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Small- to Medium-Scale Urban Legume Exchange in Lilongwe, with a Focus on Pigeon Pea

Identifying Opportunities and Constraints to the Scaling of Multipurpose Legume Innovations in Maize-based Farming Systems

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Executive Summary

The findings in this report are the result of a multidisciplinary research effort comprised of researchers from Michigan State University's Global Center for Food Systems Innovation (GCFSI) and the Lilongwe University of Agriculture and Natural Resources (LUANAR). Most data was collected during the summer of 2014 through a coordinated series of intensive studies, which sought to shed light on the question, "Where and how can multipurpose legumes be scaled for sustainable intensification of maize systems and what would the potential impacts be, in the medium term, across the food system in Malawi?" The integration of multipurpose legumes into maize-based farming systems is a well-known and well-regarded agronomic innovation that can improve soil fertility, raise maize yields, and diversify and improve household nutrition and livelihoods. To date, most multipurpose legume research has taken place in relation farmer adoption and the on-farm production environment. In contrast, this GCFSI research project recognizes that farming systems go well beyond the farm gate, and that innovation in off-farm food system policy and practice can have a profound impact on farmer decision-making.

Findings, which rely on data collected through 108 extensive interviews in 21 of Lilongwe's 39 markets, focus on small- to medium-scaled legume trade in Lilongwe, are primarily qualitative in nature, and were analyzed with the help of NVivo qualitative software. Findings are organized into three major sections: (1) pigeon pea specific, (2) general legume: sourcing and transportation, and (3) general legume: storage. Pigeon pea was a focus due to its potential role in sustainably intensifying the maize-legume cropping system. Several other GCFSI research projects also focused on pigeon pea.

This research is qualitative and is meant to understand better the constraints and opportunities in the legume sector as small- to medium-scaled entrepreneurs describe them. Findings are largely based on response rankings. Due to the conventional wisdom that pigeon pea is a legume of the south and not widely available in Lilongwe, it was surprising to find that most respondents carried it. Given demographic patterns that show population movements from south to north, it is expected that the demand for pigeon pea will grow as more southerners settle in the central region. To enhance the ability to accommodate demand, innovations should target the well-defined problems people face in storage and transportation infrastructure, and should improve their ability to invest in their businesses. Where possible, solutions should aim to leverage existing infrastructure and organizational forms. Importantly, the identification, creation and scaling of innovation in urban areas should occur through collaborative mechanisms and involve municipal officials.

In a deliberate effort to maintain and intensify interdisciplinary efforts, the report identifies a number of synergies with other GCFSI research. Recognizing that urban food provisioning and exchange occurs within a social, economic, and environmental context, future urban food research should always consider how farmers are affected, present and future ecological uncertainty, and gender/other sociocultural factors.

Lastly, the report identifies several next steps, which include building mixed methods research capacity, continuing to address local research needs, and addressing specific intervention areas, in part through a targeted RFA process. Those intervention areas include storage, access to capital for those working in urban food-based livelihoods, and organizational models that concern food transportation.

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Acronyms

GCFSI	Global Center for Food Systems Innovation
LUANAR	Lilongwe University of Agriculture and Natural Resources
MSU	Michigan State University

1. Introduction

The research in this report focuses on small- to medium-sized legume trade in Lilongwe’s open-air retail and wholesale markets, and is guided by the primary question, “Where and how can multipurpose legumes¹ be scaled for sustainable intensification of maize systems and what would the potential impacts be, in the medium term, across the food system² in Malawi?”³ The research outlined in this report attempts to answer this question by identifying constraints and opportunities relating to the exchange of legumes, particularly pigeon pea, in urban markets. Pigeon pea was a particular focus due to its well-established potential in sustainably intensifying maize-based cropping systems in parts of Malawi (Bezner-Kerr, Snapp, Shumba, & Msachi, 2007; Mhango, Snapp, & Phiri, 2013; SS Snapp, Jones, Minja, Rusike, & Silim, 2003).⁴

The use of multipurpose perennial grain legumes to diversify cropping systems is a well-recognized agronomic innovation that can help improve food and ecosystem security, especially in marginal landscapes where farmers have limited access to resources (Glover et al. 2010; SS Snapp et al. 2003). Pigeon pea has long been recognized by both researchers and smallholder farmers to hold potential for improving maize-based cropping systems by enhancing productivity; however, barriers to adoption, and thus, scaling of the innovation, remain.

Much of the research and investment into pigeon pea adoption barriers have focused on developing improved varieties, agricultural practice and farmer perception (Kanyama-Phiri, Snapp, & Wellard, 2000; S Snapp, Kanyama-Phiri, Kamanga, Gilbert, & Wellard, 2002; Sieglinde Snapp, Blackie, & Donovan, 2003). The importance of improving input and output markets to intensify adoption of multipurpose legumes is also well-recognized, though much of this research and investment has focused on export markets (Jones, Freeman, & Monaco, 2002; Odeny, 2007; Rusike, Lo Monaco, & Heinrich, 2003).⁵ As it applies to the domestic context, the benefits of increasing pigeon pea consumption are framed primarily in relation to rural food security (Bezner-Kerr, Berti, & Shumba, 2011; Bezner-Kerr & Chirwa, 2004; Bezner-Kerr et al. 2007; Rusike et al. 2003).

Interestingly, there has not been much focus on the role that domestic urban markets might play in legume intensification efforts. In Malawi, there is a general consensus that most domestic demand for pigeon pea occurs in the southern region, and that its availability in markets in other parts of Malawi is very limited. However, along with rapid urbanization, such as that experienced in Malawi, come opportunities to develop new marketing niches and economic prospects in new geographies.

¹ Multipurpose legumes are defined as those that provide multiple services, producing food and vegetative biomass for enhanced soil productivity, resilience to climate change and human health, e.g., pigeon pea, doubled up legumes (pigeon pea overstory, pulses such as soybean and groundnut understory), and climbing beans.

² Herein the definition of food systems is from Ericksen, 2008. The relationships between social and ecological environments that comprise food provisioning systems, as well as the practices themselves; the results produced by these processes and practices on social and ecological environments, such as improved security, pollution and social welfare, including economic development; and other determinants of food security stemming from the interactions of the above factors.

³ The research findings in this report are part of a larger research effort, conducted by multiple teams, all seeking to answer the question based on their areas of expertise. Such a methodological approach enacts the recognition that agri-food systems are complex, with influencing factors at multiple scales, across space and time.

⁴ Sustainable intensification refers to a set of agricultural practices and technologies that increase food production on existing cultivated land while “reducing negative environmental impacts and at the same time increasing contributions to natural capital and the flow of environmental services” (Pretty, Toulmin, and Williams, 2011, p. 8). Though the practices that are associated with sustainable intensification may be either newly created or long-practiced and will vary according to system objectives, the collective efforts towards sustainable intensification should be understood as agricultural system innovation to better deal with current and projected food system challenges, such as urbanization, demographic shifts, climate change, and various agricultural production scarcities (e.g., water, land, nutrients, energy).

⁵ Rusike et al. (2003) view “effective demand as the pump that pulls goods and services, including new technologies, cultivars, nutrients, and farm equipment innovations through the vertical system” (p. 228).

In this paper, we explore the existing status of pigeon pea in Lilongwe markets, as well as the opportunities and constraints experienced by urban legume retailers. This approach recognizes that the development and scaling of multipurpose legume innovations is a complex, socially embedded process (Hekkert, Suurs, Negro, Kuhlmann, & Smits, 2007), and develops insight on post-farm-gate factors that could affect a farmers' capacity or willingness to adopt the pigeon pea innovation. Specifically, the research is intended to provide a better understanding of how strategic investments could support improvements in (1) legume trading networks so they are better able to meet urban legume demand now and as urban populations grow, and (2) the urban market environment in order to benefit the livelihoods of small- to medium-scaled retailers.

This project also has longer-term implications in relation to urban food research and the evolution of sustainable urban food systems. Urban-rural interactions in relation to national and regional food systems dynamics and food security are not well understood. They will become increasingly important as urbanization proceeds, and as proportionally fewer farmers are producing for urban populations. Urban and rural livelihoods are inextricably linked, in part through the exchange of food. Better articulating the conditions, constraints, and characteristics of (1) rural to urban food provisioning and exchange, and (2) urban food-based livelihoods on can lead to new areas of inquiry and insights about how to support innovation in regional agri-food systems.⁶

The remainder of this report includes the research methodology and a discussion of findings. The discussion of the findings' implications outlines how this research interacts with other GCFSI research, as well as implications for capacity-building needs at LUANAR. The report concludes with follow-up research and action recommendations.

