of organic farming and gendered reproductive livelihood activities for time may cause women to disadopt the technology: "*we usually leave our organic vegetable farm in the night. Married women's husband would complain that they left their farms late in the night, wondering about the time they would have left to take care of their children. Even me that is yet to be married, there are many house chores that I have to defer until nighttime. Organic farming affects those activities* (DisA1, female farmer).

Table 4.3. Household head gender, household composition and gender of disadopters

Respondent Sex	Marital status	HHH	HHH Occupation	HHS	Available HH labor for farm work	Age of HH members (save HH)		
						0-10	11-20	21-40
F	Single	M	Non-farm	7	0	2	1	1
F	Married	M	Non-farm	6	2	2	2	0
M	Married	M	Farming	7	4	2	3	0
M	Married	M	Farming	7	2	3	2	0
F	Widow*	F	Farming	4	2	2	1	1
F	Widow	F	Farming	8	3	1	4	2
F	Widow	F	Farming	7	4	2	3	1

*indicates status as of the time of disadoption; HHH - Household head; HHS- Household size; HH- Household

The emergent narrative from the findings and as captured in Table 4.4, is that individual disadoption decision was shaped by several factors, which include financial and human capital constraints, as well as institutional and vulnerability context factors (e.g. market access problem, yield and financial losses). More importantly and as elaborated below, the factors interacted synchronously and simultaneously to inform disadoption decision. Paying attention to what factors impacted the other to profoundly influence disadoption decision may provide useful entry points for policy interventions.

Table 4.4. Typology of some of the factors that shaped disadoption decision of respondents

Resp.	TALAF Component		Primarily Caused by	Related To
DIsA1	*Livelihood asset* - financial and natural capital constraints	No money to buy seed	Expenses on academic certificate	Lack of institutional credit access
		Land insecurity	Infringed by another farmer	
DisA2	*Livelihood asset* - human and financial capital constraints	Lack of physical capacity	pregnancy/postpartum stress	
		Unavailability of household labor	livelihood activity of husband; children in	Household composition (e.g.
		No money to hire labor	Expenses on newborn and self	
DisE1	*Livelihood asset* - human and financial capital constraints	Lacked physical capacity for weeding	*Technology attribute* (barring of weed killer and burning)	*Livelihood activity* – conventional farm, household composition
		No money to hire labor	No profitable income from organic; market access/organic marketing issues *(institutional*)	labor need/cost in organic (t*echnology attribute*)
	Institutional and policy context	market access/marketing issues	Limited sales and access to pricier organic markets in town	Poor market for organic in Elekuru (*institutional*)
		No support to hire labor/access organic input		
	Vulnerability context	Yield and financial losses	Organic market access/marketing issues (*institutional*)	Vulnerability of organic crops to pest attack
DisE2	*Institutional and policy context*	market access/marketing issues	Limited sales and access to pricier organic markets in town	Poor market for organic in Elekuru (*institutional*)
		Lack of support to hire labor		
DisE3	*Livelihood asset* – human capital	Limited knowledge of pest management	Dearth of follow-up extension support/training (*institutional*)	
	Vulnerability context	Yield and financial losses	Limited knowledge of pest control	No profitable farm income (*livelihood outcome*)
DisE4	*Livelihood asset*- human and financial capital constraints	Lack of physical capacity; household labor constraint	Limited physical capacity for laborious tasks; children age/schooling commitment	Land clearing/weeding in organic; *household composition* (no male adult)
		Limited knowledge of organic farming	Dearth of follow-up extension support/training (*institutional*)	
		No money to hire labor	Market access/marketing issues *(institutional*)	Labor need/cost in organic (*technology attribute*)
			Income loss/indebtedness	market access/marketing issues (*institutional*)

Table 4.4. (cont'd)

Resp.	TALAF Component	Primarily Caused by	Related To	Resp.
DisE4	*Institutional and policy context*	market access/marketing issues	Limited sales and access to pricier organic markets in town	Poor market opportunity for organic in Elekuru (*institutional*)
	Vulnerability context	Yield and financial losses; indebtedness	Market access/marketing issues (*institutional*)	Vulnerability of organic crops to pest attack
	Technology attributes	Laborious, difficult, physically exacting		Household composition, prohibition of weed killers, status as a widow
DisE5	*Institutional and policy context*	Conflict-induced organic market access blockage	Conflict with pastor	Religio-patriarchal norms (*cultural*)

4.6 Discussion of Findings

In this section, the findings of this study and their implications are elaborated upon, interlocked into TALAF and grounded them against existing literature on the disadoption of organic farming. Overall, this study found that disadoption was higher in Elekuru than in Ajibode, mainly due to market access/marketing problems, an institutional factor in TALAF. The findings also showed that factors such as household composition, gendered division of labor and some specific attributes of organic farming (e.g. labor intensity and cost) can cause disadoption to be gendered. It was also found that disadoption can be strongly influenced by lack of institutional financial incentives, financial and human capital constraints (e.g. lack of money to hire labor, household labor availability), and by exposure to yield and financial losses that negatively affect farmers' livelihood conditions. As shown in Table 4.4, this study also alludes to the confluence of many factors captured in TALAF as shaping disadoption decision. One such illustration is that disadoption may arise from the feedback effect of an *institutional and policy context* factor such as market access problems, on farmers' livelihood assets (e.g. financial condition). However, I did not find evidence linking disadoption to farmers' livelihood activities, access to and control over resources and intrahousehold decision-making dynamics.

Three factors representing the institutional and policy context component in TALAF influenced disadoption in this study. These include organic market access/marketing problems, lack of institutional

support to hire/access free organic inputs, and lack of institutional credit access. Specifically, in Elekuru, the findings showed that disadoption was largely motivated by a three-faceted organic market access/marketing problem, which resulted to yield and financial loses. This includes NOAN's inability to guarantee Elekuru organic farmers a steady and reliable access to high price paying markets in urban locations; irregular and limited demand by NOAN for the organic produce from Elekuru for sales at pricier markets in urban locations; difficulty selling and attracting profitable prices for organic produce in a rural Elekuru market. Similar findings were reported by Sierra et al. (2008), Alexopoulos et al. (2010), and especially Rigby et al. (2011), whose study identified the inability to find market outlets and attract profitable prices for organic produce as the foremost reason for the disadoption of organic farming in the UK. A comparable result was reported by Torres and Marshall (2018), whose study suggested that farmers who considered organic markets as reliable were less likely to disadopt certified organic farming. The finding was no surprise, given that the expectation of accessing financially rewarding pricier markets in urban locations was the main reason the disadopters from Elekuru adopted organic farming.

The local marketing challenges that enthused disadoption in Elekuru may be related to the attention deficit by NOAN in creating market outlets and consumer awareness about organic in rural communities. Regarding this, the effort of NOAN and other pro-organic groups in Ibadan and elsewhere were limited to urban areas, a bias that was mainly driven by the improving socio-economic status of some segments of urban elites and their shifting food choices from conventional to organic (Obayelu et al., 2014; Omonona et al., 2014; Oyawole et al., 2016). As a result, consumer awareness about organic was almost non-existent in rural areas, with that explaining why disadopters had difficulty finding buyers and securing profitable prices for their organic produce in Elekuru market. Equally, the findings may be related to the location of Elekuru in an almost isolated rural area; the dependency of Elekuru organic farmers on NOAN to access pricier markets in urban areas; physical asset constraints such as a lack of vehicle for organic produce transportation to urban centers. Except on Elekuru market days (transacted every 4 days), it was difficult securing commercial transportation to and outside of Elekuru, owing to its remoteness. The preceding, together with the distance between Elekuru and the nearest daily markets seem to constrain

Elekuru organic farmers from accessing markets in urban locations where they possibly could find buyers for their produce. Collectively, the findings suggest that market access issues, denoting *institutional and policy context* in TALAF, may be the single most important factor that stimulates the disadoption of organic farming. The finding also underscores that attention should be given to expanding access to existing high price paying organic markets in urban locations and to the transportation gaps and other distributional factors limiting market access for Elekuru organic farmers. Furthermore, the findings demonstrate a need by NOAN to prioritize organic market development and consumer awareness creation, especially, among Elekuru/rural consumers.

Disadoption has been linked to the lack of, or removal of institutional financial incentives which made organic less risky and profitable (Alexopoulos et al., 2010; Läpple, 2010). This study also found that the lack of institutional incentives to hire labor and access organic inputs and people's lack of money for those were a major factor that impacted the disadoption decisions of some respondents in Elekuru. The finding is related to the labor required for land preparation and weeding in organic, a need which respondent' own and available household labor could not satisfy. That necessitated a need for hired labor, which came at an increased cost because for excluding the use weed killers, land preparation and weeding on an organic farm was said to take longer time and more physically demanding. The respondents did not have the financial capacity to meet the labor cost, as they were not making a profitable income from their organic farms due to market access problems. Consequently, they felt the need for the provision of financial incentives to hire labor, an expectation that did not materialize. Here, in relation to TALAF, the expectation for such a financial support was circumstantiated by three interconnected factors: (1) the attributes of organic farming vis-à-vis labor need and cost; (2) the lack of human and financial capital to meet the required labor need and cost; (3) market access problems (institutional factor), which birthed the lack of financial capital in the form of savings and cash needed to hire labor in order offset the human capital gap. The result from Ajibode also suggests that the availability of institutional credit support for organic farmers through NOAN could have assisted respondents to overcome the liquidity constraint, which motivated their disadoption decision. Overall, the findings reinforce the need to address the market

access problems affecting the financial viability of organic farming in Elekuru. The findings also suggest that institutional financial support in the form of credit access to hire labor and buy production inputs can help relieve financial constraints that otherwise could cause disadoption. In the case of Elekuru, such a support may be inadequate, without addressing the market access/marketing problems, which seem to mediate most of the other factors that contributed to disadoption in that study location. In addition, the findings validated the components in TALAF, which linked disadoption to the *institutional and policy context* within farmers and organic farming are located, and to the interplay between household assets and institutional context.

Consistent with TALAF and existing literature on the disadoption of organic farming, this study also found that livelihood asset constraints, which include the lack of financial capacity in the form of cash and savings to access production inputs such as labor or seed were a primary reason for disadoption. As it was in Elekuru, this study revealed that such a financial constraint may arise from the financial losses incurred from both the dearth of access to high price paying markets in urban locations and lack of financially rewarding markets for organic produce in a rural setting. In other words, this finding indicates that market access/marketing problems (an institutional factor) caused the financial capital constraint, which led to disadoption. This finding is in accordance with TALAF's underlying proposition, which suggests that disadoption may arise from the feedback effect of institutional context factors on farmers' livelihood assets (in this instance - financial condition). Also, as it was in Ajibode, this study indicated that such a financial constraint may arise from non-institutional factors, such as the expenses incurred on personal livelihood needs (from the expenses on securing an academic credential and tending to a newborn baby). To some extent, the findings are in line with Goldberger (2018), who found that the lack of money to buy organic inputs contributed to disadoption in Kenya.

Agreeably with TALAF, this study also demonstrated that human capital constraints related to household labor availability, household composition, farmers' physical capacity and limited knowledge of organic pest management were pivotal to disadoption decision. Similar findings were reported by Goldberger (2008), who indicated that household labor shortage and limited knowledge of biological pest

control influenced the disadoption of organic farming in Kenya. The findings also suggest that failure to possess human capital in the form of knowledge that is necessary to make organic farming practically feasible and economically viable may motivate disadoption. Furthermore, the findings from Elekuru suggest that vulnerability to yield and financial losses that undermine farmers' financial capacity and livelihood conditions can profoundly contribute to disadoption. Here, the yield and financial losses that caused disadoption arose from an admixture of market access problems (*institutional factor*) and human capital constraint vis-à-vis constraint knowledge deficit on organic pest management. The findings are somewhat comparable to a Norwegian study which found that high risk to farm income and yield losses from weeds, insect pests, and diseases led to the disadoption of organic farming (Flaten et al., 2010). Related to TALAF, the finding showed that the *vulnerability context* that shaped disadoption was a confluence between an *institutional and policy context* factor and *human capital* constraint.

This study also showed that disadoption could be because of unrealized expected livelihood outcomes or the negative consequences of the adoption of technology on farmers' livelihood assets. This happened in Elekuru, where the anticipation that the adoption of organic farming would result in improved livelihood condition from earning profitable farm income through access to financially rewarding markets never happened. Instead, respondents' financial and livelihood conditions reportedly deteriorated because they were incurring financial losses, which arose from the dearth of access to 'premium' markets in urban locations and the inability to find profitable patronage for their organic produce in Elekuru rural market. Consequently, disadoption decision was shaped by the dashed expectation of improved financial and livelihood condition. Related to TALAF, the finding alludes to negative feedback effect of the livelihood outcome of the adoption of organic farming on respondents' financial capital, a factor, which in turn fed into the decision to disadopt the technology. This finding is consistent with Harris et al. (2008), which found that unmet expectation of improved farm income, which was caused by adverse prices and low demand for organic produce led to disadoption in the UK. Rigby et al. (2001) and Flaten et al. (2010) also found that poor financial outcomes led to the disadoption of organic farming. However, the findings from Ajibode suggest that farmers who disadopted organic farming for reasons other than its perceived

outcomes may re-adopt the technology if it was producing their desired outcomes. Even, the disadopters in Elekuru indicated a willingness to re-adopt organic farming if there is an evidence that the market access issues that made them to disadopt the technology have been resolved. This finding, and the fact that the two disadopters in Ajibode re-adopted organic farming bolster my take that disadoption as a dynamic decisional phenomenon that is intrinsic to the adoption process may not necessarily be permanent. The results also imply that farmers for which organic farming is not leading to improved financial and livelihood outcomes may disadopt the technology.

In line with Sierra et al. (2008), Flaten et al. (2010) and TALAF, this study found that some attributes of organic farming were a major reason for its disadoption in Elekuru. Examples include its characterization by respondents as burdensome, labor-intensive, time-consuming and highly susceptible to pest and weed infestation. Those attributes affected the disadoption decision of some respondents in Elekuru, especially females. One explanation for this finding is that the required labor and additional cost in hired labor in organic was beyond respondents limited financial capacity and their available household and own labor. The finding may also reflect that NOAN was yet to cater adequately to building farmers' capacity in organic weeds and pest management. Interestingly, the two female disadopters from Ajibode also indicated that organic farming was burdensome and time-consuming, but that was not a factor in their disadoption decision. This is likely because, as they were making money from organic farming, they did not consider those attributes as a reason for disadopting the technology. This may mean that the attributes of organic farming as labor-intensive, time-consuming and burdensome may contribute to disadoption to the extent that farmers are not making a profitable income from practicing the technology.

