

Abstract

Legume-intensified maize systems have been identified as a potential “one stop” solution to the problem of food insecurity in Malawi. Previous research has failed to examine how gender relations and intra-household dynamics may influence decisions and potential food security gains at the farm level, or how gender may impact participation, performance, and benefits at later value chain stages. We identify gender-based constraints and opportunities along the chain and their implications for household level food security and poverty. We find the decision to adopt/expand pigeon pea at the farm level; the ability to participate at the various nodes of the value chain; and control over the gains derived from value chain participation are influenced by intra-household gendered patterns of resource allocation, the gendered division of roles and responsibilities, and differential power relations in decision-making between men and women. For example, lack of transportation assets and cultural restrictions on women’s mobility limit their participation in markets, affecting their access to and control over income derived from legume sales. Our findings must be taken into account by development efforts targeting food, income, and nutrition security via the development of legume value chains. We argue that empowering women economically is essential for harvesting the potential food security and poverty reduction benefits of legume expansion and commercialization.

Biography

Nathalie M. Me-Nsope (PhD) is an Assistant Professor, International Development in the Department of Agricultural Food and Resource Economics, and Gender Specialist for the Global Center for Food Systems Innovation, a USAID’s Higher Education Solutions Network at Michigan State University (MSU), United States. She holds a PhD and MS degrees in Agricultural Economics from MSU (USA) and an MA in Women’s Studies from the University of York (UK). Dr. Me-Nsope conducts research on food security and agricultural market development issues in Africa. She is interested in the gender dimensions of food systems challenges due to the global trends of rapid urbanization, population growth, climate change, and changes in land use. She has conducted several gender analyses of agricultural value chains in West, Central, and East Africa to inform the design of value chain interventions that will improve food systems outcomes, reduce gender inequalities, and empower women.

Michelle Larkins is a doctoral candidate under the direction of Dr. Wynne Wright, in MSU’s Department of Community Sustainability, and a gender research assistant in the Global Center for Food Systems Innovation, a USAID’s Higher Education Solutions Network at Michigan State University (MSU). Her research focuses on the experiences of women engaged in environmental justice action at the community level, bringing to the foreground the accomplishment and embodiment of women’s labor. Michelle was awarded the C.S. Mott Pre-doctoral fellowship in Sustainable Agriculture and has completed the Gender, Justice and Environmental Change (GJEC) and Ecological Food and Farming Systems graduate specializations. She also holds an M.S. from Michigan State University in Fisheries and Wildlife.

Empowering Women for Food and Income Security: The Case of Pigeon Pea in Malawi

by

**Nathalie Me-Nsope
and
Michelle Larkins**

Michigan State
University

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Gender, Development, and Globalization Program

Center for Gender in Global Context, Michigan State University
206 International Center, 427 N Shaw Ln
East Lansing, MI 48824-1035
Ph: 517/353-5040 • Fx: 517/432-4845
Email: gencen@msu.edu • Web: www.gencen.msu.edu

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INTRODUCTION

Poverty and food insecurity are significant challenges in Malawi. These challenges are further exacerbated by changing climates, rising population densities, and increasing pressure on land. Smallholder agriculture remains an important source of livelihoods for a majority of the rural population of Malawi (Chirwa and Matita 2012). Snapp et al. (2002) observe that the small size of most farms in Malawi (one–two hectare per household) places the majority of smallholder households at the margins of subsistence. As in most of southern Africa, maize is the dominant cropping system in Malawi. Maize accounts for 60-80% of the total area sown, and approximately 97% of farmers in the country produce this crop (Rubin and Barrett 2009). The remainder of smallholder arable land is planted with tobacco, groundnuts, pigeon pea, and other crops (Snapp et al. 2002).

There is great interest in legume intensified maize systems as an alternative technology that could enhance food security in Malawi, given the country's declining soil fertility as a result of continuous cropping with cereals (e.g. maize); minimal use of fertilizers (due to high cost); and the abandonment of the traditional fallow systems which allow the soil to recover from continuous planting (Mafongoya et al. 2006; Snapp et al. 2002). Studies related to malnutrition (FAO 2009) and poverty promote legumes as a potential solution for low income households. In comparison to the dominant maize crop, protein-rich grains of legumes have been argued to prevent malnutrition commonly associated with cereal based diets (Prasanna et al. 2001). According to Mhango et al. (2013) "legume diversification of maize-based systems is a core example of sustainable intensification, with the food security of millions of farm families at stake" (234). Further, legumes can provide market possibilities, thereby providing farmers the opportunity to improve their income and livelihoods (Giller et al. 2011; Kamanga et al. 2010), which alongside increases in total food production is needed to combat hunger (Bie et al. 2008; De Schutter 2010). Taken together, these characteristics make it critical to consider the adoption and expansion of legume cropping as part of the solution to food security concerns in Malawi. Of specific interest is the pigeon pea.