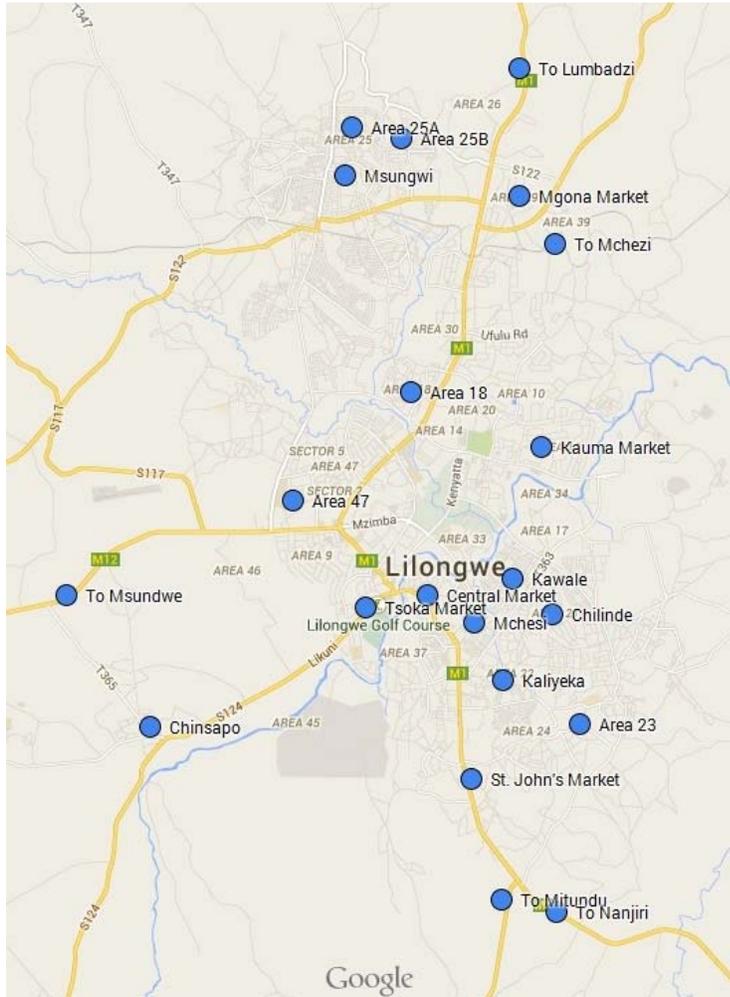
2. Methodology

This research was qualitative in nature, and relied primarily on participant observation and semi-structured interviews (Protocol in Appendix 1). Such approaches are intended to delve into the daily experiences of respondents, an important step for informing innovation processes that support livelihood and improve well-being. In addition, such analyses can help make sense of larger trends or quantitative data in ways that are locally meaningful. Qualitative data is critical for understanding innovation systems due to the contextually specific nature of innovation, the role of the system in producing it, and the need for interventions to address constraints and opportunities as they are relevant to particular populations and circumstances.

Research was conducted at 21 of the 34 official and five unofficial markets in and around Lilongwe (see Figure 1) over a two-week period in June 2014. Four of six rural main markets (Nanjiri, Mitundu, Msundwe, and Mchezi) were also sampled due to their critical role as suppliers of urban markets.

⁶ Innovation is commonly thought of in isolated terms, without considering of the relationships and other dynamics that produce it. Scholars of innovation, however, are quite clear in their emphasis on the strength and qualities of the relationships that comprise and drive the *innovation system*. Hekkert et al. (2007) further note that innovation is much more than a product of *structure*, and is, rather, contingent on the quality and function of relationships.

Figure 1: Distribution and Approximate Location of Markets



The research team was composed of five LUANAR researchers (four women, one man), two MSU researchers (one woman, one man), four research assistants recently graduated from LUANAR (two women, two men), and two male drivers. An additional male documentary filmmaker accompanied the research team on most days.

Prior to the MSU team’s arrival, LUANAR faculty identified the markets for data collection and obtained permission from the appropriate municipal officials. Markets of varying sizes, in various locations, and serving various populations were chosen (see Table 1). Such variability was viewed as necessary to ensure that findings could be understood as either broadly or narrowly applicable, both of which can provide valuable information to researchers, policymakers and municipal officials.

Table 1: Number of Interviews Conducted/Density, by Market

Market Name	Number of interviews conducted	Density
Mchezi	8	Rural (wholesale)
Kauma (unofficial)	4	Peri-urban
Area 47	5	Low to medium density, residential
Area 18	3	Low to medium density, residential
Central Market	3	High density
Tsoka	6	High density
Mitundu	9	Rural (wholesale)
Nanjiri	4	Rural
St. John's (unofficial) ⁷	5	Peri-urban
Msundwe	5	Rural
Lumbadzi	5	Peri-urban (wholesale)
Msungwi	3	High density

⁷ “Unofficial” means that the market has not yet been designated as a formal market by the municipality. “Spontaneous” markets are a common phenomenon throughout African cities. These are markets that emerge as the city grows. St. Johns began as a spontaneous market, and the municipality was in the process of re-designating it as an official market.

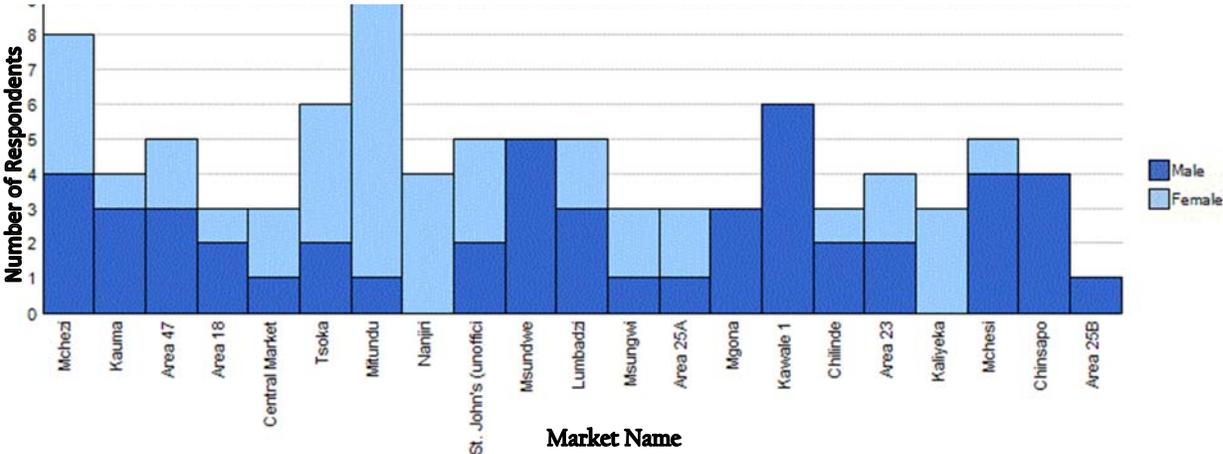
Market Name	Number of interviews conducted	Density
Area 25A	3	High density
Mgona	3	High density
Kawale 1	6	High density
Chilinde	3	High density
Area 23	4	High density
Kaliyeka	3	High density
Mchesi	5	High density
Chinsapo	4	High density
Area 25B	1	High density

Because LUANAR was still in session, the LUANAR team scheduled a rotation where one out of five faculty researchers accompanied the teams into each market. Prior to beginning data collection in any market, permission was obtained from the market master, the individual authoritative body in each market. Research assistants then entered the market, identified legume sellers, and asked for consent to interview. Individual interviewing sessions lasted 15-30 minutes, and were recorded using handheld digital recorders. Research assistants were usually able to interview all legume retailers in each of the markets, provided they were willing to participate.

The research assistants transcribed their interviews,⁸ and a final “processing” session was held with MSU and LUANAR faculty and research assistants in which immediate impressions of the data were discussed. Interviews were coded, organized, and analyzed with Nvivo software.

Out of 108 interviews conducted, 92 (50 men, 42 women, which is 54% and 46%, respectively) were analyzed and comprise the findings in this report. Several interviews were discarded due to incompleteness⁹ or because they were virtually inaudible for transcription. Figure 2 illustrates the breakdown of male/female respondents by market.

Figure 2: Number of Men and Women Interviewed, by Market



⁸ Due to a misunderstanding between research assistants and Stephanie White, one of the MSU researchers, interviews were not initially transcribed verbatim. Subsequently, interviews had to be re-transcribed by Chichewa-speaking MSU students in East Lansing.
⁹ A number of transcriptions that were included in the analysis were incomplete, but contained enough information to be considered worthwhile. The interviews that were thrown out contained too little information to be helpful.

3. Findings: Opportunities, Challenges, and Constraints as Described by Small- to Medium-scaled Legume Retailers

The primary purpose of this report is to answer the question, “Where and how can multipurpose legumes be scaled for sustainable intensification of maize systems and what would the potential impacts be, in the medium term, across the food system in Malawi?” Because pigeon pea is always sold alongside many other kinds of legumes, findings are rarely pigeon pea specific and will apply to legume exchange, in general. However, there are some pigeon pea specific findings that will be important to the scaling of integrated multipurpose legume innovations. Therefore, the first section of findings profiles pigeon pea in Lilongwe’s markets.

A. Pigeon Pea Profile

The conventional wisdom concerning pigeon pea in Lilongwe is that it is neither widely desired, nor widely available in local markets. While pigeon pea is less available among urban retailers (Figure 3), it was surprising to find that out of 92 respondents, 35 (38%) were currently selling, or sometimes sold pigeon pea, depending on availability. It was present in almost every market we visited (Figure 4).