As theorized in TALAF, the findings of this study seem to suggest that the disadoption of organic farming in my study areas can be gendered. In accordance with TALAF and as illustrated by this study, this may result from cultural factors, such as religio-patriarchal norms that grant penalizing authority to men. This occurred in Elekuru, where a female farmer disadopted organic farming for reasons related to the penalizing powers exercised by a highly-regarded male religious figure and a conflict resolution mechanism that was presided over by men. Further, the findings from Elekuru indicate that widowed

female farmers without matured male household labor that can support their organic farm operations are more likely to disadopt organic farming. This is because their situatedness as widows without matured male labor support may imply that they did not have the manpower required for land clearing and weeding in organic. Also, the finding that female farmers were more likely to experience organic farming as a burdensome and physically demanding technology may likely cause disadoption to be gendered. This finding is also connected to the fact that, unlike their male counterparts, female respondents were combining farming with routine household responsibilities. As a result, female farmers may not possess the physical capacity and time that is required to manage their organic farms, with that likely to motivate them to discontinue the technology. That more women than men explicitly ascribed their disadoption decision to lack of money for hired labor and seeds also implies that disadoption can be gendered. This may be connected with the fact that in Ajibode and Elekuru, generally, male organic farmers seem to be economically better off than their women counterparts. On one hand, the findings are at variance with Torres and Marshall (2018), who indicated that women were less likely than men to disadopt certified organic farming for reasons attributed to their concern about family health and nutritional status. On the other hand, the findings are consistent with Rigby et al. (2001) and Gambelli and Bruschi (2010), who reported that women were more likely than men to disadopt organic farming. Unlike Rigby et al. (2001) and Gambelli and Bruschi (2010), this study provides insight into the factors and context that may cause disadoption to be gendered. Overall, I consider the findings to be intriguing as they seem to question the assertion that organic farming is normatively oriented towards feminine tasks in agriculture (Trauger, 2004; Bjørkhaug, 2006). As indicated in TALAF, this is because due to gender-related and context specific factors such as the household composition and marital status of female farmers, as well as their gendered roles as homemakers, women may more likely than men experience organic farming as a burdensome technology, which they lack the physical capacity to undertake.

The findings also showed that there were differences in disadoption contexts within and across my study areas. For instance, in Ajibode, one disadoption was caused by livelihood asset constraints related to land insecurity and the lack of money to buy seeds (available money was used to obtain an academic

diploma). Whereas, the other was caused by lack of physical capacity and unavailability of own labor due to pregnancy and postpartum stress, unavailability of household labor and lack of money to hire labor for organic farm work (related to nursing a newborn). In Elekuru, with one respondent, conflict-induced market access problem contributed to disadoption, but with another respondent, disadoption was mediated by the unmet opportunistic expectation for free money and limited knowledge of organic farming. One variation in the disadoption context across my study areas is that, unlike in Ajibode, disadoption in Elekuru was mediated by market access/marketing problems and the attributes of organic farming as a labor-intensive and time-consuming technology. Equally, the financial constraints that contributed to disadoption in Elekuru were due to market access problems. That was not the case in Ajibode.

As shown in Table 4.4, this study found that the disadoption decision of an individual respondent was because of multiple factors, which were related to institutional and livelihood asset constraints, vulnerability to yield and financial losses, gendered division of labor and other components in TALAF. As highlighted in different parts of this paper and in Table 4.4, the factors synchronously intersected with one another to shape respondents' disadoption decision. One such illustration is that market access/marketing problems faced by the disadopters in Elekuru was the primary reason that they lacked the financial capital to hire labor for their organic farm work. This depicts an interaction between an institutional and livelihood asset factor to inform disadoption. The findings also showed that *vulnerability context* factors intersected with both institutional and livelihood asset constraints to inform disadoption. Exemplifying this is the findings linking disadoption in Elekuru to vulnerability to income and yield losses, which arose from limited knowledge of organic farming and dearth of access to financial rewarding markets in urban locations. Gendered roles of women as homemakers also intersected with why it was more difficult for women to farm organically than men. By identifying what factor intersected with the other to inform disadoption decisions, this study provides insights on potential entry points to exploring what can be done to curtail/mitigate the disadoption of organic farming in Ajibode and Elekuru. One such entry point is to address the market access/marketing problem that emerged as the foremost factor that caused disadoption in Elekuru. The findings also bolster the claims in the literature and the

underlying argument of TALAF that the disadoption of organic farming is a complex decisional phenomenon that is associated with the synchronous interactions of many factors (Darnhofer et al., 2005; Harris et al., 2008; Koesling et al., 2008).

4.7 Conclusions

This study contributes to the literature on agricultural technology adoption decision-making and specifically provide important exploratory insights on factors that are driving the disadoption of certified organic farming in Ibadan, Oyo State Nigeria. Results of this study point to the inability to secure a reliable access to financially rewarding markets for organic produce in urban locations as the foremost factor that motivated disadoption in rural Elekuru. Disadoption was associated with the lack of institutional financial capital to hire labor and access production inputs such as seed. This study also revealed that human capital constraints such as limited knowledge of organic farming and vulnerability to yield and financial losses from insect pest and market access problems contributed to disadoption in Elekuru. In addition, it was found that factors such as the attributes of organic farming as a physically demanding technology, and domestic role play by women could gender the disadoption of organic farming in my study areas. Collectively, the findings of this study showed that disadoption was highly contextual and linked to the multifaceted interaction of many factors that fit into most of the components in TALAF. That this study was able to elicit how different factors synchronously interacted under different contexts to influence the disadoption of organic farming assisted in gaining profound insights about the phenomenon. This suggests that TALAF is capable of facilitating a deeper understanding of how and why farmers will decide to discontinue using a technology. That there was no evidence linking disadoption to farmers' livelihood activities, intrahousehold decision-making dynamics, as well as access to and control over resources may imply the redundancy of some of the components in TALAF. More studies, especially, with larger sample size are required to ascertain maybe that is a shortcoming of TALAF or not. Overall, the findings provide context-rich information that can be drawn upon by the promoters of organic farming in Ibadan Nigeria to think through what they can do to mitigate disadoption in the study areas. However, a caveat is that this study was based on only seven respondents, the entire

population of the disadopters in my research sites. This implies that the findings of this study cannot be generalized to a broader population. Finally, as the first standalone disadoption study on organic farming in Nigeria and Africa that I know, this study provides a rich explorative context for further and related studies in Nigeria and African organics.

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CHAPTER 5

PARTICIPATORY CAUSAL LOOP MAPPING OF THE ADOPTION OF ORGANIC FARMING IN NIGERIA

ABSTRACT

Contrary to the expectations of promoters, the adoption of organic agriculture by smallholder farmers in Nigeria has been low and slow, for reasons not well understood. Therefore, participatory causal loop diagraming workshops were conducted in a rural and an urban setting in Ibadan to elucidate the underlying causal factors and feedback mechanisms driving the adoption of organic farming in Ibadan, Nigeria. The underlying assumption was that adoption decision involves nonlinear, dynamic and complex interactions of many factors, requiring a methodology that is amenable for uncovering complexity. One such approach which was applied in this study is participatory causal loop diagraming. A loop analysis of the causal loop diagrams from the workshops was conducted to analyze and contrast the central drivers of adoption of organic farming in rural and urban Ibadan. For related reasons and to identify potential leverage points for policy interventions, the resulting causal loop diagrams were quantified using network analysis, another systems-based tool. The findings underscore the importance of the knowledge of organic farming, demand- and supply-side-oriented awareness creation, and the economic viability of organic farming for widespread adoption of the technology. Overall, the study contributes to the literature on the quantification of causal loop diagrams using network analysis. It also provides useful insights about the potential leverages around which interventions can be built to help motivate adoption by farmers.

5.1 Introduction

Growing global concerns about the negative externalities of conventional agriculture have obliged a need for alternative farming systems that are highly productive, sustainable, safe, and environment-friendly (Crowder, and Reganold, 2015; Ponsio et al., 2015; Nicolopoulou-Stamati et al., 2016). One such alternative being promoted, and which has been attracting increasing attention, including in African countries, is organic agriculture. Efforts at promoting and mainstreaming organic agriculture in Africa are mostly driven by non-governmental stakeholders, local and international. Their goal is to draw on organic agriculture to address some of the livelihood and agri-food challenges facing African rural and farming communities (UNEP-UNCTAD, 2008). Proponents consider organic well-suited to small-scale farming systems that dominate African agriculture (Parrott and van Elzakker, 2003; UNEP-UNCTAD, 2008), and to the prevailing agricultural practices in Africa (Thamaga-Chitja and Hendriks, 2008; UNEP-UNCTAD, 2008; Bennett and Franzel, 2013), But the adoption of organic agriculture in Africa has been slow and adoption rates have not been high (Bouagnimbeck, 2011, Djokoto et al., 2016; Issaka et al., 2016; Njaramba, 2011), with the underlying reasons yet to be properly studied. Drawing on systems thinking, this study seeks to contribute to and fill the gap in the literature by applying participatory causal loop diagraming to map out and unbundle the factors that dynamically interact to shape the adoption of organic agriculture.

Organic farming is regarded as a complex farming system, consisting of suits of sustainable practices/management strategies (Kroma, 2006, Brzezina et al., 2017), which require context-specific local adaptations (Brzezina et al., 2017), which have consequences for its adoption (Padel, 2001). Conversion to organic involves complex and sometimes, entire system changes to farming practices (Padel, 2001), and of social and economic relations (Padel, 2001, Freyer and Bingen, 2012; Brzezina et al., 2017). The adoption of organic farming involves a complex matrix of motivations (Eyhorn, 2006; Constance, and Choi, 2010) and it occurs within a highly dynamic and contextual decision environment (Rozman et al., 2013; Olabisi et al., 2015; Farmer et al., 2014). A complex mix of interdependent and interactive factors such as farmers' livelihood assets, individual values, technology attributes, culture,

gender, technical and biophysical considerations, vulnerability, and institutional contexts also intersect with the adoption of organic farming (Darnhofer et al., 2005; Eyhorn, 2006; Constance, and Choi, 2010; Mamuya, 2011). So, to develop a nuanced understanding of the adoption of organic farming requires that the causal mechanisms driving the dynamic complexity of the interacting and interdependent factors to be captured and untangled (Darnhofer et al., 2005). One analytical approach suitable for mapping and understanding complexity is causal loop diagraming (Sterman, 2010). It is a systems-based and qualitatively-oriented analytical method employed to visually capture and represent the dynamic interacting factors driving the behavior of complex systems (Richardson, 1986; Sterman, 2010).

The overall aim of this study was to address the following questions: what are the underlying causal structures and feedback mechanisms that dynamically interact to affect the adoption of organic farming in urban and rural Africa? What similarities and differences can be observed in the causal drivers of adoption in both settings? What leverage points exist for enhancing adoption rates? To this effect, I draw on the group causal loop diagrams from two participatory modeling workshops with certified organic farmers in Elekuru, a rural area, and Ajibode, an urban setting in Ibadan, Nigeria. Ajibode and Elekuru have the highest number of certified organic farmers in Nigeria. I did a loop and network analyses of the group causal loop diagrams in order to identify and contrast their main system drivers and to discern the leverage points for interventions that could lead to a widespread adoption of the technology (Hayward, 2016; McGlashan et al., 2016).

The rest of the paper is organized as follows. In the next section, I discuss the use of participatory modeling to understand technology adoption and untangle complexity. Then, I discuss causal loop diagraming and its utility both as a tool and as a qualitatively-oriented method for identifying the causal linkages among variables and feedback mechanisms that drive dynamic complex systems. The discussion also includes social network analysis techniques, their utility for CLD analysis, the strengths and weaknesses of CLDs and how this research sought to address the weaknesses. Next, is the methods section, then, the presentation, and discussion of the causal mechanisms in the CLDs and the results of

my network analysis. Afterwards, I discuss the implications of my findings and reflect on the strengths and weaknesses of my study, with the last part concluding the paper.

5.2 Participatory Modeling: Untangling Complexity in Technology Adoption

Participatory modeling has been defined as an iterative and interactive process (Hubacek et al., 2016; Hedelin et al., 2017), which involves the integration of a diverse range of experts and stakeholders in the creation, and/or usage of qualitative/conceptual maps and computer-based decision models (Hubacek et al., 2016), and in decision-making processes (Hedelin et al., 2017). It was envisioned both as a tool and as a process (Basco-Carrera et al., 2017; Hedelin et al., 2017) for achieving two overarching objectives: (1) to increase and share knowledge and understanding of a system and its dynamics under various conditions; and, (2) to identify and clarify impacts to a given problem (Voinov and Bousquet, 2010). As a tool for collective analysis (Voinov and Bousquet, 2010), participatory modeling is considered well-suited to help inform a detailed understanding of complex systems (Voinov and Bousquet, 2010; Hedelin et al., 2017). This is because the involvement of diverse stakeholders in a participatory modeling process can help elicit a shared understanding of the interdependent causal components that dynamically interact nonlinearly to infuse a system with its attributive complexity. One condition to be fulfilled to be able to use participatory modeling is problem complexity (Basco-Carrera et al., 2017), as neither all problems nor all decision contexts are amenable to the approach (Hubacek, et al., 2016). Organic farming is a complex technology (Padel, 2001) and its adoption decision-making contexts are characterized by complexity (Olabisi et al., 2015), which make participatory modeling suitable for this study.

Qualitative participatory system dynamics modeling approaches such as the one used for this study have been applied in various disciplinary contexts, including to identify climate risk sources in West Africa's agriculture (Olabisi et al., 2018) and to understand the spread of contagious diseases (Luke and Stamatakis, 2012). The approach has also been applied to map the determinants and causes of obesity (Allender et al., 2015; McGlashan et al., 2016), to elicit the complex factors that inform land use decision-making of agricultural stakeholders (Turner et al., 2013), and to study livestock farming redesigning process associated with conversion to organic production systems (Gouttenoire, et al., 2013). Despite its

potential to help uncover the interconnections of multiple factors surrounding complex and dynamic decision-making environments, there is a paucity of evidence indicating the use of causal loop diagraming in a participatory context to study farmers' technology adoption decisions. This study aims to contribute to the existing literature that has used CLDs to model farmers' technology/innovation adoption decision-making (Rochecouste et al., 2015; Sun et al., 2015).

5.3 Causal Loop Diagraming

Causal loop diagramming is a systems-based methodology (Wolstenholme, 1983; Koca and Sverdrup, 2012) and a qualitative method of analysis used in system dynamics (Kim and Andersen, 2012; Olabisi et al., 2018) to identify and map the underlying causal structures that are theorized to cause the dynamic complexity of a system (Sterman, 2010; Bureš et al., 2017; Olabisi et al., 2018). A systems' causal structures consist of the variables that interact non-linearly and interdependently with one another, their causal relationships, polarities, and feedback loops (Schaffernicht, 2010; Olabisi et al., 2018). Interacting variables are joined by arrows (causal links), signifying the direction of their cause-effect relationships, which could be of a positive or negative polarity. A positive polarity means that the cause variable (at the tail of the arrow) produces a change that moves the effect variable (at the head of the arrow) in the same direction. A negative polarity means the cause variable produces a change that causes the effect variable to move in the opposite direction (Richardson, 1986; Sterman, 2010). As noted by Sterman (2010), the link polarities "describe what would happen **IF** (emphasis, Sterman's) there were a change. They do not describe what actually happens" (p. 139). The feedback loops in a system could be positive or negative, and they arise from the multiple and continuous interactions among system structures. Positive feedback loops are self-reinforcing as they form a closed sequence of cause-effect (circular loops) that reinforces the original. Negative feedback loops are self-correcting and produce goal seeking effects, which drive a system towards equilibrium (Meadows, 2008; Sterman, 2010). At any point in time, a system behavior will depend on the more dominant of the two types of feedback loops (Sterman, 2010).