Currently, Malawi ranks first in terms of pigeon pea production in Africa, and is the third largest producer in the world, behind India and Burma (FAOSTAT 2012). This shrubby legume is particularly attractive to smallholders for its multipurpose characteristics—dried seeds, pods and immature seeds used as green vegetables, leaves and stems used for fodder, and the dry stems as fuel (Simtowe 2009)—and its soil fertility benefits (Snapp 2002). Pigeon peas are highly drought tolerant (compared to maize, tobacco, and cotton), and their long taproot is advantageous in accessing nutrients in deeper soil profiles (Snapp et al. 2003). Pigeon pea grain has a high protein content ranging from 21% to 25% (Simtowe et al. 2009), making it a valuable source of nutrition for many poor families who cannot afford dairy or meat.

However, the adoption of legume intensified maize systems remains low (Kanyama-Phiri et al. 2000). The existing literature identifies several factors limiting adoption and expansion of pigeon peas at the farm level. Small farm sizes and poor soil quality (degraded and arid soils) decrease

production capacity, with most farmers choosing to maximize their maize crop (Mhango et al. 2012). Lack of reliable access to seeds further limits legume adoption and expansion. Legume seeds are expensive, do not store well, and are difficult to multiply for the next planting season (Snapp et al. 2002). As observed by Simtowe (2009), Malawi's seed market is informal—the majority of smallholders recycle their seeds or trade with other producers. There is almost no private sector involvement in seeds, and the availability in the public sector fluctuates (Simtowe 2009). Seed access is further differentiated by actor group. For instance, Snapp et al. (2002) found differences in the use of purchased seeds across male (approximately 30%) and female headed (approximately 15%) households. Female headed households (FHH) were also less likely to receive agricultural credit, thereby limiting their ability to purchase legume seeds and improved varieties when these are available.

A household's material resource endowment may also constrain adoption. Kerr et al. (2013) found that low resource endowed households are less likely to expand legume production because they have no recycled seeds to plant (the entire legume crop was consumed as food in the previous season), lack the funds to purchase seeds in the market, and cannot afford additional farm labor or inputs. Further, vulnerable farmers with smaller parcels will give more land to maize, as their cash crop staple—typically well over 70% (Snapp et al. 2002). Labor requirements associated with legume intensification influence cultivation decisions for all households; this includes seed selection, seed storage, plot cultivation, harvesting, and winnowing. Like land, labor allocation to crops is very competitive—it depends on the returns per unit of input, and on the efficiency of markets for both seed and grain products. Insect and livestock damage are other common challenges to legume adoption. Specifically, for pigeon peas, plant damage caused by insects is a problem when the grain is on the field and has been identified as an important cause of post-harvest losses (Kanyama-Phiri et al. 1998; Snapp et al. 2002; Snapp and Silim 1999).

Moreover, poor access to markets has been identified as a restrictive factor. In addition to reduced market access, the majority of farmers live in areas with outmoded infrastructure; fragmented and degraded farmlands; deficient institutions, organizations, and policies; and often with limited support from agricultural research and development organizations (Mhango et al. 2012). Kerr (2013) shows that the marketability of legumes (other than groundnut) was often a major constraint for profit oriented farmers to expand their production. Coupled with poor market access is the degree of competitiveness of farmgate prices (the location where most Malawians sell their legume crop). Farmgate prices for grain legumes are markedly lower across the country in comparison to retail markets (Phiri et al. 1999). Any significant expansion of legumes will remain limited until the relative profitability of these crops improves (Mhango et al. 2012). Farmers' lack of access to reliable price information often results in them selling below market value during the harvest season (Makoka 2009). Profits are further reduced by farmers not being aware of the harvest quality of pigeon pea demanded by exporters, with few actually cultivating the type that earns a premium in international markets (Makoka 2009).

The cultural importance of maize has been argued to diminish the potential of adding legumes to crop rotations throughout Malawi (Alwang and Siegel 1999; Simtowe 2009). In Malawi, food security at the household level is commonly equated with the size of the maize harvest; poor farmers prefer to avoid purchasing part of their personal food requirements in the market (Snapp

et al. 2002). According to Kerr et al. (2013) farmers defined the boundaries within which legumes can expand on their farm by food security and income—the majority of the farmers indicated that legumes can only be expanded when domestic maize production is sufficient to satisfy household demand. Snapp et al. (2002) observes that notwithstanding the marginal decline in maize harvests that would accompany a legume intensification strategy, there is a potential for significant improvement in net farm profits. The findings of Simtowe et al. (2009) support this, demonstrating that pigeon pea intercropping with other staple food crops can be done without reducing other yields.