Figure 3: Number of Respondents Who Sell Pigeon Pea Currently or Sometimes

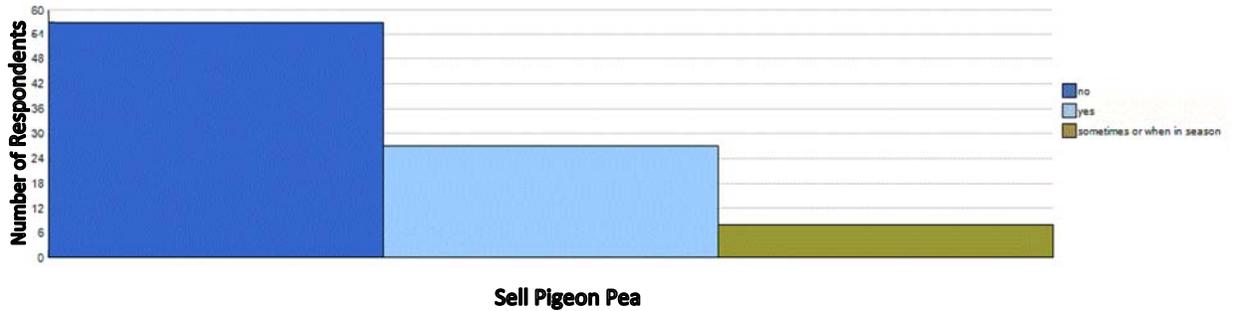
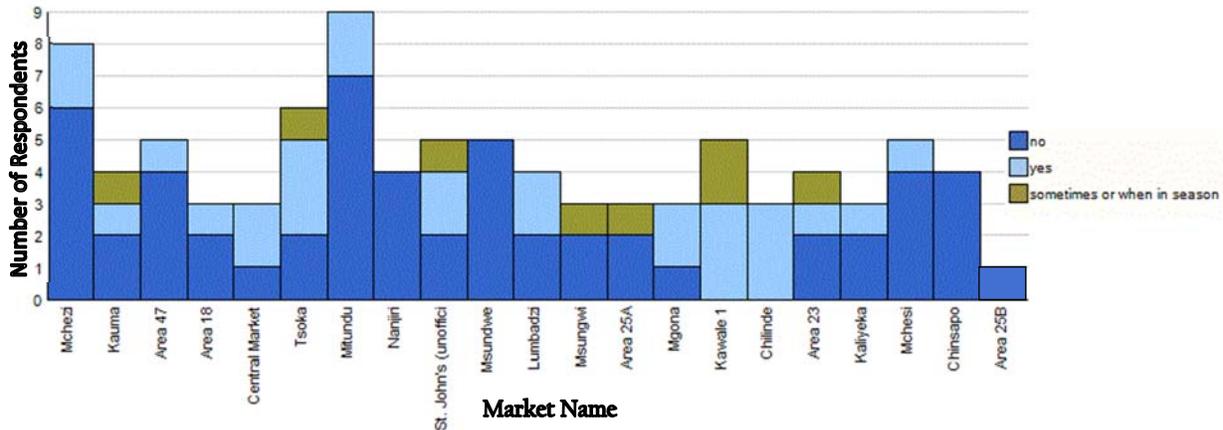
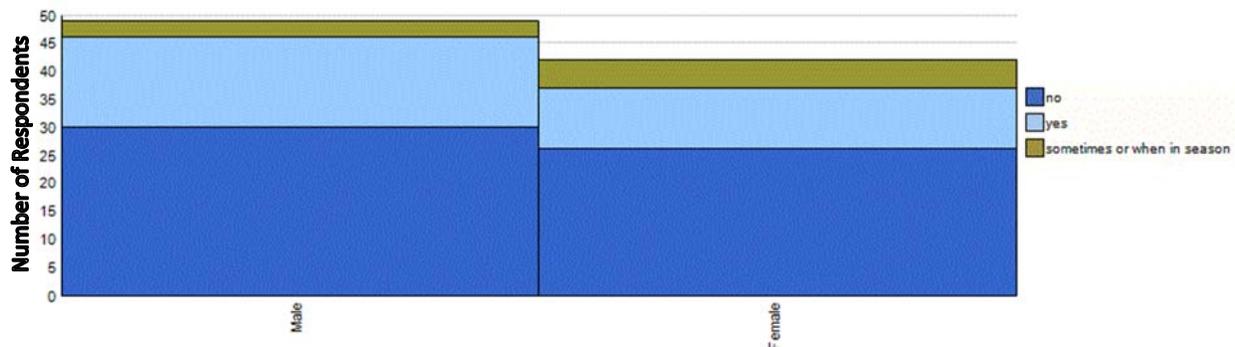


Figure 4: Vendors Who Sell Pigeon Pea, by Market



Findings indicate that men and women were equally likely to sell pigeon pea (Figure 5). Nineteen men (16 yes, 3 sometimes, 38% of men) and sixteen women (11 yes, 5 sometimes, 38% of women) were selling pigeon pea currently, or did so sometimes, based on availability.

Figure 3: Vendors Who Sell Pigeon Pea, by Gender



In addition, seven (20%) pigeon pea retailers noted that they would like to sell more pigeon pea and were unable to meet demand due to pigeon pea scarcity. One vendor said that she sells out so quickly that it becomes tiresome to restock, stating, “sometimes I have a lot of customers buying pigeon peas to the extent that it becomes tiresome to restock more than once in a week” (Kauma Market). Another vendor, also at Kauma, noted that scarcity of pigeon pea is a common problem because “most farmers do not grow pigeon peas in the central region, so it becomes difficult to get it.” Not surprisingly, such scarcity can drive up the price of pigeon pea. One vendor explained, “There is a lot of competition between the retailers in the markets where we procure the pigeon pea. This also leads to higher prices for the pigeon pea” (Kawale Market).

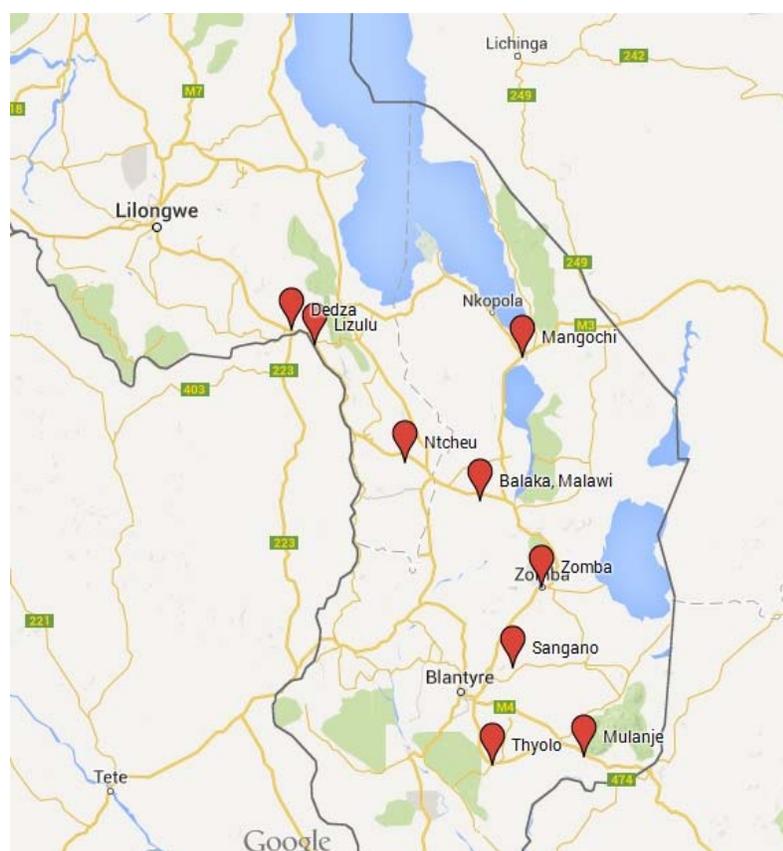
As is common with legume sourcing, retailers usually get their supplies from multiple sources. Out of the respondents answering the question (n=28), “Where and from whom do you obtain your pigeon peas?” 13 (46%) obtain at least a portion of their pigeon peas from local farmers who grow the legume or retailers who have traveled to the southern region and brought them back. In one case, a respondent at Lumbadzi market said he gets it from the National Association of Smallholder Farmers in Malawi (NASFAM) who comes to the market and sells it to him. Respondents may also obtain their pigeon peas on trips to the southern region, or if they find them at the markets where they source their other legumes. Table 2 presents the various sources that respondents said they travel to, to obtain pigeon pea, and Figure 6 maps the distant locations where retailers acquire pigeon pea.

Table 2: Pigeon Pea Sources, Traveled to by Retailers

Pigeon Pea Source (n=28)	Number of responses
Kawale (market in Lilongwe)	1 (4%)
Tsangano (southern region)	1(4%)
Balaka (southern region)	1(4%)
Zomba (southern region)	1(4%)
Mangochi (southern region)	1(4%)
farm in Mitundu (central region)	1(4%)
Mulanje (southern region)	2(7%)
Lizulu (central region)	2(7%)

Pigeon Pea Source (n=28)	Number of responses
Ntcheu (central region)	2(7%)
Thyolo (southern region)	3(11%)
Mchesi (market in Lilongwe)	3(11%)
Mchezi (peri-urban Lilongwe)	3(11%)
Dedza_Chimbiya (central region)	7(25%)
southern region (did not designate specific area)	2(7%)

Figure 4: Pigeon Pea Sources, Traveled to by Retailers



Respondents said the major challenges associated with acquiring pigeon pea are price (n=9, 26%) and availability (n=11, 31%). Retailers who noted problems with price said prices were either too high or unstable. Very few retailers said low demand was a problem (n=2, 6%), while only two respondents said farmers very often gave them poor quality or weevil-infested pigeon pea.

For the most part, problems with pigeon pea mirror those of other legumes (discussed in next sections) although four (11% of those selling pigeon pea) respondents noted that pigeon pea degrades quickly and is particularly hard to store because of its high susceptibility to attack by pests. One respondent from Mchezi market explained, “I think pigeon peas are hard to store. They need to be treated every three months, and this is sometimes hard for me, especially when I have a huge stock with me. And this is the only problem that I

face here.” She further stated that she will not buy pigeon pea from farmers if she sees any sign of infestation: “I aim at making profits, and when I see that the pigeon peas and other legumes seem to have holes or look like they are attacked, I do not buy them because...it won’t be long before they go bad. I only reduce the quantity of legumes that I purchase from the local farmers.”