A shared CLD can be developed in a participatory group setting involving stakeholders who are familiar with and have the working knowledge of a system being studied (Kim and Andersen, 2012; Eker and Zimmermann, 2016; Eker et al., 2017). They can also be generated from the data collected through surveys, interviews, focus groups, participant observation (Eker and Zimmermann, 2016; Macmillan and Woodcock, 2017; Sterman, 2010), from a literature review (González, et al., 2016) and based on primary and secondary data (Eker and Zimmermann, 2016). The three CLDs that informed this study were created during participatory systems modeling workshops with organic farmers in Ibadan, Nigeria. The CLDs generated from participatory settings are not without their limitations. This includes the representativeness and generalizability of the findings beyond those who participated in the development of group CLDs (Allender et al., 2015; Hayward, 2016; Macmillan and Woodcock, 2017), as it is based on a small group process (Hayward, 2016). Another drawback is that without quantification, generally, CLDs are only able to generate limited policy insights (Homer and Oliva, 2001; Macmillan and Woodcock, 2017), a limitation I tried to address using network analysis.

5.4 Complexity, Network Analysis, and Causal Loop Diagraming

Network analysis (NA) is a systems and graph theory-based analytical approach (Martínez-López et al., 2009; El-Sayed et al., 2012, Luke and Stamatakis, 2012) that is focused on the relationships, pattern and extent of the interconnections and interactions among a group of interconnected actors within a network (Martínez-López et al., 2009). The actors can be human and non-human (Luke and Stamatakis, 2012). Network analysis concentrates on the structural characterization of a network (Anderson and Jay, 1985; Luke and Stamatakis, 2012), and, or the location/influence of entities/subsets within a network, with a view to determining how they influence the behavior and outcomes of a system (El-Sayed et al., 2012; Hayward, 2016; Luke and Stamatakis, 2012). One reason for this is that NA attributes the behavior of a system to the interactions among the entities that populate a network (El-Sayed et al., 2012). Also, NA can be used to explore and compare multiple different networks (Martínez-López et al., 2009; Luke and Stamatakis, 2012), how networks change over time (Luke and Stamatakis 2012) and to explain the characteristics of individual nodes within networks (Martínez-López et al., 2009).

Networks consist of two key components. These include nodes/vertices/actors, which are the elements or social entities in a network, and edges/contacts, which represent the social connections/links among the nodes in a network (Martínez-López et al., 2009; McGlashan et al., 2016). Depending on the nature of the connections between nodes, networks can be undirected, or directed/digraph, which is typified by connected nodes and edges that are connected in each direction. With undirected networks, the nodes are connected together, and the edges are without a direction as they transverse bidirectionally (Martínez-López et al., 2009).

Causal loop diagrams are adjudged amenable to network analysis (Hayward, 2016; McGlashan et al., 2016). This is because CLDs are considered as directed graphical networks of relationships consisting of nodes (network variables) and edges (network relationships between interconnected variables) (McGlashan et al., 2016; Walters et al., 2017), implying CLDs have data points that allow for a network analysis (McGlashan et al., 2016). To facilitate the network analysis of the group CLDs which they developed to elicit the complex drivers of childhood and adult obesity, Hayward (2016) and McGlashan et al. (2016) regarded their CLDs as directed and unweighted networks. They treated the underlying system structural elements in their CLDs as nodes and their causal connections as edges. They conducted model and variable level analyses of their directed networks in a software called Gephi (more on this later). Hayward (2016) and McGlashan et al. (2016) concluded that network analysis offers a means of quantifying, comparing and generalizing findings from group CLDs to a broader population. They also concluded network analysis presents a way of identifying leverage points in complex systems and their underlying important structural drivers. For this study, following Hayward (2016) and McGlashan et al. (2016), I conducted variable-level network analysis of the Ajibode and Elekuru CLDs, to help identify the important drivers of the adoption of organic farming in Nigeria and potential leverage points for interventions, aimed at fostering its widespread adoption by smallholder farmers. As later explained, this was done by computing the out-degree and betweenness centrality scores for all the variables in both CLDs.

5.5 Methods

5.5.1 *Description of the study areas*

The data for this study was gathered from two participatory system dynamics modeling workshops involving organic farmers in Ajibode and Elekuru, Akinyele Local Government, Ibadan, Oyo State, Nigeria. Ajibode is in an urban setting, close to the University of Ibadan. Elekuru is sited in a remote village (N 07.59', E 3.82'), with about 50 hamlets (Hodder, 1961; Liasu et al., 2005; Adeleke et al., 2008). Combined, both have the highest population of organic farmers in Nigeria (45) and are among the areas where participatory guaranteed systems (PSG)-certified organic farming was pioneered and still being practiced in Ibadan and Nigeria (NOAN, pers. comm., 2017). The mean annual rainfall is 1279 mm (Adeyolanu et al., 2016). The rainfall pattern is bimodal, starting from March/early April to mid-November, with a dry spell in August (Vanlauwe et al., 2005; Adeyolanu et al., 2016).

Figure 5.1. Map of study areas (Ajibode and Elekuru)

5.5.2 *Respondent selection and problem initialization*

Respondent selection for the participatory system dynamics modeling workshops was preceded by consultations with the leadership of Ajibode and Elekuru organic farmers group, and NOAN. I also consulted with individual organic farmers in Ajibode and Elekuru. The consultations were used to discuss the purpose and nature of the workshops, to solicit participation in the study, and to gather inputs about the appropriate time and venue for the workshops. By discussing the objectives, scope, and nature of the workshops upfront, my goal was to initialize and foster a prior understanding of the problem (adoption of organic farming in Nigeria) at the core of the participatory system dynamics modeling workshops. As observed by Inam et al. (2015), such an effort is essential for the success of a participatory system dynamics modeling process, as it "depends on a clear articulation of the proposed problem to be studied and addressed" (p. 254).

Following Inam et al. (2015), the consultations, especially, with the leadership of the organic farmers in Ajibode and Elekuru also served as a brainstorming process for initializing discussion on who should be involved in the workshops. The selection process was iterative as the initial list that was developed together with the leaders of the organic farmers' group was updated based on inputs from the meetings with individual organic farmers and by drawing on the insights that I developed from working with the farmers since 2014. I co-prepared the final workshop list together with the leaders of the organic farmers groups. A total of 38 participants were invited and participated in both workshops. This included 25 participants in Ajibode (19 women, 6 men), and 13 in Elekuru (6 men, 7 women). Participants represented a cross-section of the farmers involved in organic production in Ajibode and Elekuru, with their year of adoption of organic farming, gender, age, and other socio-economic factors considered. I provided food and soft drinks for the workshop participants.

5.5.3 *Description of the workshops*

The workshops were held between December 6-7, 2017, in Ajibode and Elekuru, each lasting about three hours. The two workshops were conducted in an elementary school facility in Ajibode and Elekuru. Both workshops were held at a time that neither conflicted with the household responsibilities nor the

livelihood activities of the attendees. This was possible because, during the pre-workshop consultations, I discussed with the participants, the time and duration of the workshops and notified them of the workshops two weeks upfront. To foster inclusive discussion, the workshops were conducted in Yoruba, the native language spoken by all the workshop participants (McDougall et al., 2009).

I started the modeling process by explaining the objectives and format of the workshops to participants. The objectives were (1) to identify factors that dynamically interact to inform the adoption, non-adoption, and disadoption of certified organic farming in Ibadan and Nigeria as a whole; (2) to construct causal loop diagrams that capture the dynamically interacting factors that underlie adoption over time; and, (3) to identify policies and policy intervention points, that can help enhance widespread adoption and mitigate disadoption of the technology. Questions and comments were entertained from the participants. Next, I explained systems thinking and causal loop diagramming to workshop participants. He shared with them examples of feedback loops, CLDs, causal polarity, and entertained questions from them. The scale of discussion and adoption decision-making was clarified for workshop participants. They were asked to think about why an individual would choose to adopt or not adopt organic and about larger scale factors beyond individual considerations that could affect that decision. This was to ensure such factors were not left off the CLDs.

Participants were then divided into small groups consisting of 6-8 persons, to identify, discuss, and take notes of the factors driving the adoption and non-adoption of organic farming. These include three small groups formed in Ajibode workshop and two in Elekuru (gender-disaggregated), with each having a notetaker and a facilitator. Each group presented the outcomes of their discussions in a conversational plenary session. Next, participants returned to their small groups to build CLDs connecting all the variables that they had identified, guided by the following questions: how were the variables, directly and indirectly, related to one another? Does one variable in the list cause another variable to increase or decrease? How and why?

Most of the groups struggled to generate their own CLDs. This may be because most of the participants were illiterate and new to systems diagramming. Therefore, the process of drawing the CLDs

in small groups was modified. In Ajibode, each group was asked to call out and discuss each of the variables that they had identified and indicate why (justification) and how (polarity) they influenced one another, for me to connect them together on a chalk/whiteboard, one at a time, using causal arrows in real time. In Elekuru, the process was a little different as I worked with each of the two groups to create their shared CLDs, as opposed to one shared and unified group CLD created in Ajibode. This was because it was observed during Ajibode workshop that creating a causal diagram could be difficult for illiterates. Disagreements about the nature and direction of the interacting variables were discussed, following which modifications were made, where necessary, after consensus was reached. Participants discussed the feedback loops, identified and elaborated on policies and interventions that could be employed to foster the widespread adoption of organic farming in Ibadan and Nigeria, and those were incorporated into the CLDs. The workshops were wrapped up after participants reviewed and expressed satisfaction with the comprehensiveness and interactions of the causal variables in the CLDs. In all, one unified group CLD was developed in Ajibode, while two group CLDs were created in Elekuru. All the diagrams and notes taken were collected at the end of the workshops.

After the workshops, I digitized the three group CLDs in Vensim PLE. Next, following Inam et al. (2015), the two group CLDs created during Elekuru modeling workshop were merged (Figure 5.4). The merger was intended at integrating the shared understanding of the workshop participants about the drivers of the adoption of organic farming in Elekuru/rural Ibadan. This was to enable us to compare the underlying dynamics driving adoption in Elekuru and Ajibode, given their location in a rural and an urban setting respectively. The merging process started with the more comprehensive of the two group CLDs created in Elekuru. The unified Elekuru CLD was reviewed to check for redundancy and ensure that no structural elements and causal connections were omitted.

I did a causal loop analysis of the three group CLDs by discussing their reinforcing and balancing loops (Renmans et al., 2017). It involves analyzing the interactions and potential effects of causal loops on a systems behavior (Roberts et al., 1983). I draw on system archetypes to develop further insights into the underlying dynamic behaviors characterizing the feedback loops in the CLDs and to decipher their

leverage points (Sterman, 2010; Sun et al., 2015). System archetypes are generic structures that produce insights into the causal mechanisms that underlie the behavioral patterns of systems over time (For further details, see, Braun, 2002; Meadows, 2008). They can be used to elicit important system drivers and leverage points, where interventions aimed at changing the behavior of a system can be applied (Sterman, 2010; Meadows, 2009). This is because individual system archetypes have their own leverage points (Kim, 2000).

I used network analysis to compare and quantify the structural characteristics of Ajibode and merged Elekuru CLDs and to determine their important system drivers and potential leverage points (McGlashan et al., 2016; Schoenenberger and Schenker-Wicki, 2014). To do this, following Hayward (2016) and McGlashan et al. (2016), I treated the two CLDs as directed and unweighted networks, consisting of nodes (variables in the CLDs) and edges (causal connections of the variables in the CLDs). From the resulting Ajibode and Elekuru network diagrams, in Excel, I created for each of them, a node and an edge list file, which were Gephi compatible. Gephi is an open-source visualization software for network analysis and graph (Bastian et al., 2009). The node files comprise all the variables (nodes) in each of the network diagrams. They have the "ID" column, which serves as unique identifiers (numbers) for the nodes and the "Label" column, bearing the attributes (names) associated with the node identifiers (Appendix E). The edge list files represent the causal connections between the nodes in each of the two network diagrams (Appendix F) and they have two columns. These are the "Source" and "Target" columns representing the "ID" numbers of the connected nodes - of the start "source" and end node "target" for each edge. The node and edge list files were imported into Gephi for network analysis. Specifically, drawing on McGlashan et al. (2016), to determine the main system structural drivers of adoption and leverage points for interventions in the network diagrams, using the algorithms in Gephi, I conducted variable-level network analysis by computing in-degree centrality (Di_i) out-degree centrality (Do_i), and betweenness centrality (Bc_i) (Hayward, 2016). The degree centrality (Dc_i) measures the number of connections a node has with other nodes in a network. For directed networks, Dc_i can be expressed as the number of ties received by a node in a network (support/in-degree centrality (Di_i) or as

the number of causal connections coming out from a node in a network-influence/out-degree centrality (Do_i). Out-degree centrality helps determine the direct causal influence that a variable may have on other elements within a system (Hayward, 2016) Betweenness centrality (Bc_i) is a measure of the influence a node has over the spread of causal influence through the network (Newman, 2005). I also computed network summary statistics (model level network analysis) for the two network diagrams. These include the total number of edges and nodes in the three networks, average path length, network density (D), and modularity.

5.6 Results

5.6.1 *Elekuru group causal loop diagrams*

The group CLD created by female workshop participants in Elekuru contains eight reinforcing loops and two balancing loops (Figure 5.2, Appendix A). Loop R1 is driven by yield and farm size. Yield increase from the adoption of organic farming may boost the socio-economic status of adopters and relieve them of the financial constraints, which could have hindered the expansion of their land under cultivation. As farm size increases, yield is expected to increase, with adopters likely to be better off financially (R1). A related causal mechanism undergirds loop R2. Yield increase will motivate the expansion of the land under cultivation, in turn, occasioning a further increase in yield (R2), and to realize higher profits, to which there is a limit. Loops R3 and R4 are knowledge/human capital-driven. An increase in farmers' understanding and knowledge of organic farming through training will help boost their yields. Learning from and internalizing what they did right and wrong managing pest and weed to improve their yield the prior season will increase farmers' stock of agronomic knowledge of organic agriculture. As a result, organic farmers may record higher yields the next growing season, all else equal (R4). Equally, through training prompted by the pest issues affecting their yields, adopters' stock of knowledge of organic pest management will increase. This will enable them to efficaciously manage pest on their organic farms, in turn, causing yield to increase (R3). With increased profit, organic farmers' socioeconomic situations will improve, making them financially capable to expand their land under organic, in order to record high yields and profits (R5). At the core of R7 and R8 is the quantity of the

organic produce sold as organic, as well as consumer awareness of the health and other benefits of organic. With increased consumer awareness comes increased market and patronage for organic produce, in turn causing increased consumer awareness (R7). Increased consumer awareness enthused by publicity by NOAN will cause the quantity of organic produce sold as organic to increase. This will lead to a further increase in consumer awareness (R8). However, increasing consumer awareness will signalize a need for NOAN to scale down on consumer sensitization. This will attenuate growing consumer awareness level about organic and induce a balancing effect that will counterbalance the reinforcing effects of R7 and R8 on adoption (B2, added by researcher).

A pest and knowledge-driven balancing loop (B1) will offset the effects of reinforcing loops R1, R2, R3, R4, and R5 on adoption. As the yield loss to pest attack reduces, due to a better understanding and knowledge of organic pest management, lesser training will be organized. This will affect the stock of farmers' knowledge of organic pest management practices, resultantly, increasing the vulnerability of their crops to pest attacks (B1), and therefore, causing yield loses. Reinforcing loop R6 will deplete the stock of organic farmers by motivating farmers who had adopted organic farming to discontinue it (disadoption). As the stock of disadopters increases, the mockery of those still practicing organic farming will intensify, due to its financial non-viability. This will lead to more disadoption.