In addition to the general constraints discussed above, social and cultural norms have implications for adoption and expansion throughout the pigeon pea value chain. In particular, cultural norms influence gendered patterns of resource allocation within the household, and gender differences in the division of roles and responsibilities within the household and on the farm. This includes gendered power relations in intra-household decision-making with respect to crop cultivation at the farm level and market participation at post-farm levels of value chains. Moreover, the gender differences in control over production assets and incomes derived from value chain participation affect men's and women's incentives and benefits for participating in legume value chains. Value chains are embedded in a social context (Rubin et al. 2009). Access to resources (physical, financial, human resources, time, information, and skills) is critical to value chain participation. Gendered patterns of resource allocation often imply differences in participation and in the sharing of benefits from participation for men and women. Sebtad and Manfre (2011) observe that gender-defined roles in value chains and within households affect access to financial services, control over income, access to and use of new technologies, inputs, and social services. Further, gender relations affect and are affected by the ways in which value chains function (Matua et al. 2014). While value chains offer tremendous opportunities to men and women through better market linkages and employment opportunities, at the same time, the way these value chains operate can affect some groups negatively (Matua et al. 2014).

Women dominate smallholder pigeon pea production in Malawi, and they play an important role in informal food distribution and processing (Makoka 2009). Notwithstanding, Malawian women's agency and access to agricultural resources are limited (Kerr et al. 2013). Not only do rural Malawian women have less access to education, land, credit, seeds, and other agricultural resources compared to men, but they are also constrained by highly unequal workloads, including agricultural labor, household tasks, and child care responsibilities (ibid). Research that systematically investigates gender and intra-household dynamics, how these dynamics influence farm-level adoption decisions, and the participation and benefits at post-farm nodes of the value chain is almost non-existent. Previous research has focused at the farm-level, examining gender differences in preferences for different types of legumes, or the impact of the gender of the household head on farm decision-making and performance.

In this paper, we examine the pigeon pea value chain in Malawi from a gender perspective. Specifically, we analyze gender relations and roles to identify gender-based constraints (GBCs) or gender-based opportunities (GBOs) to participation at the different nodes of the value chain; and determine the implications of existing intra-household gender dynamics for the sharing of benefits from participation (incentives) for food security and poverty within the household. Overall, the study will provide critical input for the design of gender-sensitive innovations

targeting food security and poverty reduction in low-income households through the scaling of pigeon pea legumes in Malawi. In the sections that follow, we first discuss our research methods (site selection, analytical framework, and implementation); second, we discuss our findings; and third, we conclude our article by highlighting the implications of this research for innovations to promote food, nutrition, and income security through legume adoption and expansion, and some recommendations on how to achieve these outcomes.

METHODS AND DATA COLLECTION

Fieldwork was conducted in the North, Central, and South regions of Malawi. Agricultural production statistics from the 2010/2011 harvest season indicate the following yields by region: Southern: 361,885,741 kilograms; Central: 7,802,141 kilograms; and Northern: 392,044 kilograms (Tschirley et al. 2014). Within each region, sites were selected based on district level total annual production and stakeholders' input. A map showing the five districts selected for our research may be found in Figure 1.

Semi-structured interview guides were designed to collect qualitative data from actors at each node of the pigeon pea value chain: seed actors, farmers, farmers' cooperatives, retailers/local processors, independent traders/buyers, and large-scale export buyers/processors. Quantitative data collected through household surveys from actors along the value chain were used to map men's and women's participation at various levels of the pigeon pea value chain. This data helps us to understand existing inequalities and their causes, power dynamics at play along the value chain, and points of convergence and divergence of interests among actors.