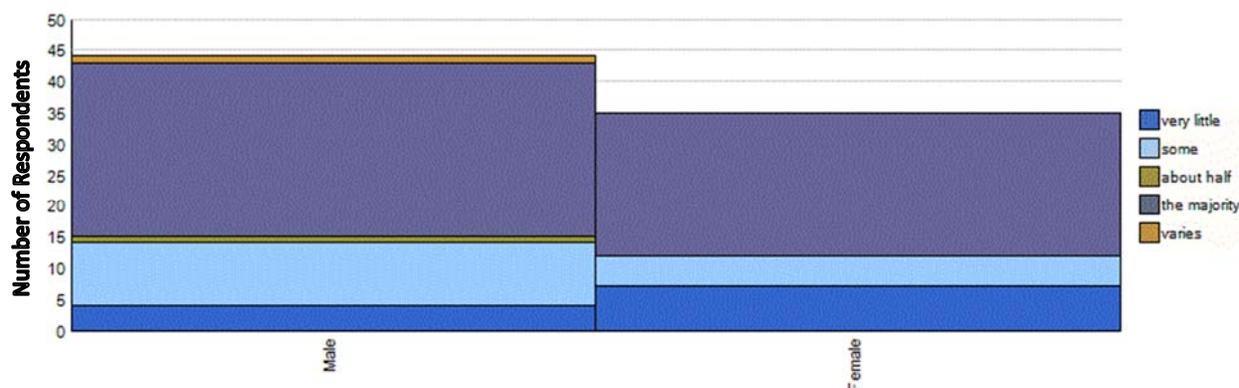
B. General Legume: Sourcing Legumes and Transportation

The next three sections provide insight into how urban legume retailers organize their livelihoods, the constraints they experience, and the ways they deal with those constraints. Legume farmers, urban legume retailers, and urban legume consumers are heavily dependent upon each other in the regional agrifood system

context. It is important to understand general factors currently influencing legume exchange to understand the opportunities and barriers for scaling individual innovations, such as multipurpose legume technologies. As previously noted in this report, no innovation exists independently of the system into which it is embedded. As Hekkert et al. (2007) put it, “understanding technical change implies creating insight in the relations between incumbent technology and the incumbent (innovation) system in relation to the emerging technology and the emerging innovation system” (p. 415). As it relates to multipurpose legume technologies, the exchange of legumes post-farm-gate influence the decisions that farmers make.

Legumes represent an important urban livelihood for both men and women. In the traditional market sector throughout sub-Saharan Africa, retailers tend to specialize in one sort of product. Most of the respondents in this study said they primarily relied on legume exchange for their livelihoods (Figure 7). Out of 48 men and 37 women responding to this question, 31 (64%) and 25 (68%) men and women respectively said selling legumes provided the majority of their income.

Figure 5: Extent to Which All Legume Sales Contribute to Livelihood, by Gender



Due to the decentralized, individualized, and adaptive nature of food exchange in which individual entrepreneurs adaptively respond to changing conditions in the market, season, or economic environment, legume retailers generally pursue multiple relationships to source their products. In addition, they typically source from multiple geographies, locally and regionally. Given that sourcing food is labor- and time-intensive, it is not surprising that people would invest their efforts into one product, and search for multiple sources. Almost without exception, retailers draw from multiple sources and adapt their strategies over the course of the year according to changing availability. One vendor explained, “Farmers come here during harvesting period, and once harvesting season is over, I always go out to find them. I sometimes buy from retailers, especially when I am buying groundnuts” (Lumbadzi Market). In many of the peri-urban markets, legume retailers and farmers are one in the same, first selling the legumes they harvest from their own farms, and then later purchasing legumes from other retailers to sell in markets, as illustrated by this quote: “Each harvest season, I start with legumes that I grow in my farm and after I sell out those, I start getting legumes from farmers and retailers” (Mitundu). Table 3 depicts the various markets from which retailers source legumes.

Table 3: Reported Legume Sources for Legume Retailers in Lilongwe Markets
Is there potential for developing any of these markets as exchange hubs?

Legume Sources (n=89)	Number of Responses
Ngala Market	2(2%)
Mozambique	2
Nathenje	2(2%)

Legume Sources (n=89)	Number of Responses
Chimwadza	2(2%)
Nsundwe	2(2%)
Gumbi	2(2%)
Mchesi	3(3%)
Nanjiri	3(3%)
Chinsapo	3(3%)
Lilongwe	3(3%)
Salima	4(4%)
Ntcheu	5(6%)
Mchezi	7(8%)
Dowa	12(13%)
Mitundu	13(15%)
Jenda_Mzimba	14(16%)
Dedza_Chimbiya	25(28%)

Legume retailers experience a number of difficulties in relation to legume sourcing that limits their ability to grow their businesses. Table 4 outlines the major challenges facing legume retailers in their business dealings, while Table 5 presents a breakdown of major challenges by market. In general, retailers at various markets experience similar challenges, suggesting that sourcing issues are broadly relevant to legume retailers in Lilongwe.

Table 4: Major Challenges in Obtaining All Legumes (respondents may have reported more than one challenge) (n=86)

Legume sourcing challenges (n=86)	Number of responses
Harassment by authorities	2(2%)
Competition from foreign or large-scale retailers	3(3%)
Poor quality from farmers	6(7%)
Transportation or remote location	19(22%)
Availability	35(41%)
Price, expense or lack of capital	36(42%)

Table 5: Sourcing Problem, by Market (respondents may have reported more than one challenge) (n=86)

Market Name	Price, expense or lack of capital	Availability	Transportation or Remote Location	Poor Quality from Farmers	Competition from Large-scale Retailers	: Harassment by authorities	D : other
Mchezi (n=8)	3	2	2	0	1	1	1
Kauma (n=4)	3	0	1	0	0	0	0
Area 47 (n=5)	3	3	1	0	0	0	3
Area 18 (n=3)	0	1	0	1	0	0	0
Central Market (n=3)	3	0	0	0	0	0	0
Tsoka (n=6)	2	1	1	0	0	0	0
Mitundu (n=9)	4	3	3	2	0	0	0
Nanjiri (n=4)	2	1	2	0	0	0	0
St. John's (n=5)	2	1	0	0	0	0	0

Market Name	Price, expense or lack of capital	Availability	Transportation or Remote Location	Poor Quality from Farmers	Competition from Large-scale Retailers	: Harassment by authorities	D : other
Msundwe (n=5)	1	1	2	1	1	0	0
Lumbadzi (n=5)	0	2	2	1	0	0	0
Msungwi (n=3)	0	0	0	0	0	0	1
Area 25A (n=3)	2	4	1	0	0	0	0
Mgona (n=3)	1	2	0	0	0	0	0
Kawale 1 (n=6)	0	3	1	0	0	0	0
Chilinde (n=3)	1	1	1	0	1	1	0
Area 23 (n=4)	1	3	0	0	0	0	0
Kaliyeka (n=3)	2	2	1	0	0	0	0
Mchesi (n=5)	4	2	0	0	0	0	1
Chinsapo (n=4)	2	3	1	1	0	0	0
Grand Total	36	35	19	6	3	2	6

Retailers generally sell at thin margins. Not surprisingly, lack of capital to invest in their business was a primary concern, as illustrated by this comment from a male retailer at Central Market: “Money is the big challenge. It happens that I am interested in purchasing different legumes or add some other items to the list of things that I sell, but lack of money limits me from doing so.” Price instability was also a major concern, especially during the off-season, and many vendors complained price fluctuations made it hard to plan and grow their business. Often, high prices were blamed on middleman vendors, as this retailer, based at Mchesi, explains, “The problem is that we do not go to the places where the beans are grown. They are brought to us by the vendors who go to the farmers to get them. The prices of the beans keep on fluctuating depending on how much the vendors have bought them from the farmers. Most of the time, the bean prices are higher when the beans are scarce.”

In an effort to lower their costs, some retailers travel directly to farmers and expect to negotiate wholesale prices. This does not always go as planned. One retailer explained, “Price instability is the major problem that I face. I go to buy legumes from the farmers expecting that the price will be cheaper, but once I get there I find that the prices have changed” (Mchezi). In addition, traveling to rural areas and other markets brings its own set of difficulties, such as high transportation costs and the unreliability of trucks, as this woman who trades at Lumbadzi explains, “The transports are not reliable because of the trucks that the local transporters use. They use old model trucks that are full of problems. If you have a breakdown, it makes you stuck on the road with these legumes. I remember that I once slept on the road when we had a breakdown.” Retailers who rely on bikes or walking to move legumes to market are severely limited in their ability to navigate scarcity by buying larger stores of legumes, which affects their ability to earn incomes. One retailer stated, “Distance is the biggest barrier; I cannot buy more beans because it is hard to carry all of it on my head and walk the long distance” (Mitundu).

Some retailers try to accommodate scarcity by acquiring large stores of beans when availability is high and prices are low. Such a practice, however, is not without difficulties. Retailers commonly noted that the quality of beans declines over time so that acquiring a stockpile can result in losing income. A retailer stated, “Sometimes we incur losses as a result of high availability on the market, which makes the prices to go down; and when we try to keep them for a longer time, they lose value” (Tsoka). Likewise, another retailer at Mchezi said, “Legumes may go bad while I am still keeping them in my storage place. This often happens in the peak season when supply is higher than demand. Once they go bad, customers do not buy them because of the holes and weevils inside them.”