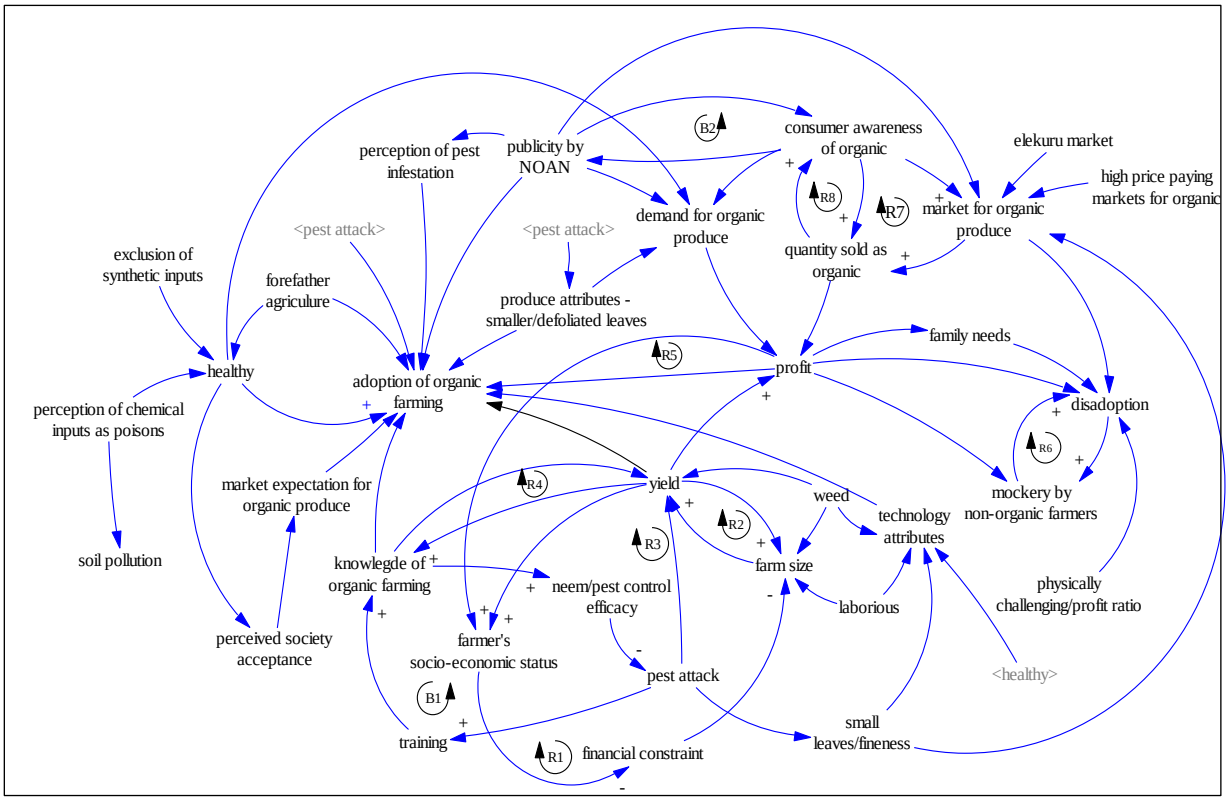

Figure 5.2. Elekuru group 1 causal loop diagram of the adoption of organic farming

The second Elekuru group CLD that was developed by men has 17 reinforcing loops and four balancing loops (Figure 5.3, Appendix D). The first five loops (Re1, Re2, Re3, Re12, Re16- identified by the researcher) concern publicity by NOAN and government aimed at sensitizing consumers to buy organic foods. The expectation of earning high profits, from increased consumer awareness and their willingness to pay higher prices for organic products will inspire farmers to adopt organic farming (Re1 and Re2). With increase in the profit made by organic farmers, more farmers will adopt organic farming. This will amplify existing publicity and consumer awareness, including of the perceived health benefits of organic farming (Re3, Re12). With increased publicity by NOAN and government, consumer awareness of organic farming and its perceived health benefits will increase. In turn, farmers will expect that organic produce will attract high prices and earn them high profits. This will motivate farmers to adopt organic farming, a development that will reinforce existing publicity about the technology (Re16).

The causal mechanisms behind reinforcing loop Re6 are the same as R2 explained above. As yield increases, organic farmers will expand their farm size to achieve higher yields (Re6). With increasing

profits, organic farmers will be financially better off and able to hire labor to support their farm operations. In turn, they will be motivated to increase their farm size so as to earn high profits (Re5). Reinforcing loop Re4 is trust-driven – trust in organic farming will foster adoption. As more farmers go organic, existing trust in the technology will deepen. This will motivate further adoption by farmers (Re4). Feedback loops Re9, Re10 and Re11 illustrate the causal mechanisms through which adoption will be reinforced by the awareness of the perceived health issues with synthetic pesticides and herbicides, the longingness for long-life and the perception that organic foods are safer and healthier. Three feedback loops (identified by the researcher) showed that trust will nonlinearly reinforce adoption (Re13, Re14, Re15), the perceived health concerns associated with farm chemicals, the notion that organic is healthy (Re14, Re15) and that its consumption will result to a longer life span (Re15). This will spur further adoption, in turn, enhancing the trust in organic farming (Re13, Re14, and Re15). There will be a delay in Re15 since perceiving a longer life span will not happen instantly.

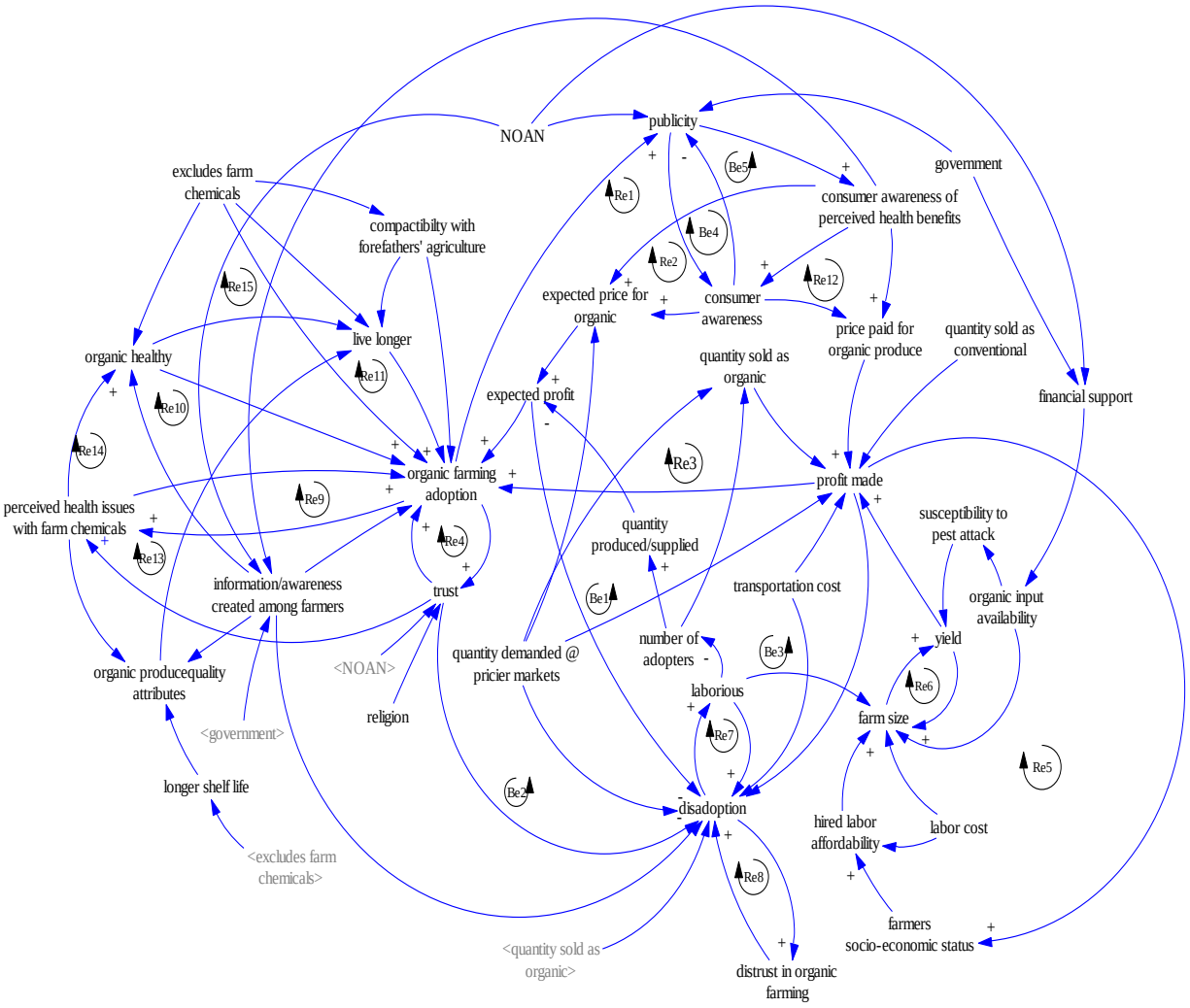

Figure 5.3. Elekuru group 2 causal loop diagram of the adoption of organic farming

The effect of the reinforcing loops discussed above will be balanced by Be1, Be2, Be3, Be4, Be5, Re7, and Re8. As the number of organic farmers increases, the production volume and quantity of organic produce supplied to the market will increase. This may dampen anticipated profit and therefore foster disadoption. As a result, the widespread perception that organic farming is labor intensive will heighten and negatively affect the number of organic farmers and their production volume (Be1). The underlying logic is that the claim that organic farming is labor intensive is being reinforced by the fact that it has not been profitable for most farmers in Elekuru. With rewarding markets that make organic farming economically rewarding, it was said that the perception that will wane. Loops Be2 and Be3 were already in the group CLD. They were not identified by the workshop participants, but by the researcher. The

underlying causal structure of Be2 is like Be1. However, it includes a trust component that fosters disadoption, following depressed profit expectation that will affect farmers' attractiveness to adopt organic farming (Be2). Disadoption will reinforce the impression that organic farming is a labor intensive and physically challenging technology. That will negatively impact the land size under organic cultivation by farmers, in effect, leading to lower yields and profits earned. The adoption and trust in the technology will reduce, in turn, bolstering disadoption (Be3). This loop reinforces disadoption. Through disadoption, reinforcing loops Re7 and Re8 will produce negative and bandwagon effects that will dampen adoption by reinforcing distrust in the technology and the perception that it is laborious. Through declining commitment of NOAN and government to consumer sensitization, consumer awareness of organic farming will decrease, thereby, creating a balancing effect on the behavior of the system (Be4 and Be5, added by the researcher).

There are 26 reinforcing loops and seven balancing loops in the unified Elekuru CLD (Figure 5.4, Appendix C). I only explain feedback loops Ri17, Ri20, Ri21, Ri22, Bi7, and Bi8. This is because the remaining feedback loops in the unified Elekuru CLD have the same causal structures and feedback mechanisms as those explained above. Increased consumer sensitization by NOAN and the government will lead to increased consumer awareness of organic products (Ri17), and also help stimulate market development for organic (Ri22). All else equal, this will lead to an upsurge in the amount of the produce sold as organic by organic farmers. This will enable them to make better profits, in turn, spurring further adoption. Consequently, the existing publicity level about organic farming will be bolstered (Ri17, Ri21, Ri22), with adoption reinforced (Ri21). With increased adoption of organic farming, the awareness of the perceived health issues with farm chemicals will increase. This will reinforce the perception that organic is healthy and lead to increased perceived society acceptance of organic products. Consequently, market expectation for organic produce will increase, in turn, reinforcing the adoption of organic farming (Ri20). The dynamic and nonlinear reinforcing effect of publicity on adoption through Ri7, Ri8, Ri9, Ri16, and Ri17 will be weakened by Bi2, Bi7, and Bi8. As shown, increased consumer publicity will drive market development for organic products (Bi8), and a corresponding surge in consumer awareness (Bi7) and the

quantity of organic produce sold by farmers (Bi7, Bi8). Increasing consumer awareness of the perceived health benefits of organic produce coupled with increased consumer patronage of organic produce will cause existing consumer awareness level to magnify. In turn, consumer sensitization by NOAN and the government will reduce (Bi7, Bi8).

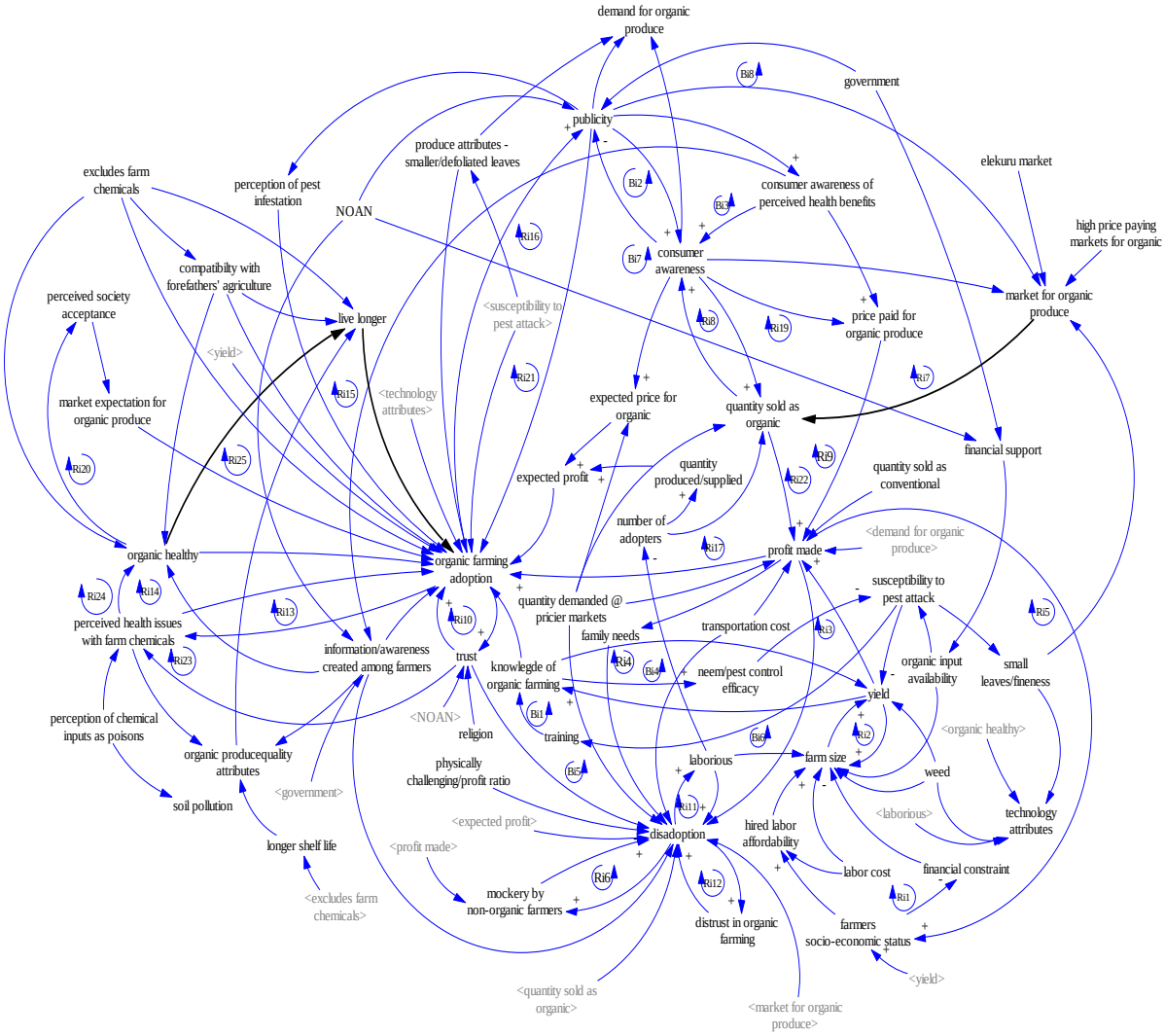

Figure 5.4. Merged Elekuru group CLD of adoption of organic farming

5.6.2 *Ajibode group causal loop diagram*

The group causal loop diagram that was created in Ajibode has eight reinforcing loops and four balancing loops, three of which were identified by the researcher (Figure 5.5, Appendix D). As awareness creation among farmers about organic farming intensifies, more farmers will adopt the technology. This

will amplify existing awareness level (Ra2). As more farmers become aware of organic farming, the awareness level of the health issues from synthetic pesticides and herbicides will increase. In turn, the understanding of the perceived health benefits of organic farming among farmers will deepen. This will reinforce the effect of awareness on adoption (Ra1). Reinforcing loops Ra4 and Ra5 show the mechanisms through which increasing consumer awareness of organic foods drives adoption. Market for organic produce will expand with increasing consumer awareness of their perceived health benefits (Ra4). In turn, organic product differentiation, consumer awareness and market for organic will amplify (Ra5).