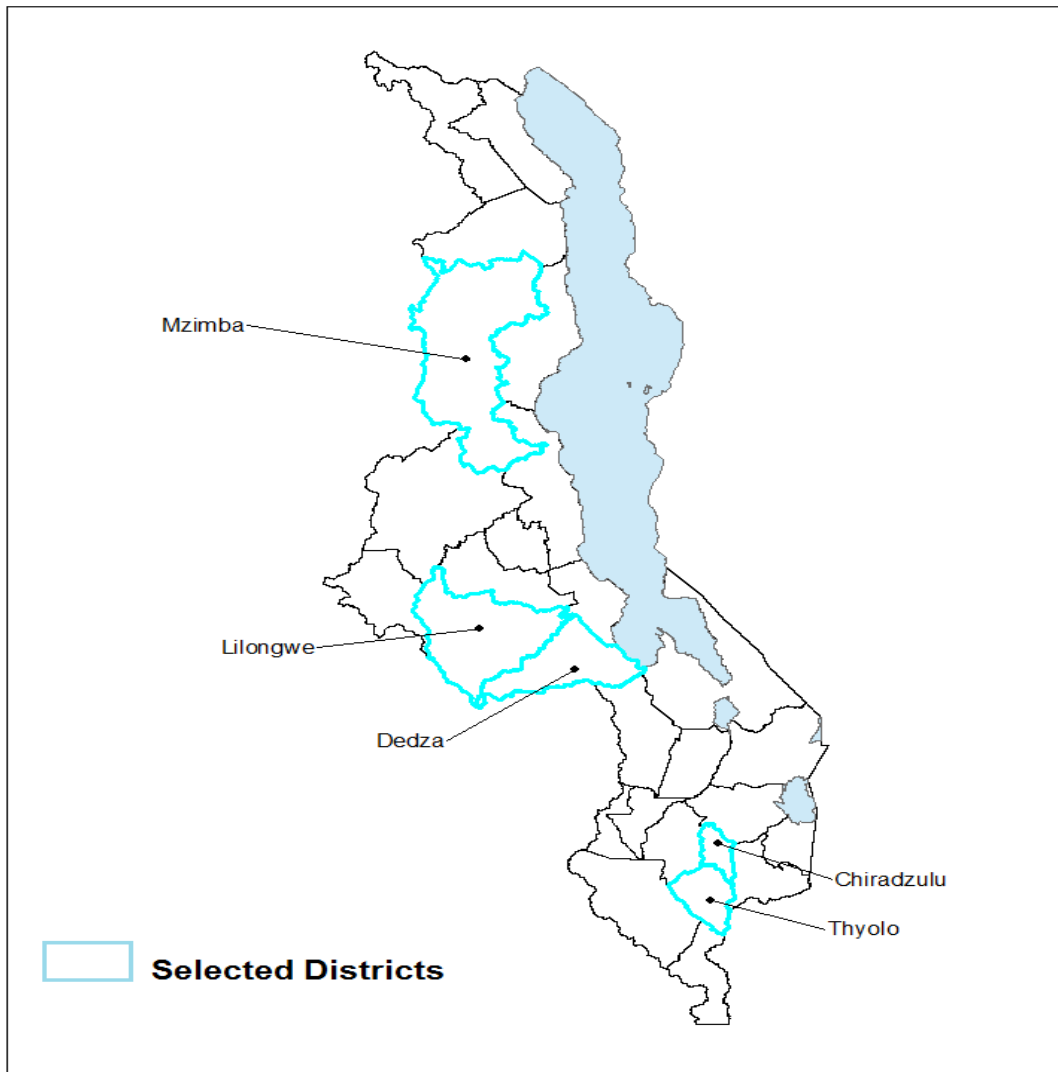
Group interviews (GI) were conducted with men and women pigeon pea farmers in the selected EPAs. In most cases separate GIs were held with men or women farmers. A group interview was also held with representative members of a farmer owned pigeon pea marketing cooperative in the District of Chiradzulu. Individual interviews were conducted with retailers/local processors of pigeon peas; pigeon pea buyers/traders; representatives of large scale pigeon pea processing and export companies; and representatives of the legume seed system in Malawi. A description of our data collection methods and the number of respondents for each node of the value chain may be found in Table 1.

Table 1. Qualitative Data Collection

Value Chain Node	Data Collection Method	Female	Male	Total Respondents
Seed Actors	Key Informant Interviews (6)	1	5	6
Producers	Group Interview (23)	152	108	260
Producer Cooperative	Group Interview (1)	21	9	30
Retailers and Local Processors	Key Informant Interviews (19)	14	5	19
Local Buyers and Traders	Key Informant Interviews (10)	2	8	10
Export Market Buyers and Traders	Key Informant Interviews (4)	0	4	4

We adopt the Integrating Gender into Agricultural Value Chains (INGIA-VC) framework developed by Rubin et al. (2009), which consists of five analytical phases. Step one involves a mapping of gender relations and roles along the value chain. Step two identifies gender-based constraints (GBCs). Step three assesses the consequences of the GBCs for the achievement of project outcomes, and on women's economic empowerment. Step 4 involves taking action to remove GBCs. Finally, step five documents and measures success. In this paper, we discuss our work toward the first 3 phases of the INGIA-VC process; and determine the implications of our findings for innovations targeting food security, poverty, and nutrition through the scaling of multipurpose legumes in Malawi.