C. General Legume: Storage

Many of the problems with legume sourcing might be addressed with better storage facilities that help to maintain the quality of legumes because retailers could keep larger quantities of legumes for a longer period of time. In general, storage types can be divided into two main types: paid and unpaid. Unpaid storage is generally at home, which means that retailers haul their beans back and forth between market and home. For paid storage, retailers may rely on a market guardian, use a market storage room or shop, or keep legumes in a nearby house. Occasionally, someone may use his or her own warehouse or rely on the warehouse of a friend or family member at no cost. Figure 8 illustrates where respondents reported storing legumes.¹⁰

Figure 6: Where Legumes Are Stored, n=91

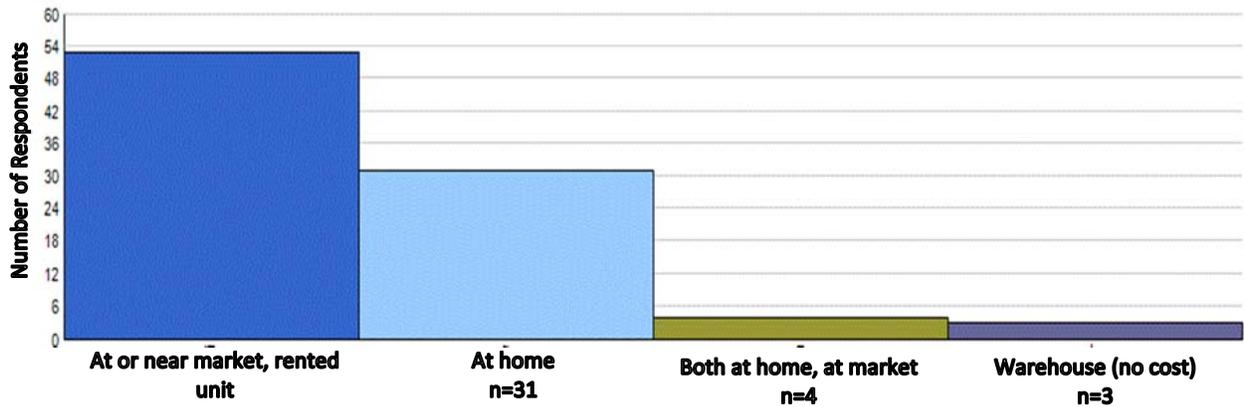
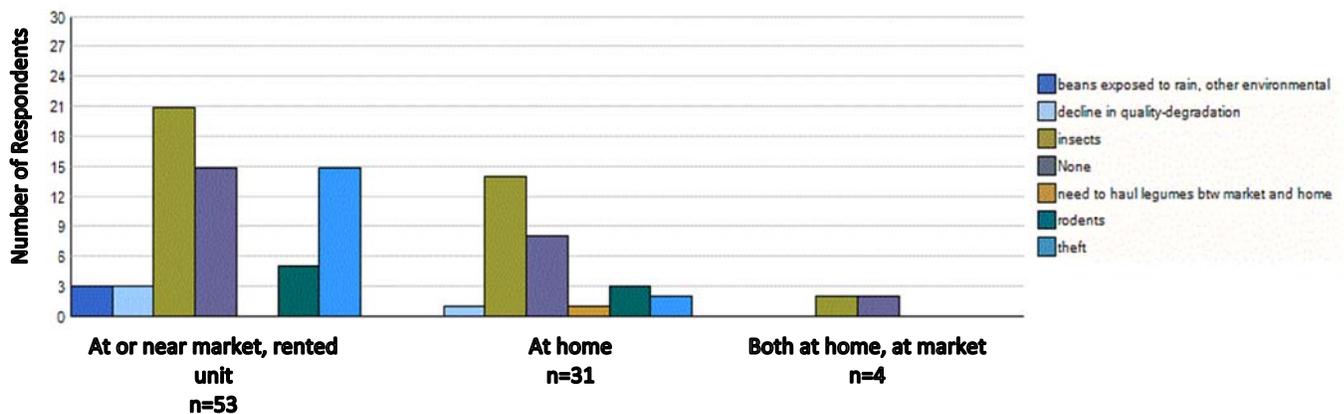


Figure 9 depicts storage problem by storage type or location. For the most part, challenges are similar both in the home and at the market. Forty percent of retailers who store their beans in a rented storage unit at or near the market experience insect infestations, while a slightly higher number (45%) of retailers using home-based storage experience the same problem. Similarly, the percent who experience issues with rodents at home (10%) is virtually the same as those who experience rodent damage at markets or in paid storage units (9%). The major difference between home-based storage and paid storage in or close to the market is with respect

Figure 7: Storage Problem by Storage Type, n=88



¹⁰“Warehouse” is eliminated in the rest of the analysis due to the lowercase n.

to theft. Twenty-eight percent of respondents who keep their legumes at or close to the market experience theft, whereas only 6% of those who keep their legumes at home reported this issue. Some markets, such as

Mitundu, Central, and Tsoka, have storage facilities or employ night guards to minimize this problem, but such protection was not necessarily reliable. One vendor said, “I store my legumes at one of the houses close to the market. There are storage facilities within the market, but I do not keep my items there because thieves come and steal. I feel safe keeping my items at somebody’s house, because I know that they will not run away with my items.”¹¹ And another at Mitundu market said, “I cannot store beans here at the market because it is risky to do so. Thieves usually come steal beans at night despite that we have guards. If they come and steal all my beans, it will mean the end of my business. So, I always keep them in my house.”

Figure 10 shows storage type by respondents at particular markets, and Table 6 shows storage problem by market. This data is preliminary, and cannot be used to make any pronouncements about specific problems at specific markets, but it could be used as a discussion starting point with market masters and retailers to better identify the root of storage problems and to develop solutions that can support longer-term storage. In Tsoka market, for example, five out of six retailers pay a guard to watch over their individual stations during the night, but half of them report that theft is a problem.

Figure 8: Storage Type by Market, n=88

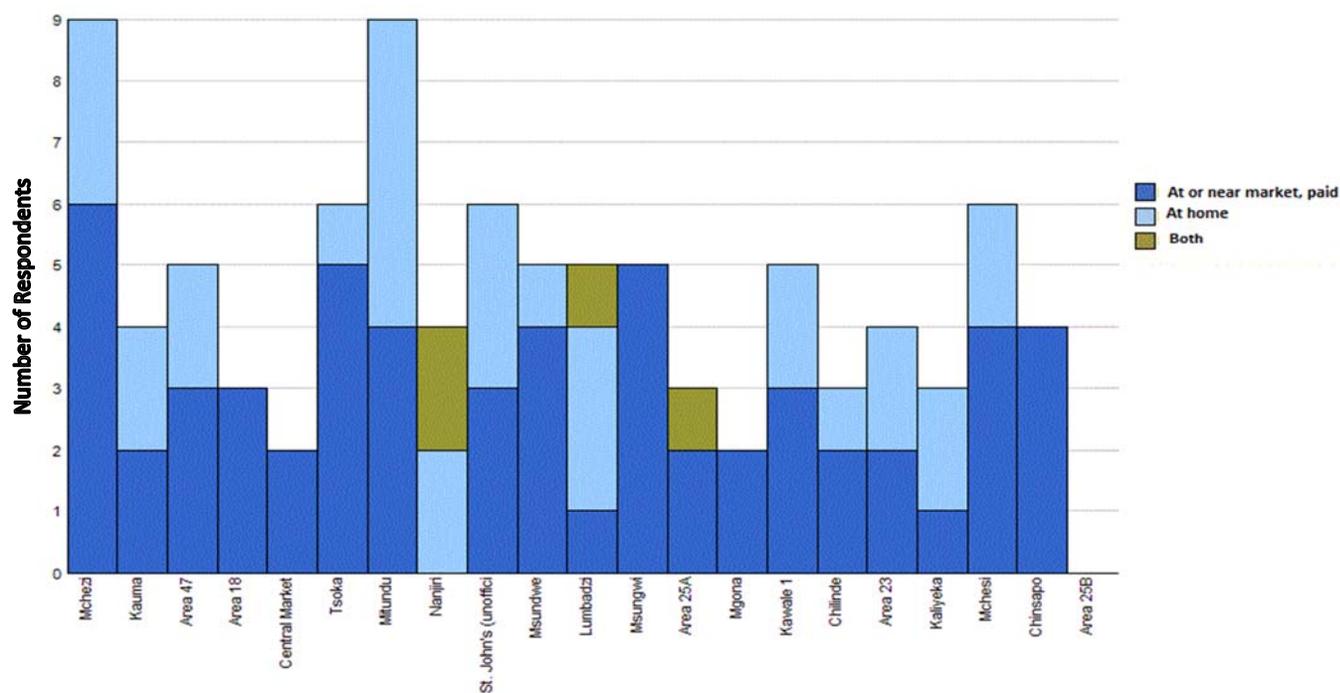


Table 6: Storage Problem, by Market (respondents may report more than one challenge) (n=88)

Market Name	Theft	Insects	Rodents	Decline in quality, degradation	Beans exposed to rain/environment	Other	None
Mchezi (n=8)	1	5	1	1	1	0	1
Kauma (n=4)	0	1	0	0	0	0	2

¹¹ The name of the market was mistakenly left off the interview protocol.

Market Name	Theft	Insects	Rodents	Decline in quality, degradation	Beans exposed to rain/environment	Other	None
Area 47 (n=5)	0	2	2	0	0	1	0
Area 18 (n=3)	0	2	0	1	0	0	0
Central Market (n=3)	2	1	0	0	0	0	2
Tsoka (n=6)	3	4	0	0	1	0	1
Mitundu (n=9)	2	3	1	1	0	0	1
Nanjiri (n=4)	0	2	1	0	0	0	1
St. John's (n=5)	4	1	1	0	0	1	1
Msundwe (n=5)	0	1	0	0	0	0	1
Lumbadzi (n=5)	1	0	1	0	0	3	2
Msungwi (n=3)	1	1	0	0	0	0	2
Area 25A (n=3)	0	2	0	0	0	0	1
Mgona (n=3)	0	0	0	0	0	0	4
Kawale 1 (n=6)	2	5	0	0	0	0	0
Chilinde (n=3)	1	3	0	0	0	0	2
Area 23 (n=4)	1	3	0	0	0	0	0
Kaliyeka (n=3)	0	1	0	0	0	0	3
Mchesi (n=5)	0	1	1	1	0	0	1
Chinsapo (n=4)	1	1	0	0	1	0	1
Grand Total	19	39	8	4	3	5	26

Although many retailers said they did not experience storage problems, it is important to understand the adaptive practices they employ in relation to the conditions they respond to. A relatively common strategy to avoid degradation or insect infestation, for example, is to buy only small quantities of legumes that sell quickly and do not sit in storage for long periods. While this practice may help mitigate or avoid storage problems, it does not mitigate scarcity or transportation issues.