At the core of reinforcing loops Ra6 and Ra7 is knowledge. Yield increases as farmers' understanding of organic production techniques and management practices improves through training and extension support. By updating their stock of knowledge based on what they did right previously, farmers may be well-positioned to record higher yields the next growing season (Ra6). With improved understanding of organic farming, yield loss to insect pests will reduce. Higher yields will be recorded, and farmers' stock of knowledge will improve (Ra7). As yield and farmers' knowledge of organic farming increases, fewer trainings will be organized for organic farmers. This will negatively affect their stock of knowledge about organic (Ba1). In turn, yield may reduce. Balancing loop Ba4 is similar to Ba1. With yield increase, fewer trainings will be organized and this will negatively affect farmers' knowledge of organic farming. Vulnerability to pest infestation and yield loses will increase, thus, causing yield reduction. This will motivate the need for further training (Ba4). Also, as the awareness level about organic increases, the money for publicity by NOAN and the government will reduce. This will negatively affect publicity about organic (Ba2). Feedback loop Ba2 shows a general mechanism through which the adoption can be dampened nonlinearly by publicity. Increase in publicity about organic farming targeted at farmers will lead to an increased awareness about the technology among farmers. In turn, awareness creation among farmers will be scaled-down (Ba3). Reinforcing loop Ra8 shows that with the adoption of organic farming, farmers' socio-economic status will supposedly improve. This will enable them to buy farm irrigation water pump machine. With improved irrigation, yield and profit are expected to increase. This will inspire more farmers to adopt organic farming.

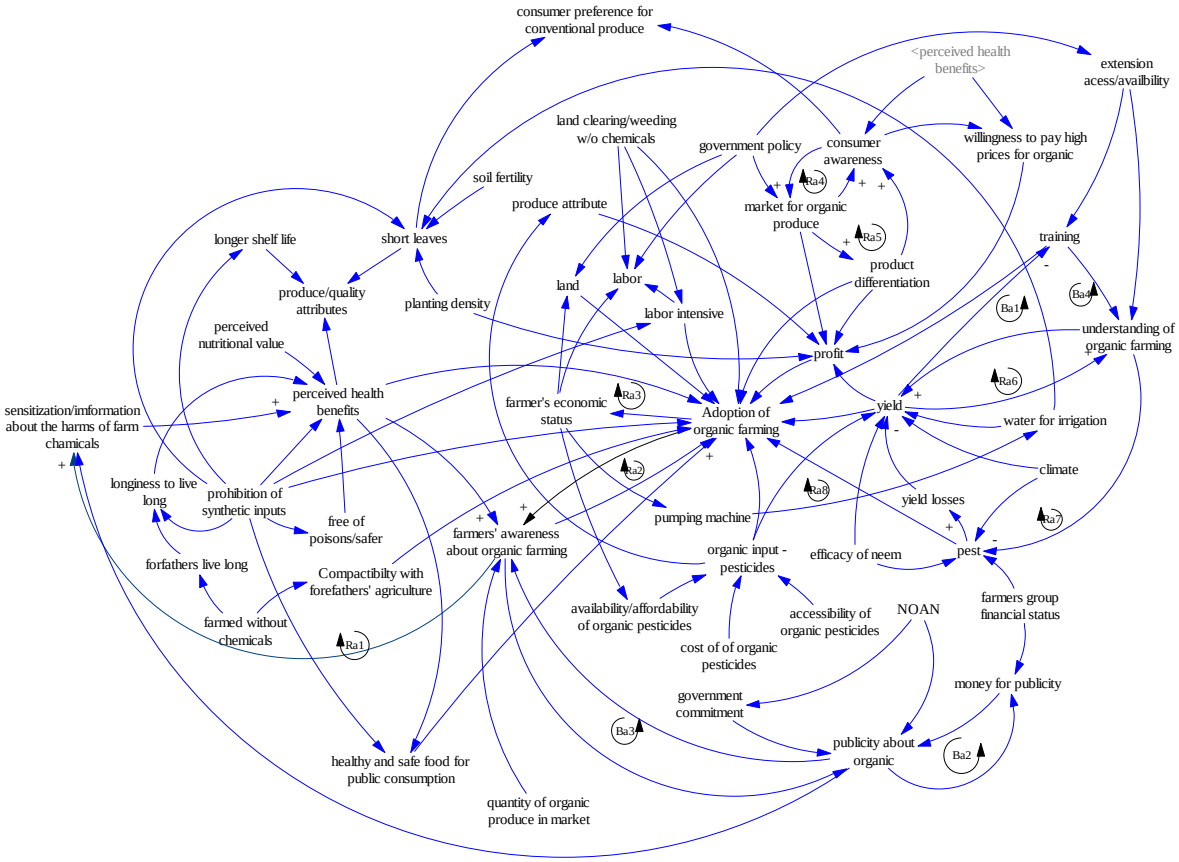

Figure 5.5. Ajibode group causal loop diagram of the adoption of organic farming

5.6.3 *Ajibode and Elekuru causal loop diagrams: A contrast*

In this sub-section, I contrast Ajibode group causal loop diagram (Figure 5.5) with Elekuru's (merged, see Figure 5.4). My goal is to highlight the structural overlaps and variations in their underlying feedback mechanisms. This will help to discern exploratory insights and 'generalizable' understanding of the factors that dynamically interact to shape the adoption of organic farming in rural and urban Ibadan. The CLDs in Ajibode and Elekuru show that demand-side-oriented publicity by NOAN, and or, the government will reinforce adoption through consumer sensitization about organic and by stimulating markets for organic products. Here, unlike Elekuru's, Ajibode CLD explicitly underscores the role of government policy in market creation for organic produce (Ra4, Figure 5.5). In both workshops, and as shown by both CLDs, consumer awareness creation and market for organic were considered imperative to facilitating and supporting the adoption of organic farming by farmers (Ra4, Ra5 – Figure 5.5, Ri7, Ri21,

Ri22 – Figure 5.4). In Ajibode CLD, product differentiation (through, for example, segmented market places in daily and weekly urban produce markets) is a unique feature of the underlying feedback mechanism that reinforces consumer awareness to stimulate market development for organic (Ra5: consumer awareness -> market for organic produce -> product differentiation -> consumer awareness). There is a similar reinforcing feedback mechanism in the unified Elekuru CLD, but with a different structural component. The quantity of organic produce sold as organic will amplify existing consumer awareness, in turn, leading to increased market for organic products (Ri7: consumer awareness -> market for organic produce -> quantity sold as organic-> consumer awareness market -> market for organic produce).

The structural variations identified above may be connected to the nature and degree of marketing constraints faced by the organic farmers in Ajibode and Elekuru. Insights from the modeling workshops and fieldwork that informed this study indicated that consumer awareness about organic produce was higher in Ajibode compared to Elekuru. This may be related to the location of Ajibode in an urban center, especially near the University of Ibadan, where NOAN's office is located. Also, due to locational factors, Ajibode organic farmers are surrounded by many daily markets and have greater market access for their organic produce. They were also aware of the market opportunities for organic in urban Ibadan and that some consumers were willing to pay premiums. The awareness of such factors possibly underscores why the consolidation and expansion of existing marketing opportunities were priority issues in Ajibode modeling workshop. They aim to attain that through means such as product differentiation, which they believed, would help boost the profitability of their organic farms, increase the visibility of their products, and reinforce the perceived health benefits/quality distinctions between conventional and organically grown crops. Thus, they surmised that product differentiation will help strengthen and expand their existing market opportunities and consumer awareness level. This contrasts with Elekuru, where the market for, and consumer awareness about organic products, were considered almost non-existent, mainly due to the absence of consumer sensitization. During the workshop, it was also stated that the remoteness of Elekuru created transportation constraints, which limited access to daily markets in the urban areas,

where farmers may find markets for their organic produce. Transportation to and out of Elekuru is also affected by the limited economic opportunities in Elekuru.

I further observed that in Elekuru CLD, on the one hand, has some more elaborate reinforcing causal mechanisms through which publicity and consumer awareness dynamically interact with market for, and price paid for organic to affect expected and actual profits and therefore, the adoption of organic farming (Ri8, Ri9, Ri16, Ri17, Ri18, Ri19, and Ri22, Figure 5.4). On the other, unified Elekuru CLD shows four feedback mechanisms (Bi2, Bi3, Bi7, and Bi8,), which will dampen and balance out the reinforcing effect of publicity-consumer awareness-quantity sold as organic- driven loops. The behaviors of the four balancing loops typify such shown by the limit to growth system archetype, which establishes that growth cannot continue unhampered by a limiting system factor, which, in this instance, is publicity (Kim, 2000; Sterman, 2000). There will be a cap to the resources, especially, monetary, those that are devoted to organic farming consumer awareness creation. With increased consumer awareness, following increased financial resources to publicity, fewer such resources will be available for further awareness creation. Besides, the motivation to commit more resources to publicity will reduce as consumer awareness of organic farming increases. A potential leverage point in such a system is to find a way to boost or fix the limiting factor, possibly through increased and sustained financial commitments to publicity. This finding is bolstered by the following loop analysis. The variable publicity is directly connected to and drives the reinforcing loops Ri9, Ri16, Ri17, Ri18, Ri19, and Ri22. It also drives Ri8 through consumer awareness and is directly connected to the balancing loops Bi2, Bi3, Bi7, and Bi8. Also, consumer awareness connects directly with feedback loops Ri7, Ri8, Ri16, Ri18, Ri19, Ri22, Bi2, Bi3, Bi7, and Bi8, and indirectly with Ri9. Drawing on Laurenti et al. (2016), this suggests that publicity and consumer awareness may be potential leverage points in the Elekuru CLD. Given that consumer awareness is driven by publicity (see Figure 5.4), it appears reasonable to zero-in on publicity as a leverage point in the system.

Ajibode and Elekuru group CLDs also highlight the importance of supply-side awareness creation among farmers to the adoption of organic farming, albeit, with obvious distinctions. Through Ra1 and

Ra2, Ajibode CLD explicitly shows the reinforcing mechanisms through which awareness creation among farmers interacts non-linearly with system variables such as the perceived health benefits of organic and the awareness of the health issues associated with synthetic pesticides and herbicides to inform adoption. The underlying structural mechanisms for corresponding reinforcing loops in Elekuru CLD are slightly different (Ri13, Ri14, Ri15, Ri19, Figure 5.4). One such distinction is that unlike in Ra1 and Ra2 (Figure 5.5), awareness creation among farmers is clearly absent in Ri13, Ri14, Ri15, and Ri19 (Figure 5.4). A shared structural cause-effect pattern is that all the said feedback loops showed that farmers' awareness of the health issues with synthetic farm chemicals will reinforce the notion that organic is healthy, with the latter stimulating adoption. We further observed that only Ajibode CLD shows the feedback mechanisms through which the reinforcing effect of supply-side-oriented awareness creation will be dampened by balancing loops, with a behavioral pattern typical of limit to growth system archetypes (Ba2, Ba3, Figure 5.5).

I also observed the following from the reinforcing and balancing loops connected to the supply-side awareness creation driven loops. In Elekuru CLD, farmers' awareness of the possible health issues with synthetic chemicals drives Ri13, Ri14, Ri15, and Ri19, while the perception that organic is healthy connects reinforcing loops Ri14 with Ri15, and Ri19. This suggests that the two variables may be important system drivers of adoption in Elekuru CLD. Equally, in Ajibode CLD, farmers' awareness of organic farming drives and connects Ra1 with Ra2, Ba3, and indirectly connects with Ba2 through publicity about organic, the cause variable that drives the former. This suggests that farmers' awareness of organic farming is a potential important system driver in Ajibode CLD. Further, the three important system drivers in Ajibode and Elekuru group CLD seem to underscore the centrality of publicity/awareness creation among farmers to the adoption of organic farming, a point that was emphasized during the workshops in Ajibode and Elekuru. In addition, from a system archetype perspective, publicity about organic also emerged as a system variable that will limit the reinforcing behavior of Ra1 and Ra2 in Ajibode CLD. Balancing loop Ba2 highlights money for publicity, as the limiting factor that will constrain publicity creation about organic among farmers.

Knowledge-yield-driven feedback mechanisms are a shared feature of both Ajibode and merged Elekuru group CLDs. This is illustrated by Ra6 (Ajibode) and Ri4 (Elekuru), which structurally and behaviorally, consists of reinforcing non-linear interactions between yield and knowledge: All else equal, increased knowledge will lead to yield increase, then, increased knowledge. Ra7 (Ajibode) and Ri3 (Elekuru) are also similar in form and behavior, as they both point to the structural mechanisms through which an increase in the knowledge of organic farming will reinforce adoption through an increase in yield, brought about by being able to better manage insect pest issues on an organic farm. Despite their similarities, Ra7 and Ri3 offer slightly different but complementary structural details: Ra7: understanding of organic -> pest-> yield loses -> yield -> understanding of organic; Ri3: knowledge of organic farming -> neem/pest control efficacy -> susceptibility to pest attack-> yield -> knowledge of organic farming. As further observed, the effects of the reinforcing loops in both Ajibode and Elekuru CLDs will be attenuated by structurally and behaviorally equivalent balancing loops. These include two balancing loops in Ajibode CLD (Ba1, Ba4), and one balancing feedback mechanism in Elekuru CLD (Bi1), which with different levels of detail, showed that extension support will be scaled down and that fewer trainings will be organized for organic farmers, following their ability to better manage pests and reduce yield losses. This will negatively affect farmers' evolving understanding of organic farming, cause yield loss from pest issues, and therefore lock the system along a balancing loop trajectory that will affect adoption. The underlying causal mechanisms of the balancing loops are not essentially different, except for some level of structural detail.

It seems that knowledge and yield are a possible driver of the feedback loops analyzed above. This is because both variables connect and drive Ra6, Ra7, Ba1, and Ba4 in Ajibode group CLD. I also noticed that yield is affected by pests, and both variables by the knowledge of organic farming. Through its effect on yield loss and yield, pest infestation as a system variable in Ajibode CLD will affect whether further training will be organized for farmers or not, with that having consequences for farmers' stock of knowledge of organic farming. This underlines the centrality of the susceptibility to pest attack to the behaviors of Ra6, Ra7, Ba1, Ba4, and the adoption of organic farming. Similarly, in Elekuru CLD,

reinforcing loops Ri3 and Ri4 are linked and driven by yield and knowledge of organic farming. Further, balancing loop Bi1 is connected to reinforcing loops Ri4 and Ri3 by knowledge of organic farming. As shown in the balancing loop Ba1 and reinforcing loop Ri3, susceptibility to pest attack impacts yield and training, thereby, alluding to the variable as a potential system influencer.