Figure 1. Map of Malawi Districts



Selected research areas in North, Central and Southern Malawi.

The Gender Dimensions Framework (GDF) (Rubin et al. 2009) provided the tool-kit for collecting, organizing, and analyzing data from actors at different stages of the value chain. The GDF contemplates four dimensions of inequality: i) access to and control over key productive

assets (tangible and intangible); ii) practices and participation; iii) beliefs and perceptions; and iv) legal frameworks. Power is a cross-cutting component in each of these four dimensions (Rubin et al. 2009).

The first dimension, access to assets, describes the social relationships that shape the allocation of resources that are necessary to be a fully active and productive (socially, economically, and politically) participant in society. These include access to land, labor, capital, natural resources, education, employment, and information (Rubin et al. 2009). Empirical evidence supports that assets are not always pooled within the household—they may be held individually by men, women, and children (Haddad et al. 1997). Men and women own different types of assets, accumulate these assets in variable ways, have disparate access to the same set of resources, and distribution between men and women is often unequal (Meinzen-Dick et al. 2011; Rubin and Barrett 2009). Who within a household has access to which resources and for what purposes is conditioned by the broader sociocultural context and by intra-household allocation rules (Meinzen-Dick et al. 2011). The distribution of assets within the household is critical to household and individual well-being, as measured by outcomes such as food security, nutrition, and education. Different types of assets enable varied livelihoods and may have diverse implications for bargaining power or well-being within the household (Meinzen-Dick et al. 2011). Thus, the gendered nature of asset distribution could influence participation at the various nodes of the value chain, as well as control over the benefits derived from participation. Under this dimension, we examine questions such as: What are the resources needed to participate in this value chain? Do men and women differ in their ability to mobilize those resources? How? Why?

The second dimension of the GDF, practices and participation, examines how gender influences what people do and the way they engage in development activities (Rubin et al. 2009). It seeks to understand the productive, reproductive, and community development roles and responsibilities of men and women, and to determine the implications and rewards for value chain participation (Rubin et al. 2009). The third dimension, beliefs and perception, details who knows what and how, describing how these domains of knowledge may differ between men and women. Cultural belief systems influence gender identities and behavior, define roles for men and women, boys and girls, and how they go about their daily lives (Rubin et al. 2009). The fourth dimension, legal frameworks, investigates how gender can influence the way people are regarded by and treated within the judicial system—including customary law and the formal legal code. Gender relationships may affect rights to legal documents, ownership and inheritance, reproductive choice and personal safety, representation, and due process (Rubin et al. 2009). Again, power cuts across all four dimensions of the GDF.

FINDINGS AND DISCUSSION

Gender Mapping of the Pigeon Pea Value Chain in Malawi

Figure 2 below is a simple sketch of the pigeon pea value chain, which details points of access and nodes of activity for men and women along the value chain. We identified the following actors along the pigeon pea value chain: seed actors, farmers, farmers' cooperatives, retailers/local processors, independent traders/buyers, and large-scale export buyers/processors.

Given the regional variation of production and marketing activities (i.e. more activity in the South than North or Central), we have included the upper and lower limits of value chain involvement for men and women as reported by respondents. Along with regional differences, our qualitative data suggests that participation rates may vary by season (e.g. greater involvement during harvest season).

In the case of pigeon peas, seeds are a major input—however, the seed system for most legumes in Malawi is not well developed. We could not find any input distributors or suppliers carrying pigeon pea seeds during our fieldwork. Almost all producers used grains recycled from previous harvest as seeds. Producers occasionally obtained improved seeds (often free of charge) from research organizations or projects—such as Africa Rising and ICRAF (World Agroforestry Research Centre). Buyers and traders occasionally functioned as seed distributors, selecting the highest quality grains from their inventory, which they later sell as seeds during planting.

After harvest, smallholder farmers dry and sell the legumes to either vendors (middlemen), traders/buyers in the villages (or rural assemblers), or to agents buying for large scale buyers/processors. Harvesting and drying of pigeon peas are tasks that are predominantly performed by women across all three regions. This is not surprising because pigeon pea is considered a women's crop, given its role as household foodstuff and the hand winnowing required. However, while our interviews reveal that women are heavily involved in all farming activities for pigeon peas, men may be perceived to 'participate' in the value chain as farmers during the harvest season when they are seen taking legumes to the market. Thus, based on our data, women comprise 60% of farmers, and men, 40%. It should be noted that the majority of group interview participants at this stage came from the Southern region where there is greater pigeon pea activity, and men are increasingly becoming involved with this crop as its cash value increases. Therefore, it is likely that their visibility is greater in this region compared to the other two.