4. Implications for Scaling Multipurpose Legume Technologies

While on-farm research remains important, it is also critical to understand how urban food provisioning and exchange environments may influence farmer decision-making, regional food production, and regional food security. Not only do urban markets rely heavily on the rural hinterlands for much of their food, but also the transport and demand of this food is shaped by the capacity of urban entrepreneurs, as well as the systemic constraints and opportunities they experience. Understanding these issues is an important factor in identifying the post-farm-gate factors that affect the scaling of multipurpose legume technologies. In addition, the relationships that constitute food provisioning and exchange at urban markets reveal trajectories that link different spaces (e.g., rural, urban, or regional) as well as important socioeconomic dynamics, such as migration, food preferences, and cultural diversity.

The findings from this research have a number of implications for pigeon pea production and scaling.

- Pigeon pea is widely available in Lilongwe, and in higher demand than expected. Some retailers could not keep up with demand. The ongoing influx of southern Malawians to Lilongwe, who are generally more amenable to consumption of pigeon pea, may be bringing about this change. As Lilongwe grows, and as exchange of food from the various markets and regions continues and intensifies, it is expected that the demand for pigeon pea will increase. Much of the current research on pigeon pea production focuses on connecting farmers with export markets, but there should be a greater effort on communicating the demand in urban markets. Finding ways to signal this information to

farmers—for example, through the use of radio and phone applications—may help promote multipurpose legumes where adoption rates remain low.

- Urban food insecurity is a growing problem, and pigeon pea represents an important and appropriate source of nutrition. Better communicating its nutritive value via video or radio can help to increase the “pull” factors that can have an effect on farmer adoption rates.
- Insect damage in storage is a major problem that is usually treated by applications of pesticides. This seems to be the only widely known tool for treating insects, which indicates limited adaptive capacity. In fact, several retailers observed that the pesticides did not appear to be working as well anymore, which is unsurprising given that insects commonly develop resistance to agri-chemicals. In addition, retailers commonly complained about the high cost of pesticides. Resilience in urban food systems could be improved with innovative storage technologies, which in turn would have a positive effect on incomes. The lessons of integrated pest management would provide a good starting point for storage design and practice. In an urban environment, where theft is a problem, care should be taken to develop storage methods that are both secure and effective, and to develop these technologies in collaborative ways that involve municipal officials, retailers, and market officials. Improving storage technologies can have several different positive outcomes, such as reducing expenditures on pesticides, reducing food waste, dealing with scarcity better, and reducing travel needs to source legumes.
- Many retailers complained of a lack of access to capital and the lack of formal loan and information services. As municipalities seek to upgrade markets, different arrangements and services—including small business loans or training, improved sanitation infrastructure, and access to clean water—could be created to support urban food-based livelihoods.

5. Synergies and Antagonisms

Identifying or scaling innovation in relation to the systems perspective upon which GCFSI is premised requires an understanding of how individual research projects relate to each other and applying discrete lesson gleaned from them more broadly. This section reflects on how objectives or findings in this research report are synergistic or antagonistic with other GCFSI projects.

Urban food provisioning and exchange represents a comparatively new area of research and forum for seeking and scaling innovation. In practice, of course, urban food provisioning occurs within a social, economic, and environmental context. Considering this context is critical to making well-informed and appropriate decisions about where and how to identify and scale urban food innovations.

Projects that link with farmers. In food systems where the transportation of food relies on the individual efforts of small- to medium-sized entrepreneurs, there are many robust connections between the urban and rural environments. A number of other GCFSI projects are focused on production in rural environments, and a significant concern for many of them is identifying viable market opportunities for farmers. In doing this, it is important to understand the qualities and practical realities of “the market,” which, far from being a nebulous concept, is actually comprised of relationships between farmers, traders, retailers and consumers. Markets happen in specific, locally circumscribed ways and it is important to understand the dynamics so that efforts at scaling innovation can be properly targeted. For example, understanding the constraints that urban entrepreneurs face in transportation and how they manage those constraints (e.g., by buying small quantities), can help to address the underlying factors that generate these constraints. In addition, better understanding the particularities of markets throughout the city will help our understanding of how to signal to farmers about what crops are in demand in urban places, an issue that has implications for information and communication technologies, as well.

Projects that link with environmental analysis. Several GCFSI projects are focused on providing a finer analysis in relation to the biophysical environment and its production potential. Urban food exchange and

food security happens in an environmental context. In agriculturally based economies, cities depend substantially on their hinterlands and regional agricultural production. In a context of climate change, it will be important to understand/plan for environmental change in relation to food availability/exchange systems. An accurate understanding of the environmental parameters for the production of multipurpose legumes is an important factor in scaling such technologies, and will have an impact on the expansion of the urban multipurpose legume markets.

Gender. Over the course of the research, we interviewed both men and women and found that legumes were an important source of livelihood for both of them. In terms of developing the urban market for multipurpose legumes, as well as targeting resources to improve market economic, social and physical environments, it will be necessary to better understand the gender-differentiated constraints and opportunities in urban food exchange and provisioning. GCFSI's gender specialist, Nathalie Me-Nsope, detailed many of these in her analysis of the pigeon pea value chain. A finer analysis should consider how individual market environments are conditioned by gender, and how gender roles and relationships are conditioned by markets. These kinds of analyses can contribute to understanding what sorts of interventions may produce positive livelihood opportunities and outcomes for men and women.

Projects that deal with post-harvest concerns. Post-harvest concerns are attracting increased attention in recent years, though much of it is in relation to on-farm harvests. However, improving storage practice and infrastructure is a key component to multiple GCFSI projects, including in urban markets. Improved seed quality, small-scale processing, and price stability all require improved post-harvest storage capacity. Approaches will be context dependent (e.g., what farmers require to improve storage capacity will be different than what is required in urban markets).

6. Next-Steps/Follow-up

The following section discusses next steps in relation to better understanding and addressing the constraints in urban food systems. It is divided into three main parts: local research capacity building, research needs, and specific subject areas for more targeted inquiry and intervention.

Local research capacity. As it relates to supporting healthy and diverse food environments, most research and effort has been focused on small-scale farmers. An intensified focus in urban areas will require an improved understanding of urban food-based livelihoods and urban food provisioning and exchange. For example, spatial analysis, in combination with infrastructure analysis, can help to quantify needs, limitations, and projections for future food movement where infrastructure will be important. In addition, the locally specific arrangements of food networks and relationships necessitate mixed methods research, which LUANAR faculty have identified as an area where capacity-building and improved analytical tools (e.g., NVivo) are needed.

Local research needs. The outcomes of this research suggest other areas of research that will improve understanding of urban food environments, including the factors that produce urban food insecurity. In seeking to improve urban demand for pigeon pea, future research should engage pigeon pea consumers to understand, for example, their buying habits, their home regions, and other factors that cause them to purchase pigeon pea. This information might be used to craft marketing campaigns or urban nutrition extension efforts to stimulate urban pigeon pea demand. Furthermore, identifying nascent processing activities (for both humans and livestock) could help to target investment to scale pigeon pea processing and support urban livelihoods simultaneously.

Specific subject areas for targeted inquiry and intervention.

- Storage at markets is a critical need. A next step would be to engage municipal officials and those working at markets to think about ways to improve upon existing practices and seek better alternatives.
- Access to capital should be a major component of projects. For example, women working in food-based livelihoods commonly use revolving funds (known as Banki Nkhonde) to access capital. According to those working in urban markets, by the end of the year, groups can generate as much as five million kwacha in interest, which is then distributed to members. Once distributed, the group starts the cycle again. As an existing and successful practice, local LUANAR faculty members have suggested it holds promise for supporting improved food provisioning and exchange.
- Because food exchange and provisioning is such a highly individualized and decentralized activity, many people are obligated to travel long distances fairly often. While such food exchange practices provide a measure of resilience by providing a flexible and robust exchange network, there are very likely opportunities for improving efficiencies. Fuel is already very expensive in Malawi, and it is likely to get more expensive in the future. Therefore, more attention should be given to the implications of such wide and decentralized reliance on transport. Analyses could quantify the amount of fuel currently used and project this into the future. Without assuming that technological improvements would be made, identify some ways to minimize this cost and improve efficiencies for moving food. Future research could explore innovative practices, such as collective organization, to support livelihood through better sourcing practices.

In ways that mirror the strong support given to small-scale farmers, efforts in cities should focus on supporting small- to medium-scaled food based livelihood in order to enhance both economic and food security. Policies and policy-makers should recognize the important role that such food-based livelihoods have in the overall well-being of the city, and research and scaling efforts should support them.

Appendix 1: Interview Instrument

Informed Consent

Hello, My name is _____ and I am working for the Global Center for Food Systems Innovation. Researchers from Michigan State University and LUANAR are trying to learn about the lives of retailers in Lilongwe. We are asking retailers, like you, if they would like to participate in a face-to-face interview about your work selling legumes. The interview will last about 30 minutes. You must be at least 18 years old to participate.