There are causal mechanisms that are unique to either Ajibode or Elekuru CLDs, which provide valuable insights into the factors that interact nonlinearly to influence adoption. These include reinforcing loops Ri1, Ri2, Ri3 and Ri5, which show how farm size and yield dynamically interact with one another to affect the profit made by organic farmers, and their socio-economic situations, thereby, locking the system into a trajectory that reinforces adoption. Somewhat similar, but functionally and structurally different reinforcing mechanisms in Ajibode CLD is reinforcing loop Ra3 and Ra8. Ra3 shows that with increasing agricultural support for organic farming, farmers' access to land will increase, thereby stimulating adoption. Farmers' socio-economic situation was expected to improve with the adoption of organic farming, in turn, availing farmers the financial resources necessary to access more land for their organic farm operations (Ra3). This loop speaks to land constraint as a factor that, without government policy support, may inhibit the adoption of organic farming in an urban setting, given the competing uses of land for other purposes such as for road and building construction to accommodate growing urban population. It was a major issue discussed in Ajibode workshop. It was unanimously agreed that government support through access to free or subsidized land for organic farming will encourage the adoption of the technology in urban areas. In contrast, in Elekuru neither land availability nor land rental/acquisition cost was a limiting factor for farming or a constraint to the adoption of organic agriculture. Land was said to be readily available and accessible for rent and ownership at affordable rates. Also, the reinforcing loops Ra3 (Ajibode), Ri1, Ri2, Ri3 and Ri5 (Elekuru - with a greater level of details) illustrate how farmers' land in organic will get expanded and reinforce adoption. Akin to Ri1, Ri2, Ri3, and Ri5 (Elekuru), but with a markedly different structural mechanism, reinforcing loop Ra8 in Ajibode showed that adoption will be reinforced through the effect of improvement in organic farmers' socio-economic situation on irrigation, yield, and profit. One more distinction is that the CLD from

Elekuru shows how trust reinforces adoption (Ri10, Ri23, Ri24, Ri25) and how adoption is also dampened by disadoption, through three balancing feedback mechanisms: socially-driven loops Ri6 (mockery by non-organic farmers -> disadoption -> mockery by non-organic farmers) and Ri12 (distrust in organic farming -> disadoption -> distrust in organic farming); and a technology attribute-driven loop Ri11 (laborious -> disadoption -> (laborious).

5.7 *Network analysis results*

The model-level network summary statistics showed that Ajibode group CLD has 50 nodes and 96 causal connections. The merged Elekuru group CLD has 57 system variables (nodes) and 126 causal connections (edges) (Table 5.1). Both CLDs are of low, sparse and similar network density (0.039), and are of comparably low average path lengths (4.251 for Ajibode, 4.333 for Elekuru). The network density of 0.039 shows that the networks contain 3.9% of the theoretically possible causal connections in both CLDs. Being of low density suggests that adoption may respond less forcefully to changes in one system variable in both networks (McGlashan et al., 2016). The average path lengths show that the variables in Ajibode and unified Elekuru CLDs will respectively travel through 4.251 and 4.333 mean causal connections before reaching another variable in their networks.

The results also showed that both CLDs are divided networks with low modularity (Ajibode: 0.507, with 6 structural clusters of variables; Elekuru: 0.483, with 5 clusters of variables). The clusters of nodes associated with the modules in each of the networks correspond to the loop structures in both CLDs. Being of low modularity implies a change to a variable within a module is likely to produce a system-wide effect on other variables in the network (Beilin et al., 2013).

Table 5.1. Model-level summary statistics of Ajibode and Elekuru Causal Loop Diagrams

Network Global Summaries	Ajibode	Elekuru
Nodes	50	57
Edges	96	126
Density	0.039	0.039
Average Path Length	4.251	4.333
Modularity	0.507	0.488

The 13 highest ranked variables in Ajibode and unified Elekuru group CLDs based on the results of our variable-level analysis are shown in Table 5.2. Ajibode group CLD has out-degree scores ranging from 0-8, while that of Elekuru group CLD ranged from 0-6. The score range denotes the nodes with the least and highest number of contacts with other nodes in both networks. As shown in Table 5.2, 'the prohibition of synthetic inputs' has the highest out-degree score (8) in Ajibode CLD, followed by the awareness of the perceived health benefits of organic (out-degree=6), then, 'yield,' 'farmer's economic status,' and 'government policy' (out-degree=4). In the unified Elekuru group CLD, 'consumer awareness,' and 'publicity' have the highest out-degree score (out-degree=6 each); followed by 'yield,' then 'profit made', 'susceptibility to pest attack,' and 'excludes farm chemicals' (out-degree=5, each). This implies the variables and the other ones in Table 5.2 with high out-degree scores are probable important drivers of the adoption of organic farming in their respective CLDs. This is because they have the most causal relationships with other variables in their networks (McGlashan et al., 2016).

For both CLDs, the variable 'adoption of organic farming' has the highest in-degree, but it is of no analytical import as it is what I am studying. As shown in Table 5.2, in Ajibode group CLD, 'profit' and 'yield' both have the highest in-degree scores of six, each, followed by the 'perceived health benefits of organic' (out-degree=5). With the merged Elekuru group CLD, disadoption has the highest in-degree score (13), then, 'farm size' and 'profit made' by organic farmers (in-degree score=7, each). Having high in-degree scores imply that they will be influenced by many other variables in their networks (Hayward, 2016). For the betweenness centrality, I overlooked the scores for adoption in both CLDs, for the same reason indicated above. Therefore, and as shown in Table 5.2, for Ajibode group CLD, organic farmers' economic status has the highest betweenness score (betweenness=471.0). Next is farmers' awareness about organic farming' (betweenness=390.0), then, the perceived health benefits of organic (betweenness=368.3). For unified Elekuru group, disadoption has highest betweenness score of 667.7. Next is 'yield' (betweenness=542.2), then, 'publicity' (betweenness=523.8). Those variables and others in Table 5.2 with high betweenness scores can help mediate a change in adoption dynamics in both CLDs (Hayward, 2016; McGlashan et al., 2016).

The network analyses result also showed how each of the variables in both CLDs comparatively ranked on out-degree and betweenness scores. In Ajibode group CLD, the perceived health benefits of organic, organic farmers' socio-economic status and yield all ranked highly on out-degree and betweenness scores. In the merged Elekuru CLD, similar attributes were exhibited by 'yield,' 'publicity,' and the profit made by organic farmers (Table 5.2). The variables with high out-degree and betweenness scores are potential leverage points, which can directly and significantly influence most of the variables in both systems (Hayward, 2016, Walters, 2016).

The results further showed that some variables scored higher on betweenness than out-degree scores. These include the following variables: 'sensitization/information about the potential harms of farm chemicals,' 'farmers' awareness about organic farming' (Ajibode group CLD); 'knowledge of organic farming,' 'farm size,' 'disadoption,' and 'perceived health issues with farm chemicals' (Elekuru group CLD). Variables with such out-degree and betweenness scores are a strong bridge for facilitating a system-wide change, but with potentially fewer direct effects on the variables in the system (Hayward, 2016). Finally, some of the variables combined high out-degree scores with zero betweenness scores. These include the 'prohibition of synthetic inputs' and 'government policy' (Ajibode group CLD) and variables such as 'excludes farm chemicals,' and 'quantity of organic produce demanded at pricier markets' (Elekuru group CLD). Such variables can causally affect other variables in the system but they have no mediatory potential in the model. In other words, they are exogenous drivers.

Table 5.2. Ajibode and unified group Elekuru CLDs model and node-level statistics

Ajibode			Elekuru		
Id	**Label**	**I/Degree**	**Id**	**Label**	**I/Degree**
21	adoption of organic farming	14	12	organic farming adoption	17
22	profit	6	41	disadoption	13
31	yield	6	32	profit made	7
8	perceived health benefits	5	44	farm size	7
7	farmers' awareness about organic farming	4	25	market for organic produce	5
12	short leaves	4	3	organic healthy	4
17	labor	4	14	live longer	4
34	pest	4	17	technology attributes	4
39	publicity about organic	4	18	yield	4
11	produce/quality attributes	3	21	publicity	4
24	consumer awareness	3	29	quantity sold as organic	4
30	understanding of organic farm	3	8	organic produce quality attributes	3
44	organic input pesticides	3	10	information/awareness created among farmers	3
Id	**Label**	**O/Degree**	**Id**	**Label**	**O/Degree**
3	prohibition of synthetic inputs	8	21	publicity	6
8	perceived health benefits	6	24	consumer awareness	6
20	farmer's economic status	4	9	excludes farm chemicals	5
26	government policy	4	18	yield	5
31	yield	4	20	susceptibility to pest attack	5
7	farmers' awareness about organic farming	3	32	profit made	5
16	land clearing/weeding without chemicals	3	3	organic healthy	4
23	product differentiation	3	10	information/awareness created among farmers	4
24	consumer awareness	3	16	NOAN	4
25	market for organic produce	3	37	quantity demanded at pricier markets	4
39	publicity about organic	3	48	laborious	4
44	organic input pesticides	3	5	perceived health issues with farm chemicals	3
12	short leaves	2	11	government	3
Id	**Label**	**Between**	**Id**	**Label**	**Between**
21	adoption of organic farming	802.5	12	organic farming adoption	1013.1
20	farmer's economic status	471.0	41	disadoption	667.7
7	farmers' awareness about organic farming	390.0	48	laborious	562.3
8	perceived health benefits	368.3	18	yield	542. 2
1	sensitization/information about the harms of farm chemicals	255.0	21	publicity	523.8
31	yield	253.7	44	farm size	476. 7
44	organic input pesticides	192.7	32	profit made	392.7
45	pumping machine	166. 3	39	knowledge of organic farming	280.0
46	availability/affordability of organic pesticides	152. 7	5	perceived health issues with farm chemicals	274.3
32	water for irrigation	150. 3	20	susceptibility to pest attack	257.8
39	publicity about organic	128.5	56	trust	238.75
24	consumer awareness	111.5	40	neem/pest control efficacy	198
22	profit	101.7	24	consumer awareness	184.3

5.8 Discussion of Findings

Ajibode and merged Elekuru CLDs (Figures. 3 and 4) indicate some similarities in the underlying causal structures and feedback mechanisms that will drive adoption in rural and urban Ibadan. One such similarity is that demand-side-oriented publicity structured around the awareness of food safety issues, and the perceived health benefits of consuming organic products is imperative for fostering adoption in both settings. This result pertains to the fact there is a low consumer awareness about organic products in Ibadan (Obayelu et al., 2014). As shown by both CLDs, consumer awareness creation will help spur demand and market for organic products, with that likely to motivate farmers to adopt organic farming. This finding aligns with studies which stated that growing consumer demand for organic products, which was inspired by food safety awareness stimulated markets for organic and motivated farmers to adopt organic farming (Shanahan et al., 2008; Sierra et al., 2008).

Ajibode and Elekuru group CLDs also underscored the need for supply-side publicity targeted at farmers in order to stimulate and reinforce adoption over time in rural and urban Ibadan. The basis for this pertains to generally low awareness and limited understanding of organic farming among the farmers in southwestern Nigeria (Odunkoya, 2009; Oyesola and Obabire, 2011). The finding also conforms with Alawode and Abegunde (2015) who proposed that publicity should be intensified to increase the awareness and adoption of organic farming by farmers in Oyo State. As suggested during the modelling workshops, such awareness efforts will provide information that can motivate farmers to adopt organic farming for its perceived quality attributes, healthfulness, and economic viability.

The findings from my causal loop analysis also allude to yield and knowledge of organic farming as a key variable that will drive adoption in rural and urban Ibadan, through its effect on pest and yield. The network analysis also suggests that the knowledge of organic farming and yield are a potential leverage point for stimulating widespread adoption in both settings. This conforms with Eyhorn (2006), which reported that the impacts of organic farming on yield financially motivated conventional farmers to adopt the technology. Equally, my causal loop and network analyses suggest that the livelihood impacts of organic farming on the socio-economic status of organic farmers and the profit made by them will

strongly influence adoption in Ajibode and Elekuru. The finding is intuitive given that poverty is prevalent among smallholder farmers in Ibadan and Nigeria, generally (Yusuf et al., 2008; Oni and Olaniran, 2010). That Ajibode and unified Elekuru networks have comparable overall network summaries (the same network density, almost equal average path length and nodes) further suggests that the causal drivers of adoption in both systems are largely similar (Hayward, 2016).

The findings also highlight some differences in the underlying causal mechanisms that will shape adoption in rural and urban Ibadan. For example, land is specific to, and is at the core of one of the reinforcing loops driving adoption in Ajibode group CLD. This finding is understandable given that the location of Ajibode in a rapidly urbanizing setting means that land can be a limiting factor to farming generally (Adelekan et al., 2014). As indicated in the Ajibode group CLD, this finding implies that government policy support to access land for organic farming can help drive adoption in urban Ibadan. No need was expressed for such a policy during Elekuru modeling workshop as access to land in rural Ibadan was not considered a constraint to the adoption. Another notable difference between both CLDs pertains to the market for organic and consumer awareness creation. Specifically, it was found that market for organic produce featured more prominently as a part of the causal drivers of adoption in unified Elekuru, compared to Ajibode. This was mainly because compared to Ajibode, market and consumer awareness about organic was almost non-existent in Elekuru for reasons earlier explained. This finding suggests that market for organic and consumer awareness creation are more likely to impact adoption dynamics in Elekuru than in Ajibode. Also, disadoption featured in Elekuru CLD, unlike in Ajibode's. This may be because Elekuru has experienced greater cases of disadoption (5), compared to Ajibode, where the two farmers that discontinued organic went back to it at a later time.

The causal loop and network analyses were indicative of multiple leverage points in both CLDs for potential interventions that can help spur widespread adoption of organic farming. These include publicity/awareness creation among farmers and consumers about organic and food safety issues. As observed by the workshop participants and demonstrated by my analyses, consumer awareness creation through for example radio jingles can help drive demand, market development and rewarding prices for

organic produce, factors which were expected to increase adoption rates. A similar finding was reported by Rozman et al. (2013), whose study identified awareness creation and market development as the most important leverage points for the development of organic farming in Slovenia. Akin to Bastan et al. (2018), my loop and network analyses also suggest that the profit from organic farming is another potential leverage point in both systems. In line with Eyhorn et al. (2007) and Mamuya (2011) my loop analysis shows that profitability will be dynamically affected by factors such as demand and price paid for organic products, yield and market. This implies that efforts aimed at boosting consumer awareness and yield can help make organic farming profitable and attractive for adoption. Stemming disadoption also emerged a potential leverage that is peculiar to Elekuru CLD. This is consistent with observation in the literature that the adoption of a technology can be constrained by its disadoption by previous users of the technology (Moser and Barrett, 2006). Overall, the multiple potential leverage points can be drawn upon by the promoters of organic farming and policymakers to inform and prioritize interventions aimed to boost the adoption rates of the technology by farmers.