Smallholder farmers who are members of cooperatives (few) sell their legumes through the marketing cooperative. Some smallholder farmers are also local processors—they cook the fresh legume from their own production and sell for consumption as a snack in the market during harvest season. Retailers purchase processed grains (dried, hulled, and split) from urban wholesalers/retailers or large processors which they sell to consumers in villages or peri-urban areas. Retailers and local processors of pigeon peas were identified in the Central (Dedza Central market) and Southern (Namtambo, Yasini, and Kanje markets) regions of Malawi. With the exception of one local processor who sold biscuits/flitters (commonly known as cheula) made from processed pigeon pea flour, the majority of local processors cooked fresh pigeon pea pods obtained from their own fields to sell to consumers on market days. Retailers sell dried grains or processed pigeon peas obtained from processors. Women are more likely to be involved in this node as local processors—a role that is heavily associated with cooking. The participation rate of men as local processors was estimated to be only 5-10% across the three regions, whereas their rate of participation as retailers ranged from 0-70% depending on the district.

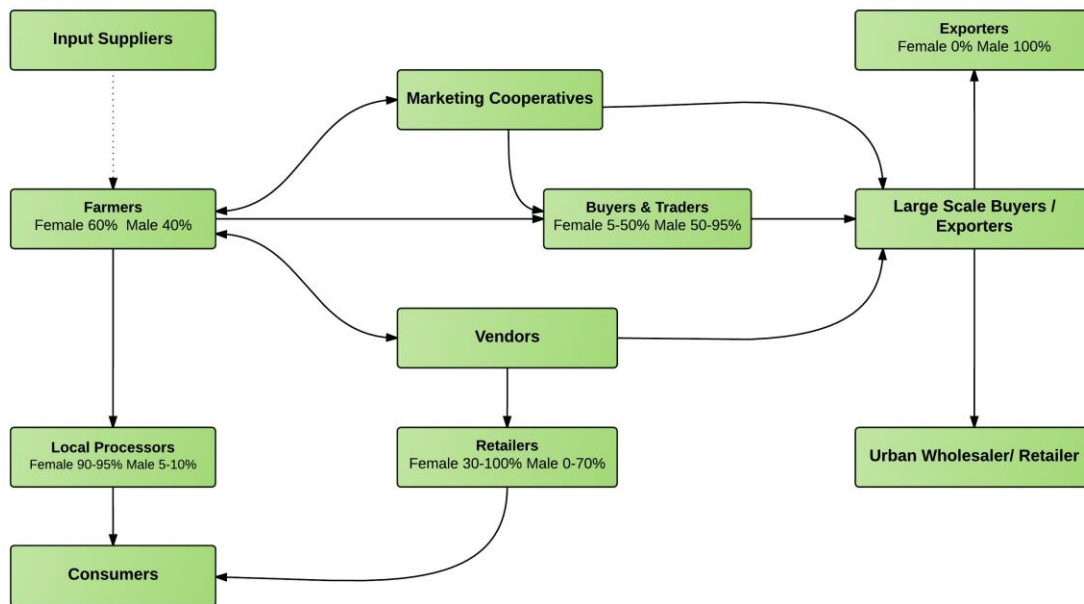
Buyers and traders source dry pigeon pea grains from farmers and vendors/middlemen to sell to the large exporters/processors located in Blantyre or Limbe. All buyers/traders interviewed were located in the South (Thyolo and Chiradzulu districts) due to the aforementioned activity in this region. Buyers/traders have informal relationships with vendors/middlemen who aggregate pigeon peas from farmers. However, they may also buy legumes from farmers, vendors, and

farmers' groups, and sell to the large scale buyers/processors. The main activities of this node include: buying of pigeon pea from sellers, lifting of grain bags, storage, weighing, sacking of grain, treatment, and sorting. Most of these tasks are performed by paid laborers, and there is a preference for male laborers who are perceived to be physically stronger. We find that men are much more likely to be engaged at this node (50-95%).

Large scale, privately owned grain exporting/processing companies interviewed in Limbe and Blantyre include: Access to Global Online Research in Agriculture (AGORA), Export Trading Group (ETG), Rab Processors, and Transglobe, INC. The companies buy and export pigeon peas and other commodities (cowpeas, grams, beans, groundnuts, soybeans, sunflower, and even maize) and are spread throughout the country in major pigeon pea producing areas where farmers take their grain to sell. There are no women who act as large scale buyer/exporters, and very few of the employees in these branches are women. The main activities associated with buying of the grain at this level include lifting, weighing, bagging, and transporting of the grain from the branches to the warehouse. These activities are believed to be difficult for women to undertake, since women are perceived to be physically weaker than men.