MuliBwanji! Dzinalangandine ndipondikugwirantchitondi Global Center for Food Systems Innovation. Gulu la a kafukufuku la ku Michigan State University ndi Lilongwe University of Agriculture and Natural Resources (LUANAR) likufunalidziwezokhudzanandiumoyowaameneamachitamalondam'Malawi. Tikufunsaamalonda/ageningatiinu, ngatimuliokonzekakutenganawogawopoyankhamafunsookhuzanandimalondaambeuza mu gulu la nyemba. Mafunsowaatitengalapafupifupitheka la ola. Mukuyenerakukhalaosacheperazakakhumindizisanun'zitanu (18) kutimutengenawogawo.

We are not selling anything or offering any services to you right now. We are only gathering information, but hope that by understanding the lives of food retailers in Lilongwe, Michigan State University, LUANAR, and other organizations may provide better services in the future.

Sitikugulitsa china chili chonse kapena kupereka upangiri wina ulionse kwainu pakadali pano, koma tikungofuna kudziwa chabe, m'mene miyoyo ya anthu amalonda a zakudya ilili kuno ku Lilongwe, ndipo tili ndichikhulupiliro kuti tikadziwa, Michigan State University, LUANAR ndimabungwe ena angathe kuthandizapo mtsogolo muno.

Your participation is completely voluntary. Choosing to participate will not increase your opportunities to get services; and choosing not to participate will not decrease your opportunities to receive services. If you choose to participate, I will ask you a number of questions about your work and your personal circumstances so that we can understand what sorts of situations affect your ability to do your work. In addition, we are interested in your ideas about the kinds of things you think would increase your profits, as well as the kinds of things that would decrease your operating costs, so please be thinking about that as we go along. You can choose not to answer any question you wish. Your answers will be completely confidential and only the research staff will see your answers. When we do our reports, your answers will be grouped with other retailers' answers to give an overall picture of the lives of retailers in this area. No one in your community will know what your answers are unless you tell them.

Kutengapo mbali mukafukufukuyi ndikosakakamiza. Mukasankha kutengapo mbali sindiye kuti mukuchulukitsa mwayi wanu wakutimudzalandile upangiri kapena thandizo lililonse komanso mukasankha kuti musatengapo gawo sindiye kuti mukuchepetsa mwayi wanu wodzalandila upangiri kapena thandizo lililonse. Ngati mwasankha kutengapo mbali,ndikufunsani mafunso angapo okhudza ntchito yanu ndizina zokhudza moyo wanu watsikunditsiku kuti tidziwe kuti ndi zinthu ziti zimene zimakusowetsani mtendere kapena ayi pa magwiridwe anu antchito. Simukukakamizidwa kuyankha funso lililonse limene lingafunsidwe pano ngati simukufuna kutero. Mayankho anu akhala a chinsinsi koterokuti ndianthu okhawo amene akupanga kafukufukuyi amene angaone mayankho anuwo. Tikadzalemba ma lipoti athu, mayankho anu adzaphatikizidwa ndimayankho ena anzanu ochita malonda kuti tidzakhale ndi chithunzithunzi cha m'mene miyoyo ya a malonda m'dera lino ikuyendera. Palibe munthu wina aliyense wam'dera lino amene adziwe zamayankho anu pokhapokha ngati inu eni muwauze.

There's no cost or compensation offered to participate.

Dziwani kuti palibe ndalama ina iliyonse kapena chipepeso china chili chonse chimene mupatsidwe chifukwa chakuti mwatengapo gawo.

If you have any questions about the study you may contact Agnes Mwangwela at (+265888878777) or Judith Kamoto at (+265995567000/+265888029196)

Ngati muli ndimafunso ena alionse okhudza kafukufukuyi, mukhoza kufunsa a Agnes Mwangwela pa nambala iyi (+265-888-878-777) kapena a Judith Kamoto pa manambala iyi (+265-888-029-196)

Do you have any questions about this study or your participation?

Kodi muli ndimafunso ena ali onse okhudza kafukufukuyi kapena okhudza kutengapo mbali kwanu pakafukufukuyi?

CONSENT: Please select your choice below.

- You have been read the above information
- You voluntarily agree to participate
- You are 18 years of age or older

Agree

Disagree

Enumerator code (market name + interview number + interviewer name): (e.g. Makolija_2_Mchezi)	Date and Time of interview:
	Gender of respondent: 1=Male, 2=Female
Language of Interview: 1=Chichewa, 2=English, 3=Other (specify)	Age of respondent (year born):

Section 1: Background information

Enumerator (say to respondent): First, I will ask you some questions about you and your household.

(Choyamba ndi kufunsani mafunso okhudza inuyo ndipakhoma/kunyumba kwanu

No.	QUESTIONS	ANSWERS
A.	<i>What is the name of the Primary Respondent?</i> Kodi dzina lanu ndi ndani?	
B.	<i>Are you the head of your household?</i> Kodi ndinu mutu wabanja?	1=Yes (skip to 1D) 2=No
C.	<i>What's your relationship to the head of this household?</i> Ubale wanu ndimutu wabanja ndiotani?	1=Spouse / Wachikondi 2=Son/Daughter / Mwana 3=Father/Mother / Makolo/Bambo 4=Brother/Sister / Achimwene / achemwali 99=Other (specify) / Zina(tchulani):

D.	<i>What is your marital status?</i> Kodi muli pa banja kapena ayi?	1= <i>Monogamous married and living with spouse</i> Wokwatila ndipo akukhala limodzi ndi wokondedwa wawo
		2= <i>Polygamous married and living with spouse</i> Wa mitala ndipo akukhala ndi wokondedwa wawo
		3= <i>Married and heading household; spouse lives or works elsewhere</i> Wokwatira ndinso mutu wabanja; Wokondedwa amakhala kapena amagwira ntchito kwina
		4= <i>Separated/ divorced/ widowed and living without spouse</i> Wosiyana/Wosudzulidwa/Woferedwa ndipo sanakwatirensa
		5= <i>Never married / Sanakwatirepo</i>
		99= <i>Other (specify) / Zina(tchulani):</i>
E.	<i>How many children aged 14 years or less are in your household?</i> Kodi pa nyumba panu pali ana angati a zaka khumi ndi zinayi (14) kapena zocheperapo?	
F.	<i>How many people aged 15-69 years are in your household?</i> Kodi ndianthu angati m'nyumbamu amene ali ndi zaka pakati pa 15 ndi 69?	
G.	<i>How many people aged 70 years or above are in your household?</i> Kodi ndi anthu angati m'nyumbamu amene ali ndi zaka 70 kapena kupitilira pamenepo?	
H.	To which ethnic group do you belong? Kodi inu ndimtundu wanji waanthu? 1= Chewa 2= Ngoni 3= Tumbuka 4= Tonga 5=Lomwe 6=Sena 7=Yao 8=Mang'anja 9=Nkhonde, 10=other, specify _____	
I.	<i>What is your level of education?</i> Kodi maphunziro anu munalekeza pati?	1= <i>No schooling / Sadapitepo kusukulu</i>
		2= <i>Some primary school / Sadamalize kupulayimale</i>
		3= <i>Completed primary school / Adamaliza kupulayimale</i>
		4= <i>Some secondary school / Sanamalize ku sekondale</i>
		5= <i>Completed secondary school / Adamaliza kusekondale</i>
		6= <i>Post-secondary school / Adaphunzira kuposera ku sekondale</i> 99=other (specify)

J. <i>How did you come to Lilongwe?</i> Munabwera bwanji m'mudzinda wa Lilongwe uno?	1= <i>Born in Lilongwe</i> Anabadwira m'boma la Lilongwe mom'muno
	2= <i>Migrated with family (as child)</i> Adasamukilamo ndi banja lomwe alimwana
	3= <i>Migrated alone / Adasamukilamo yekha</i>
	4= <i>Married someone from Lilongwe</i> Adakwatira/wa m'mudzinda/boma la Lilongwe lino
	99= <i>Other (specify) / Zina (Tchulani):</i>
K. <i>For how many years have you lived in Lilongwe?</i> Mu Lilongwe muno mwakhalamo kwazaka zingati?	1= <i>Less than 5 years / Zochepera zisanu (5)</i>
	2= <i>Between 5 and 15 years / Pakati pa 5 ndi 15</i>
	3= <i>Between 15 and 30 years / Pakati pa 15 ndi 30</i>
	4= <i>More than 30 years / Kupitilira makumi 30</i>
L. <i>Where in the city do you currently reside</i> Kodi mu mzinda wa Lilongwe uno mumakhala kuti?	Insert names of neighborhoods

Section 2: Livelihood general <i>Enumerator (say to respondent): Now I will ask you some questions about your work.</i> (Tsopano ndikufunsani mafunso okhudzana ndi business yanu/ntchito yanu)		
No.	QUESTIONS	ANSWERS
A.	<i>What are your sources of income for livelihood support</i> Kodi ndi njira zaji zimene mumapezera ndalama zokuthandizirani pakhomo	
B.	<i>Is this your primary source of income?</i> Kodi bizineziyi ndi yomwe mumadalira popeza ndalama?	1=Yes/ <u>Eya</u> 2=No/ <u>Ayi</u>

C.	<p><i>What percentage of your income comes from this activity?</i></p> <p>Kodi ndinalama zochuluka bwanji zomwe mumapeza kudzera mu ntchitoyi poyelekeza ndi ndalama zonse zomwe mumapeza?</p>	<p>1=very little, 2=some, 3=about half, 4=the majority</p>
D.	<p><i>How long does it take you to travel to the market?</i></p> <p>Kodi zimakutengerani nthawi yochuluka bwanji kuti mukafike kumsika?</p>	<p>1=0-15minutes 2=16-30 minutes 3=31-45 minutes 4=46 minutes-1 hour 5=more than 1 hour</p>
E.	<p>How many days a week do you sell at this market?</p> <p>Kodi mumagulitsa masiku angati pasabata pa msikawu?</p>	
F.	<p>Do you sell anywhere else? If so, where and when?</p> <p>Kodi palinso msika wina komwe mumagulitsako? Ngatiulipo,tchulani malo komanso tsiku lomwe mumakagulitsa?</p>	(make a note of the place and when they are there)
G.	<p><i>What costs do you have over the course of a day?</i></p> <p>Kodi mumalowetsa ndalama zingati patsiku?</p>	
H.	<p><i>Do you rely on a cell phone to help you in your work</i></p> <p>Kodi mumagwiritsa ntchito foni pa bizinezi yanu?</p>	<p>1=yes 2=no</p>
I.	<p><i>Do you rely on any other technology, such as a radio, for your work?</i></p> <p>Kodi mumagwiritsa ntchito makina kapena chida chilichonse monga wayilesi pa bizinezi yanu?</p>	<p>1=yes(if yes, ask which technology) 2=no</p>

Section 3: Livelihood legume specific (pigeon pea)

Enumerator (say to respondent): Now I will ask you some questions specifically about pigeon pea. . .