5.9 A Reflection on Participatory Causal Loop Diagraming Approach

The use of participatory causal loop diagraming for this study was not without some strengths and limitations. A strength of the approach is that when workshop participants were discussing the feedback structures in the CLDs, they gained insights into how different interventions may affect adoption and the livelihood outcomes from organic farming. The process was also empowering and self-realizing, as it enabled workshop participants to discern what they can do collectively by self-organizing as farmers groups to influence the focus of NOAN. The cause and effect nature of the causal loop diagraming process also enabled participants to gather some insights and exchange ideas about how different practices could affect yield. For example, during the workshop in Ajibode, participants discussed and exchanged ideas on how different land preparation techniques, crop diversity, planting time, and water management can impact yield, weeds and pests on their organic farms. The causal loop diagramming process also fostered discussions, which enabled participants in both workshops to develop a deeper understanding of their marketing challenges and how they can be addressed.

The experience from both workshops suggests that the diagraming of causal linkages may be challenging for illiterates. Participants understood the underlying idea behind causal loop diagramming. But, they struggled to create causal diagrams of the factors that dynamically interact to shape adoption. I intervened by facilitating the causal diagraming process. This seems to suggest that participatory causal loop diagraming may require certain facilitation approach to make it work for illiterates. This is consistent with Király et al.'s (2016) contention that, "participatory systems mapping is not necessarily a method that can involve all levels of lay knowledge" (p. 509). To overcome this limitation, Király et al. (2016) suggested that the cause and effect relationships among the variables that drive a complex phenomenon of interest should be elicited in a focus group, to be transformed by a modeler into causal loop diagrams. As they rightly observed, following such an approach raises concern about the participatory nature of the process. Here, my study differs from Király et al. (2016), as it offers a potential way the same limitation can be overcome in a participatory modeling setting. My approach requires having a modeler/workshop organizer help participants to map their shared mental model by occupying a non-interfering role.

5.10 Conclusions

This paper sought to understand the factors that dynamically interact to influence the adoption of organic farming in Ibadan, Nigeria. To do this, I conducted participatory causal loop diagraming workshops in an urban and a rural setting, where organic farming is being practiced by smallholder farmers in Ibadan. I did a loop and network analysis of the group CLDs that were created from the workshops drawing as well on system archetypes for my analysis. The findings indicated similarities and differences in the underlying causal structures and feedback mechanisms driving the adoption of organic farming in both settings. One such similarity is the need for awareness creation that will motivate farmers to adopt organic farming and stimulate consumers to patronize organic products. The findings also suggested that awareness creation can spur a change in consumer food choices to organic, influence their willingness to pay premium prices and facilitate the development of markets for organic, factors which may motivate more farmers to adopt organic farming. The need for training, programs and extension support mechanisms that will help farmers to acquire the technical-know of organic production

techniques also emerged as a key driver of adoption. It was also found that the livelihood impacts of organic farming, especially on the socio-economic situations of adopters can affect the adoption of the technology in rural and urban Ibadan. This study also identified awareness creation, the knowledge of, and profit that accrues from organic farming as potential leverage points for interventions that may influence adoption in both systems. It is important that the CLDs be quantitatively simulated as system dynamics models to help ascertain the drivers of adoption and leverage points for intervention. Overall, this study provides information that can help policymakers and the promoters of organic farming to gain insights into the causal factors that drive the adoption of organic in Ibadan. It seems instructive that this study is replicated in other areas in southwestern Nigeria, where organic farming has been introduced to farmers.

APPENDICES

APPENDIX A: Description of Elekuru group 1 causal loop diagram of the adoption of organic farming

Loops	Description	Remarks
R1	Yield → **(+)** Farmers socio-economic status → **(-)** Financial constraints → **(-)** Farm size→ **(+)** Yield	Reinforcing loop
R2	Yield → (+) Farm size → (+)Yield	Reinforcing loop
R3	Knowledge of organic farming → (+) Neem/pest control efficacy → (-) Pest attack→ (-) Yield → (+) Knowledge of organic farming	Reinforcing loop
R4	Knowledge of organic farming → (+) Yield → (+) Knowledge of organic agriculture	Reinforcing loop
R5	Yield → **(+)** Profit → (+) Farmers socio-economic status → **(-)** Financial constraints → **(-)** Farm size→ **(+)** Yield	Reinforcing loop
R6	Mockery by non-organic farmers → (+) Disadoption→ (+) Mockery by non-organic farmers	Reinforcing loop that balances adoption
R7	Consumer awareness → (+) Market for organic produce → (+) Quantity sold as organic → (+) Consumer awareness market	Reinforcing loop
Ri8	Consumer awareness→ (+) Quantity sold as organic → (+) Consumer awareness	Reinforcing loop
B1	Knowledge of organic farming → (+) Neem/pest control efficacy → (-) Pest attack→ (+) Training → (+) Knowledge of organic farming	Balancing loop
B2	Publicity by NOAN → (+) Consumer awareness → (-) Publicity by NOAN	Balancing loop

Remark: (+) means that the two variables between the arrows change in the same direction; (-) means that the two variables between the arrows change in the opposite direction.

APPENDIX B: Description of Elekuru group 2 causal loop diagram of the adoption of organic farming

Loops	Description	Remarks
Re1	Publicity → (+) Consumer awareness of perceived health benefits → (+) Expected price for organic → (+) Expected profit → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Re2	Publicity → (+) Consumer awareness → (+) Expected price for organic → (+) Expected profit → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Re3	Publicity → (+) Consumer awareness of perceived health benefits → (+) Price paid for organic → (+) Profit made → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Re4	Organic farming adoption → (+) Trust → (+) Organic farming adoption	Reinforcing loop
Re5	Yield → **(+)** Profit made → (+) Farmers socio-economic status → **(+)** Hired labor affordability → **(+)** Farm size→ **(+)** Yield	Reinforcing loop
Re6	Yield → (+) Farm size → (+)Yield	Reinforcing loop
Re7	Laborious → (+) Disadoption → (+) Laborious	Reinforcing loop that balances adoption
Re8	Distrust in organic farming → (+) Disadoption → (+) Distrust in organic farming	Reinforcing loop that balances adoption
Re9	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic farming adoption	Reinforcing loop
Re10	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic health → (+) Organic farming adoption	Reinforcing loop
Re11	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic health → (+) Live longer → (+) Organic farming adoption	Reinforcing loop
Re12	Publicity → (+) Consumer awareness → (+) Price paid for organic → (+) Profit made→ (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Re13	Organic farming adoption → (+) Trust → (+) Perceived health issues with farm chemicals → (+) Organic farming adoption	Reinforcing loop
Re14	Trust → (+) Perceived health issues with farm chemicals→ (+) Organic healthy → (+) Organic adoption → (+) Trust	Reinforcing loop
Re15	Trust → (+) Perceived health issues with farm chemicals → (+) Organic healthy → (+) Live longer → (+) Organic farming adoption → (+) Trust	Reinforcing loop
Re16	Publicity → (+) Consumer awareness of perceived health benefits → (+) Consumer awareness → (+) Expected price for organic → (+) Expected profit → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Be1	Disadoption → (+) Laborious → (-) Number of adopters → (+) Quantity produced/supplied → (-) Expected profit → (-) Disadoption	Balancing loop
Be2	Disadoption → (+) Laborious → (-) Number of adopters → (+) Quantity produced/supplied → (-) Expected profit → (+) organic farming adoption → (+) Trust→ (-) Disadoption	Balancing loop
Be3	Disadoption → (+) Laborious → (-) Farm size → (+) Yield → (+) Profit made→ (+) Organic farming adoption → (+) Trust→ (-) Disadoption	Reinforcing loop, which bolsters disadoption

APPENDIX B (cont'd)

Loops	**Description**	**Remarks**
Be4	Publicity → (+) Consumer awareness → (-) Publicity	Balancing loop
Be5	Publicity → (+) Consumer awareness of perceived health benefits → (+) Consumer awareness → (-) Publicity	Balancing loop

Remark: (+) means that the two variables between the arrows change in the same direction; (-) means that the two variables between the arrows change in the opposite direction.

APPENDIX C: Description of merged Elekuru causal loop diagram of the adoption of organic farming

Loops	Description	Remarks
Ri1=R5	Yield → **(+)** Profit made → (+) Farmers socio-economic status → **(-)** Financial constraints → **(-)** Farm size → **(+)** Yield	Reinforcing loop
Ri2=R2=Re6	Yield → (+) Farm size → (+) Yield	Reinforcing loop
Ri3=R3	Knowledge of organic farming → (+) Neem/pest control efficacy → (-) Susceptibility to pest attack→ (-) Yield → (+) Knowledge of organic farming	Reinforcing loop
Ri4=R4	Knowledge of organic farming → (+) Yield → (+) Knowledge of organic agriculture	Reinforcing loop
Ri5=Re5	Yield → **(+)** Profit made → (+) Farmers socio-economic status → **(+)** Hired labor affordability → **(+)** Farm size→ **(+)** Yield	Reinforcing loop
Ri6=R6	Mockery by non-organic farmers → (+) Disadoption→ (+) Mockery by non-organic farmers	Reinforcing loop, which balances adoption
Ri7=R7	Consumer awareness → (+) Market for organic produce → (+) Quantity sold as organic → (+) Consumer awareness market	Reinforcing loop
Ri8=R8	Consumer awareness→ (+) Quantity sold as organic → (+) Consumer awareness	Reinforcing loop
Ri9=Re3	Publicity → (+) Consumer awareness of perceived health benefits→ (+) Price paid for organic produce → (+) Profit made → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri10=Re4	Organic farming adoption → (+) Trust → (+) Organic farming adoption	Reinforcing loop
Ri11=Re7	Laborious → (+) Disadoption → (+) Laborious	Reinforcing loop, which balances adoption
Ri12=Re8	Distrust in organic farming → (+) Disadoption → (+) Distrust in organic farming	Reinforcing loop that balances adoption
Ri13=Re9	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic farming adoption	Reinforcing loop
Ri14=Re10	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic health → (+) Organic farming adoption	Reinforcing loop
Ri15=Re11	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic health → (+) Live longer → (+) Organic farming adoption	Reinforcing loop
Ri16=Re16	Publicity → (+) Consumer awareness of perceived health benefits → (+) Consumer awareness → (+) Expected price for organic → (+) Expected profit → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri17	Publicity → (+) Consumer awareness of perceived health benefits → (+) Consumer awareness → (+) Quantity sold as organic → (+) Profit made→ (+) Organic farming adoption → (+) Publicity	Reinforcing loop

APPENDIX C (cont'd)

Ri18=Re2	Publicity → (+) Consumer awareness → (+) Expected price for organic → (+) Expected profit → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri19=Re12	Publicity → (+) Consumer awareness → (+) Price paid for organic → (+) Profit made→ (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri20	Organic farming adoption → (+) Perceived health issues with farm chemicals → (+) Organic healthy → (+) Perceived society acceptance → (+) Market expectation for organic produce → (+) Organic farming adoption	Reinforcing loop
Ri21	Publicity → (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri22	Publicity → (+) Consumer awareness → (+) Market for organic produce → (+) Quantity sold as organic → (+) Profit made→ (+) Organic farming adoption → (+) Publicity	Reinforcing loop
Ri23=Re13	Organic farming adoption → (+) Trust → (+) Perceived health issues with farm chemicals → (+) Organic farming adoption	Reinforcing loop
Ri24=Re14	Trust → (+) Perceived health issues with farm chemicals→ (+) Organic healthy → (+) Organic adoption → (+) Trust	Reinforcing loop
Ri25=Re15	Trust → (+) Perceived health issues with farm chemicals → (+) Organic healthy → (+) Live longer → (+) Organic farming adoption → (+) Trust	Reinforcing loop
Bi1=B1	Knowledge of organic farming → (+) Neem/pest control efficacy → (-) Susceptibility to pest attack→ (+) Training → (+) Knowledge of organic farming	Balancing loop
Bi2=Be4	Publicity → (+) Consumer awareness → (-) Publicity	Balancing loop
Bi3=Be5	Publicity → (+) Consumer awareness of perceived health benefits → (+) Consumer awareness → (-) Publicity	Balancing loop
Bi4=Be2	Disadoption → (+) Laborious → (-) Number of adopters → (+) Quantity produced/supplied → (-) Expected profit → (+) organic farming adoption → (+) Trust→ (-) Disadoption	Balancing loop
Bi5=Be1	Disadoption → (+) Laborious → (-) Number of adopters → (+) Quantity produced/supplied → (-) Expected profit → (-) Disadoption	Balancing loop
Bi6=Be3	Disadoption → (+) Laborious → (-) Farm size → (+) Yield → (+) Profit made→ (+) Organic farming adoption → (+) Trust→ (-) Disadoption	Reinforcing loop, which bolsters disadoption
Bi7	Publicity → (+) Consumer awareness → (+) Quantity sold organic → (+) Consumer awareness → (-) Publicity	Balancing loop
Bi8	Publicity → (+) Market for organic produce → (+) Quantity sold as organic → (+) Consumer awareness → (-) Publicity	Balancing loop

Remark: (+) means that the two variables between the arrows change in the same direction; (-) means that the two variables between the arrows change in the opposite direction.

APPENDIX D: Description of Elekuru group 2 causal loop diagram of the adoption of organic farming

Loops	Description	Remarks
Ra1	Farmers' awareness about organic farming → (+) Sensitization/information about the harms of farm chemicals → (+) Perceived health benefits → (+) Farmers' awareness about organic farming	Reinforcing loop
Ra2	Farmers' awareness about organic farming → (+) Adoption of organic farming → (+) Farmers' awareness about organic farming	Reinforcing loop
Ra3	Land → (+) Adoption of organic farming → (+) Farmer's economic status → (+) Land	Reinforcing loop
Ra4	Consumer awareness → (+) Market for organic produce → (+) Consumer awareness	Reinforcing loop
Ra5	Consumer awareness → (+) Market for organic produce → (+) Product differentiation → (+) Consumer awareness	Reinforcing loop
Ra6	Understanding of organic farming → (+) Yield → (+) Understanding of organic farming	Reinforcing loop
Ra7	Understanding of organic farming → (-) Pest → (+) Yield losses → (-) Yield → (+) Understanding of organic farming	Reinforcing loop
Ra8	Adoption of organic farming → (+) Farmer's socio-economic status → (+) Pumping machine → (+) Water for irrigation → (+) Yield → (+) Adoption of organic farming	Reinforcing loop
Ba1	Training → (+) Understanding of organic farming→ (+) Yield → (-) Training	Balancing loop
Ba2	Money for publicity → (+) Publicity about organic → (-) Money for publicity	Balancing loop
Ba3	Publicity about organic → (+) Farmers' awareness about organic farming → (-) Publicity about organic	Balancing loop
Ba4	Yield → (-) Trainings → (+) Understanding of organic farming → (-) Pest → (+) Yield loses → (-) Yield	Balancing loop

Remark: (+) means that the two variables between the arrows change in the same direction; (-) means that the two variables between the arrows change in the opposite direction.