In the following sections, we discuss the specific gender-based constraints and opportunities for each node of the value chain.

Figure 2. Map of the Pigeon Pea Value Chain in Malawi¹



Actor nodes and participation rates by gender for the pigeon pea value chain in Malawi.

¹ Participation rates of men and women are reported as the minimum and maximum range, and were found to vary somewhat by season (e.g. more men participate in lower nodes of the value chain during the busy harvest season). Gendered participation rates were self-reported by respondents, and in key informant interviews.

Seed Supply System

The absence of pigeon pea seed distributors made it hard to identify any gender specific patterns with respect to access to and/or utilization of improved pigeon pea seeds. However, we were able to conduct interviews with other actors in the seed system to understand general challenges facing this node of the value chain², as well as diagnose, to the extent possible, gender issues that may have implications for seed access and utilization. Low excludability of pigeon pea seeds and farmers' frequent use of recycled seeds were identified as major disincentives to local seed production, given the profit oriented nature of seed producing companies. In spite of the higher seed multiplication ratio of pigeon pea (compared to other legumes), farmers' demand for quality and high yielding seeds was reported to have remained low due to low output prices. Few farmers had access to price information; and poverty and lack of grain storage were cited as factors that pushed farmers to sell at very low prices. According to the representative from ICRAF, past efforts to get farmers to purchase their own seeds have been largely unsuccessful. Further, some farmers and their families consume the seeds when hungry. Thus, any intervention to increase access to improve seeds must take into account the differing needs of poor and vulnerable households, which are more likely to be headed by women.

The GOM also reports that a general lack of trust amongst farmers hinders projects that attempt to engage farmers in community seed production. Efforts to promote the production of this legume must therefore include strategies that: i) support local seed production; ii) stimulate demand for improved seeds amongst farmers; and iii) support seed distribution networks that promote gender equitable access to improved seeds. To achieve ii), farmers' access to market information (especially prices) would need to be improved. Further, farmers (especially women) would need to be supported and organized to facilitate access to profitable product markets and given training to improve their bargaining and negotiation skills. However, regionally, a deeply rooted culture of patriarchy places women in a subordinate position to men, demonstrated by the mobility limitations women face, as well as their restricted role in intra-household decision making. Interventions to improve women's access to markets and their bargaining power are less likely to be resisted (or more likely to be successful) if men are also targeted and educated on the potential benefits to the family of women's empowerment.

Education as an intervention for both men and women is likely to have an impact at each node of the value chain, as the potential to facilitate women's economic empowerment is constrained by cultural expectations of their performance. Moreover, these suggested interventions should not be interpreted as a universal assumption that all women in these regions will choose to increase their participation in the pigeon pea value chain. Rather, our focus is on creating opportunities for women where they might realize greater economic empowerment and food security outcomes for their families; and that for these opportunities to be successful, contemporary gender relations must be examined.

²Specifically, the team met with representatives from the Field Crops Department at the Ministry of Agriculture; the Association of Smallholder Seed Marketing Action Group (ASSMAG); the Alliance for Green Revolution in Africa (AGRA); the National Smallholder Farmers Association of Malawi (NASFAM); the International Center for Research in Agroforestry (ICRAF); and Center for Agricultural Research and Development (CARD).

Farmers and Producers

Pigeon pea production and marketing activities are occurring to varying extents across the three regions. Not surprisingly, the South continues to dominate given the long tradition of pigeon pea cultivation and consumption in the region. Recent expansion in the processing capacities of most multinational grain exporting companies in the South has created a high demand for pigeon pea, thereby increasing the importance of the legume, not only as a staple food source but as a source of income to many farm households. The increasing importance of the legume as a cash crop has led farmers to adopt a mix of cropping methods, and there have been increases in the field space allocated to pigeon peas over other traditional crops. Compared to the South region, the legume is relatively new in the Central and North regions. For example, in the Nsipe EPA, District of Ntcheu, Central region, farmers reported that they had only grown pigeon pea for two seasons, and had lost almost all of the first harvests to pests and disease.

One of the primary requirements to participate in the pigeon pea value chain is access to land, which can be difficult for many women. In the North, interviews revealed that initial landholdings were allocated by the clan head to families. However, within each family, land inheritance is through the male line. Contrary to the North, in the Southern and Central regions, land inheritance is primarily through the female line. Across all regions, control over land is deeply rooted in the culture of patriarchy. Members of a household cultivate a common plot. The head of household (HHH), usually a man, is responsible for making major decisions with respect to land utilization and marketing of agricultural products. Men and women respondents agreed that men decided on how much of each cash crop (maize, bananas, and pigeon peas) to cultivate based on yearly income needs, and on farming practices (intercropping vs. crop rotation). Adoption and expansion of pigeon pea is determined by the cash generating potential of the legume, and this in turn influences the allocation of production resources—decisions made by men—to the legume.