Tsopano ndikufunsani mafunso okhudzana ndimalonda a za mgulu la Nandolo

No.	QUESTIONS	ANSWERS
A.	What legumes do you sell? Kodi mumagulitsa nyemba za mitundu yosiyasiyana	(Record all answers here. Include pigeonpea, groundnut, soya, Bambara nut, cowpea. If the retailer does not have pigeon pea, skip to Sectio
B.	<i>Where and from whom do you obtain your pigeon peas?</i> Kodi nyemba zanu zamgulu la Nandolo mumazipeza kuti ndipo kwandani?	
C.	How do you get them from your source to market? Mumanyamula bwanji kuchoka kogula kupita kumsika?	(method of transportation
D.	What quantities do most consumers buy? Kodi ogula amagula zochuluka bwanji?	<i>Record by weig</i>
E.	<i>Do you have repeat customers?</i> Muli ndi makastomala odalilika?	1=yes 2=no
F.	How often do the consumers buy? Kodi makasitomala anowo amakugulani pafupipafupi bwanji?	1=more than once/week 2=once a week 3=twice a month 4=less than twice a month
G.	How often do you have to restock? Kodi mumawoda pafupi-pafupi bwanji Nandolo?	1=more than once/week 2=once a week 3=twice a month 4=less than twice a month
H.	Where do you store your legumes?	1=on site, in a rented storage unit 2=at home 99=other (specify

	Kodi mumasunga kuti Nandolo wanu?	
I.	<i>What are the costs associated with legume acquisition and storage?</i> Kodi mumawono nga kapena zimalowa ndalama zingati kuwoda ndikusungira mbewu za Nandolo?	(break costs down-to include travel and transportation costs, loading,storage)
J.	<i>Does your supply and sales vary over the course of a year</i> Kodi pamakhala kusiyana kulikonse pakapezedwe ka nandolo ndi zimene mumawoda ndi zimene mumagulitsa mkati mwachaka chonse?	1=Yes (if yes, ask them to describe how it varies, e.g. by season? by social occasion?)
K.	<i>What are your biggest challenges in obtaining legumes?</i> Kodi mumakumana ndimavuto anji popeza Nandolo?	
L.	What are your biggest challenges in storing legumes? (if they do not mention it, ask if are pests a problem?) Kodi mumakumana ndi mavuto anji posunga mbewu zamgulu la nyemba?	
M.	<i>What are you doing to address your challenges?</i> Mukuchitapo chiani pazovuta zomwe mukumananazo mubizinesi yanu	
N.	What 3 things could be changed or provided to you to help you be more successful in your business?(probe, Would belonging to a cooperative be helpful to your business?)	

	Kodi ndi zinthu zitatu ziti zomwe zingasinthidwepo kukuthandizani kutibizinesi yanu yipite patsogolo?	
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Section 4: Livelihood legume specific (All)-treat all questions as open-ended – other legumes.

Enumerator (say to respondent): Now I will ask you some questions specifically about legumes. .

Tsopano ndikufunsani mafunso okhudzana ndi malonda a zamgulu la nyemba

No.	QUESTIONS	ANSWERS
A.	Where and from whom do you obtain your legumes? Kodi nyemba zosiyanasianazi mumazipeza kuti ndipo kwandani?	<i>(include information about Bambara, soya, groundnut, compea)</i>
B.	How do you get them from your source to market? Mumanyamula bwanji kuchoka kogula kupita kumsika?	<i>(method of transportation)</i>
C.	What quantities do most consumers buy? Kodi ogula amagula zochuluka bwanji?	<i>(Record by weight)</i>
D.	Do you have repeat customers? Muli ndi makasitomala odalilika?	
E.	How often do the consumers buy? Kodi makasitomala amagula pafupipafupi bwanji?	
F.	How often do you have to restock? Kodi mumawoda pafupi-pafupi bwanji nyembazi?	
G.	Where do you store your legumes? Kodi mumasunga kuti nyemba zanu?	
H.	<i>What are the costs associated with legume acquisition and storage?</i> Kodi mumawononga kapena zimalowa ndalama zingati kuwoda ndi kusungira nyemba za mitundu yosiyanasiyana?	<i>(break costs down-to include travel and transportation costs, loading,sto)</i>
I.	<i>Does your supply and sales vary over the course of a year</i>	

	<p><i>Kodi pamakhala kusiyana kulikonse pakapezedwe ndi kagulitsidwe ka nyemba zosiyanasianazi mkati mwachaka chonse?</i></p>	
J.	<p><i>What are your biggest challenges in obtaining legumes?</i></p> <p><i>Kodi mumakumana ndimavuto anji pakapezedwe kanyemba za mitundu yosiyanasianazi?</i></p>	
K.	<p><i>What are your biggest challenges in storing legumes?</i></p> <p>(if they do not mention it, ask(are pests a problem?))</p> <p><i>Kodi mumakumana ndimavuto anji posunga nyemba zosiyanasianazi?</i></p>	
L.	<p><i>What are you doing to address your challenges?</i></p> <p>Mukuchitapo chiani pazovuta zomwe mukumana nazo mubizinesianu?</p>	
M.	<p>What 3 things could be changed or provided to you to help you be more successful in your business?(probe, Would belonging to a cooperative be helpful to your business?)</p> <p>Kodi ndi zinthu zitatu ziti zomwe zingasinthidwe pokukuthandizani kuti business yanu yipitepatsogolo?</p>	
N.	<p>Thank you very much for your time today. Is there anything else you would like to add about your business, or anything you would like to ask me?</p> <p>Zikomo kwambiri chifukwa cha nthawi yanu. Palichowonjezera chilichonse chokhuzana ndinthito yanu kapena palifunso lililonse?</p>	

Appendix 4: Exempt Certification

APPENDIX 1 EXEMPT CATEGORY

Name of Principal Investigator: Stephanie White

Title of Project: Profiling Legume Exchange Among Small-Scale Urban Traders in Lilongwe

IRB #: i046215

1. Select the appropriate exemption category(s) for research.
2. For each exemption category selected, complete the corresponding QUESTIONS.

A	Category	B. QUESTIONS. <i>When explaining, provide protocol specific information.</i>
<input type="checkbox"/>	45 CFR 46.101(b)(1) Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.	<p>To qualify for this exemption, BOTH STATEMENTS answer must be YES.</p> <p><input type="checkbox"/> N <input type="checkbox"/> Y Research conducted in established or commonly accepted educational settings. <i>If no, STOP. Research does not qualify for this exemption. If yes, explain.</i></p> <p><input type="checkbox"/> N <input type="checkbox"/> Y Research involves normal educational practices. <i>If no, STOP. Research does not qualify for this exemption. If yes, explain.</i></p>
<input type="checkbox"/>	45 CFR 46.101(b)(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.	<p>PRE-SCREENING QUESTION: <input checked="" type="checkbox"/> N <input type="checkbox"/> Y Does the research involve children? <i>If yes:</i> <input type="checkbox"/> N <input type="checkbox"/> Y Does the research involve survey procedures, interview procedures, or observation of public behavior where the investigator will participate in the activities being observed? <i>If yes, STOP. Research does not qualify for this exemption. If no, explain.</i></p> <p>To qualify for this exemption, statement answer must be YES. <input type="checkbox"/> N <input checked="" type="checkbox"/> Y Research involving use of educational tests, survey procedures, interview procedures, or observation of public behavior. <i>If no, STOP. Research does not qualify for this exemption. If yes, explain.</i></p> <p>If you answer YES to BOTH of the questions below, your research DOES NOT QUALIFY for this exempt category. <input checked="" type="checkbox"/> N <input type="checkbox"/> Y Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects. <i>Explain. We do not need to link information to research subject.</i></p> <p><input checked="" type="checkbox"/> N <input type="checkbox"/> Y Any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation. <i>Explain. We are observing and inquiring about a widely accepted and practiced livelihood, and no criminal or civil liability is involved.</i></p> <p>If YES TO BOTH, STOP. Research does not qualify for this exemption.</p>
<input type="checkbox"/>	45 CFR 46.101(b)(3) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under paragraph (b)(2) of this section. f. (i) the human subjects	<p>To qualify for this exemption, statement answer must be YES. <input type="checkbox"/> N <input type="checkbox"/> Y Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior that is not exempt under 45 CFR 46.101 (b)(2). <i>If no, STOP. Research does not qualify for this exemption. If yes, explain.</i></p>

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