APPENDIX E: Ajibode and Elekuru nodes lists

Ajibode Nodes List		Elekuru Nodes List	
ID	Label	**ID**	Label
1	sensitization/information about the harms of farm chemicals	**1**	perceived society acceptance
2	longingness to live long	**2**	market expectation for organic produce
3	prohibition of synthetic inputs	**3**	organic healthy
4	forefathers live long	**4**	longer shelf life
5	free of poisons/safer	**5**	perceived health issues with farm chemicals
6	compatibility with forefathers' agriculture	**6**	perception of farm chemicals as poisons
7	farmers' awareness about organic farming	**7**	soil pollution
8	perceived health benefits	**8**	organic produce quality attributes
9	perceived nutritional value	**9**	excludes farm chemicals
10	longer shelf life	**10**	information/awareness created among farmers
11	produce/quality attributes	**11**	government
12	short leaves	**12**	organic farming adoption
13	planting density	**13**	compatibility with forefather’s agriculture
14	soil fertility	**14**	live longer
15	consumer preference for conventional produce	**15**	perception of pest infestation
16	land clearing/weeding without chemicals	**16**	NOAN
17	labor	**17**	technology attributes
18	labor intensive	**18**	yield
19	land	**19**	produce attributes - smaller/defoliated leaves
20	farmer's economic status	**20**	susceptibility to pest attack
21	adoption of organic farming	**21**	publicity
22	profit	**22**	Elekuru market
23	product differentiation	**23**	demand for organic produce
24	consumer awareness	**24**	consumer awareness
25	market for organic produce	**25**	market for organic produce
26	government policy	**26**	consumer awareness of perceived health benefits
27	willingness to pay high prices for organic	**27**	high price paying markets for organic
28	extension access/availability	**28**	price paid for organic
29	training	**29**	quantity sold as organic
30	understanding of organic farm	**30**	expected price for organic
31	yield	**31**	expected profit
32	water for irrigation	**32**	profit made
33	climate	**33**	quantity sold as conventional

APPENDIX E (cont'd)

Ajibode Nodes List		Elekuru Nodes List	
ID	**Label**	**ID**	**Label**
34	pest	**34**	financial support
35	yield loss	**35**	number of adopters
36	efficacy of neem	**36**	quantity produced/supplied
37	farmers group financial status	**37**	quantity demanded at pricier markets
38	money for publicity	**38**	transportation cost
39	publicity about organic	**39**	knowledge of organic farming
40	NOAN	**40**	neem/pest control efficacy
41	government commitment	**41**	disadoption
42	cost of organic pesticides	**42**	family needs
43	accessibility of organic pesticides	**43**	training
44	organic input pesticides	**44**	farm size
45	pumping machine	**45**	weed
46	availability/affordability of organic pesticides	**46**	organic input availability
47	quantity of organic produce	**47**	small leaves/fineness
48	healthy and safe food for public consumption	**48**	laborious
49	farmed without chemicals	**49**	labor cost
50	produce attributes	**50**	hired labor affordability
		51	financial constraints
		52	farmers socio-economic status
		53	distrust in organic farming
		54	mockery by non-organic farmers
		55	physically challenging/profit ratio
		56	trust
		57	religion

APPENDIX F: Ajibode and Elekuru edge lists

Ajibode Edge List				**Elekuru Edge List**			
Source	Target	Source	Target	Source	Target	Source	Target
1	8	25	23	1	2	24	29
2	8	25	22	2	12	24	23
3	12	25	24	3	12	25	29
3	2	26	19	3	14	25	41
3	5	26	17	3	17	26	28
3	21	26	25	3	1	26	24
3	18	26	28	4	8	26	10
3	8	27	22	5	12	27	25
3	10	28	30	5	3	28	32
3	48	28	29	5	8	29	32
4	2	29	21	6	5	29	24
5	8	29	30	6	7	29	41
6	21	30	31	8	14	30	31
7	1	30	34	9	14	31	12
7	21	31	21	9	12	31	41
7	39	31	30	9	3	32	12
8	21	31	22	9	13	32	52
8	7	31	29	9	4	32	41
8	48	32	31	10	8	32	42
8	11	32	12	10	3	32	54
8	27	33	31	10	41	33	32
8	24	33	34	10	12	34	46
9	8	34	21	11	10	35	36
10	11	34	35	11	21	35	29
12	15	35	31	11	34	36	31
12	11	36	34	12	21	37	32
13	12	36	31	12	5	37	41
13	22	37	34	12	56	37	29
14	12	37	38	13	3	37	30
16	21	38	39	13	12	38	32
16	18	39	38	13	14	38	41
16	17	39	7	14	12	39	18
18	21	39	1	15	12	39	40
18	17	40	41	16	21	39	12
19	21	40	39	16	10	40	20
20	19	41	39	16	56	41	48
20	17	42	44	16	34	41	53
20	45	43	44	17	12	41	54
20	46	44	31	18	44	42	41
21	20	44	21	18	39	43	39
21	7	44	50	18	32	44	18
22	21	45	32	18	52	45	18
23	24	46	44	18	12	45	44
23	22	47	7	19	23	45	17
23	21	48	21	19	12	46	20
24	15	49	6	20	19	46	44
24	27	49	4	20	47	47	25

APPENDIX F (cont'd)

Ajibode Edge List				**Elekuru Edge List**			
Source	Target	Source	Target	Source	Target	Source	Target
24	25	50	22	20	18	47	17
				20	43	48	35
				20	12	48	44
				21	24	48	41
				21	26	48	17
				21	12	49	44
				21	15	49	50
				21	25	50	44
				21	23	51	44
				22	25	52	50
				23	32	52	51
				24	21	53	41
				24	30	54	41
				24	28	55	41
				24	25	56	41
						56	12
						57	56

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CHAPTER 6

CONCLUSIONS

6.1 Introduction

Organic farming is being promoted in Nigeria by non-governmental stakeholders as a pro-poor strategy that can help improve the livelihood conditions of smallholder farmers through increased yield and farm income. The promoters of organic farming in Nigeria, which includes the National Organic Association of Nigeria (NOAN) considered it suitable to the socio-economic conditions of smallholders and their existing farming practices. As a result, they anticipated that the technology would be well adopted by smallholder farmers in the country. However, that has not been the case. It was against this backdrop that this dissertation research was undertaken with the following overarching objectives in mind: to investigate the factors influencing and hindering the adoption of organic farming in Nigeria and how the factors interact; to explore the factors that motivated farmers to disadopt organic farming in the study areas; and to shed insights on the similarities and differences in the causal drivers of adoption of organic farming in urban and rural Ibadan.

In order to achieve its objectives, this dissertation research was delimited to southwestern Nigeria. This is the region where organic farming was pioneered (Aiyelaagbe, 2013; Atungwu et al., 2016) and is most established in the country, however, with low adoption rates by smallholder farmers (Atungwu et al., 2016). The dissertation's focus was further limited to Ibadan, Oyo State Nigeria, as this is the place with the highest population of certified organic farmers (50) in the region. In Ibadan, organic farming is practiced in three locations, where this dissertation research was conducted: Ajibode, an urban setting; Akinyele, a peri-urban location; and, Elekuru, a rural area.

The dissertation is organized around three major essays and a livelihood-based conceptual framework named TALAF (Chapter 2), which was used to inform the second and third essays (Chapters 3 and 4). The first major essay (Chapter 3) explored the factors fostering and constraining the adoption of organic leafy vegetable farming in Ibadan. The data for this essay was collected through semi-structured interviews and focus group discussions with organic (adopters) and conventional leafy vegetable farmers

(non-adopters); group discussions and participant observation field visits of adopters and non-adopters' farms; and expert interviews with some NOAN and government officers that are working with farmers to promote organic farming in the study areas. Using semi-structured interviews, the second major essay (Chapter 4) qualitatively investigated the contexts and factors that motivated the disadoption of organic farming in Ibadan. The coding and analysis of the data for the essays in Chapters 3 and 4 were conducted using thematic analysis and by drawing on TALAF, the conceptual framework that informed both essays. The third major essay (Chapter 5) combined participatory causal loop diagraming with network analysis to map and contrast the similarities and differences in the underlying causal drivers of the adoption of organic farming in urban and rural Ibadan. The data for this essay was obtained from participatory causal loop diagraming modeling workshops, which were conducted with organic farmers in Ajibode and Elekuru. Overall, the findings and resulting recommendations from the three major essays offer useful insights that the promoters of organic farming in the study areas and policymakers can draw upon to foster the adoption rates of the technology. A summary of some of the key insights from the three main essays is presented below.

6.2 Main Insights from this Dissertation Research

This section highlights some of the main findings and cross-cutting insights from three major essays in this dissertation (Chapters 3-5). A key finding from Chapter 3 is that that the adoption of organic farming in the study areas was influenced by a mix of motivations related to the perceived economic and non-economic benefits of the technology. These include the desire for profit, and improved market access and farm income; the need to solve existing financial problems; a desire for a long and healthy life, family and society; and, an expectation of improved soil and environmental health. Related to TALAF, the diversity of economic and non-economic motivations indicates the anticipated livelihood outcomes farmers seek to achieve by adopting organic farming. So, policies and promotional efforts aimed at encouraging farmers to adopt OLVP in the study areas should account for the arrays of the motivating factors (anticipated livelihood outcomes). Incentivizing the non-economic motives may be a way to increase the attractiveness of OLVP for adoption.

From Chapters 3-5, access to information and knowledge of organic production methods emerged as an important human capital factor in TALAF that determined whether a farmer will adopt, not adopt or disadopt the technology. As to this, disadoption was in this study heavily influenced by limited knowledge of pest management in organic farming (Chapter 4). It was also found that access to information and knowledge of organic production techniques motivated farmers to adopt the technology; the lack of which also hindered adoption (Chapter 3). Furthermore, the results from Chapter 5 identified awareness creation on among farmers and their acquisition of the technical-know on organic management practices as potential leverage points that can help foster a widespread adoption of organic farming over time in both urban and rural Ibadan. This includes awareness of the perceived health and economic benefits of organic farming. The finding also extends to farmers' awareness of the potential of the ill-health issues that may arise from chemical pesticides. Therefore, it was concluded that the provision of training and information on organic production techniques to smallholder farmers can stimulate an increase in the rate of adoption of the technology in Ibadan. As indicated in Chapter 3, one mechanism through which this can be done is NOAN or by leveraging the existing social capital of adopters, such as their ties with non-adopters, farmers group, and religious associations. Overall and in line with TALAF, the essays indicate that farmers 'adoption decision of organic farming will be mediated by their livelihood assets such as their knowledge of the technology.

Another major and cross-cutting finding across the three major essays is the role of *institutional and policy context* factors in TALAF in facilitating and limiting the adoption of organic farming in the study areas. Specifically, this dissertation identified the dearth of niche/high-price paying markets that can make organic farming economically attractive as the foremost obstacle to adoption. Some of the specific market issues that constrained adoption, and which also enthused disadoption in Elekuru include the following: the lack of a reliable access to lucrative markets for organic products in urban locations; the inability to find buyers for organic product in Elekuru rural market due to an almost non-existent consumer awareness of organic. Together, the findings across Chapters 3-5 indicated a need for increased consumer awareness creation; expansion of existing pricier markets for organic in Ibadan and creation of newer

ones in the rural areas; building the capacity of the organic farmers group in Elekuru to facilitate market linkage with buyers in urban locations. Other institutional factors in TALAF, which limited adoption and fostered disadoption in this study was a lack of institutional incentives to hire labor and access free organic inputs. Among others, this finding pertained to the dearth of lucrative markets that can make organic farming economically self-sustaining without the need for any financial support. It was, therefore, suggested that institutional credit access or financing support for organic farming may be necessary to enable farmers to overcome financial obstacles to adoption. Adoption was also limited by the lack of extension support, an institutional constraint, which can be addressed by building the capacity of organic farmers to conduct training and offer technical support for farmers on organic production techniques. Together, and consistent with TALAF, the findings showed that the institutional environment within which organic farming is located and within which farmers operate shaped adoption decisions.

This study further suggests that organic farming may be more appealing to farmers who are socially and/or financially vulnerable due to lack of stable income or because of market insecurity for their farm produce. It was also found that farmers who had experienced or are concerned of their vulnerability to ill-health from pesticides/herbicides and those who have financial difficulty buying synthetic inputs (especially women) may be more likely adopt organic farming. Therefore, it seems plausible that organic farming should be targeted at those categories of farmers in the study areas. The findings of this research also indicated that organic farming may be less attractive to farmers who are cultivating relatively big farms and to those who are satisfied with the income from their conventional leafy vegetable farm. Moreover, this dissertation research also showed that adoption was largely constrained by the perceived vulnerability of organic produce to yield and financial losses from insect pests. Related vulnerability issues motivated disadoption in this study. Overall, the findings suggest that increased attention to capacity building training aimed at reducing vulnerability to yield and financial losses in organic farming, while enhancing and sustaining productivity can help spur adoption and also stem disadoption. As depicted in TALAF, the findings also showed that farmers' (dis)adoption decision will be influenced by their perception of how organic farming will impact or has affected their vulnerability conditions.

The results of this dissertation provide insights into the probable factors that can gender (dis)adoption in the study areas. This includes gendered roles of women as homemakers, a factor that can make it more difficult for women to farm or continue farming organically than men. It was also found that intrahousehold power relations, vis-à-vis the decision-making authority of men over women's time could discourage women from adopting organic farming. The physically demanding nature of organic farming may also discourage women more than men from adopting organic. As a whole, the three major essays showed that farmers' decision whether or not to adopt organic farming will be informed by the many interconnected factors, such as livelihood assets (e.g. financial condition, physical capability), market availability and access and labor need of the technology. Through TALAF, the dissertation offers a conceptual framework which can help untie the complexity in technology adoption decision-making, and why and how adoption can be gendered.

This dissertation also makes an important contribution to theory by addressing some of the shortcomings of the sustainable livelihood framework (SLF). To this end, through TALAF, this dissertation proposed and operationalized a livelihood framework, which can permit a gendered analysis of the adoption of agricultural technologies. This was done by expanding the SLF to include for example, *household composition*, *access to and control over resources*, *culture*, *technology attributes*, *gender division of labor*, and *intrahousehold decision-making dynamics*. Including such components in TALAF made it possible to identify technology specific attributes and gender-related factors, which as showed in Chapters 3 and 4, contributed to gendering of the (dis)adoption of organic farming in this study. This may not have been possible if this study was framed using the SLF, as it is not conceptually capable of fostering a gendered analysis of agricultural technology adoption decision-making (Adato and Meinzen-Dick, 2002; Eyhorn, 2006). As further indicated by the findings in Chapters 3-4, using TALAF to inform this dissertation helped reveal how technology specific attributes such as the perceived health benefits of organic farming and its inherently labor intensive nature affected the (dis)adoption of the technology. Nothing in the SLF makes it capable of revealing the intersection between adoption decision-making and technology attributes (Dinh et al., 2015). Other than those, the findings of this study about how the

(dis)adoption of organic farming was affected by farmers' *vulnerability contexts*, their *livelihood assets* and *livelihood activities*, *institutional and policy contex*t *factors* and by the expected and actual *livelihood outcomes* of the technology can be explained using the revised SLF by Adato and Meinzen-Dick (2002).

Econometric models could also help explain some of the findings of this dissertation. These include how the decision whether to adopt organic farming or not was affected by farmers' livelihood assets, market and extension access, economic motives (Acs et al., 2005; Sarker et al., 2009; Khaledi et al., 2010; Grogan, 2012; Djokoto et al., 2016), and technology attributes (Thapa and Rattanasuteerakul, 2011). However, econometric models are not usually a good fit for illuminating the cultural, institutional and vulnerability factors that influence farmers' adoption decision, due to their highly qualitative and contextual nature (Adato and Meinzen-Dick, 2002; Meinzen-Dick et al., 2004). The findings of this study in Chapters 4-5 demonstrated that TALAF has the potential to foster a comprehensive understanding of how adoption decision can be influenced by such factors. This dissertation also revealed that TALAF can assist in visualizing and accounting for the multifaceted and interconnected different factors that interact to influence adoption decision-making. Applying TALF in further adoption studies is necessary to help affirm its analytical capability and reveal its shortcomings.

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