Further, while the matrilineal land inheritance structure found in the Southern and Central regions may improve women's bargaining power within the household with respect to what to cultivate on the land, it does not necessarily translate to greater control for women over the asset or revenues generated therein. Access to, or ownership of, assets is a necessary but not a sufficient condition for women's empowerment. Given the limited availability of land in the Central and Southern regions, men's decision making power can limit expansion of the legume. Moreover, the decision to invest crop income on farm inputs is usually that of the head of household. Women reported a tendency by husbands to use revenue from pigeon pea sales to purchase fertilizers and seeds for maize (cash crop), while women were responsible for saving seeds for the production of the legume in the next planting season. There were no reports of using pigeon pea revenue explicitly for the benefit of the following year's yield. This practice has implications for crop yields, especially given the high risk of pest damage. Promoting pigeon pea adoption across all regions would require increasing the role of women in intra-household decision making.

The on-farm division of labor reveals that women are responsible for most of the pigeon pea production tasks. Women were more likely to be in charge of seed selection, seed storage, harvesting, transport, and cooking. In addition to performing production activities on the family

farm where pigeon pea and other cash crops such as maize are cultivated, women are responsible for household chores and childcare. Across all regions (especially in the North and Central), constraints on women's time due to their multiple roles (productive and reproductive), and the secondary position of the crop in terms of its cash generating potential often results in late planting and/or insufficient amounts of resources allocated to its production (cash crops are taken care of first). Our findings highlight that efforts to expand legume production are likely to have negative implications for women if the current gendered division of labor, in which women perform most of the work, is maintained.

Within the household, men and women differ in their priorities for growing legumes and hence in preference for different varieties. Women primarily express interest in pigeon pea first as a source of "relish" for household consumption, and second as a source of income. Men's awareness of legumes is as a source of income. As observed by women in the North and Central regions, improving access to markets will increase men's interest in pigeon pea, and, therefore, the risk of men appropriating the crop. This reasoning is congruent to what is observed in the South, where the high demand for the legume (for local consumption and export markets) and the potential of the legume to generate cash has led to greater interest in the legume amongst men.

Gender disparities in access to transportation resources limit women's participation in distant markets. Throughout Malawi, women frequently transport by headload, whereas men have access to bicycles or carts. Women's participation in markets is simultaneously limited by cultural restrictions on their mobility. We found a general belief (especially amongst men) that women are weaker than men and therefore vulnerable to attack, which generates concerns about women's safety when they travel farther away from home. In the North and Central regions with few buyers at the farmgate, commercialization requires travel. Inequalities in transportation assets and restrictions on women's mobility limit women's income activity (Kerr et al. 2013).

Women's limited access to transportation assets not only limits their participation in markets, but forcefully solicits the involvement of men in legume marketing. Thus, women's access to and control over income derived from pigeon pea production activities is circumscribed. Across all regions, men's participation in markets gives them greater access to and control over crop income. In the North and Central regions where access to pigeon pea markets/buyers is significantly limited, most women indicated that including husbands in the transportation and marketing of the pigeon peas quite often results in their husbands using the revenue generated from sales for their own personal needs (e.g. alcohol and/or to hire prostitutes). Men's use of crop revenue for their own personal gains was reported to be a significant source of household conflict (particularly in the Central region) and could result in a family going without food or being forced to find alternative food provisioning resources. In the Southern region it is customary for women who sold pigeon peas to return all generated revenue to men/husbands, who have greater decision making authority on the allocation of crop revenue to different household expenditure categories. Women had access to only a small part of the crop revenue, and they were expected to use their part for the provisioning of food for the household. Thus, innovations targeting food security through legume value chains should not only strive to improve women's participation in markets, and so doing give them direct access to crop revenue,

but should also identify mechanisms for improving women's position in decision-making (power) on the allocation of crop revenue within the household.

The cooptation of women's labor, their lack of control over cash resources, and exclusion from resource decision-making all evince continuing unequal gender relations in Malawi. Kerr et al. (2005) found that intra-household dynamics vary greatly by region in Malawi, with some families practicing more egalitarian income sharing. Generally, women in the North had less access to cash resources and/or control over household provisioning (ibid). While we found some instances of income sharing, the role of men as the authoritative household head was undisputed in our findings. Men's control over resources and decision-making (even when funds are gained solely through women's work) significantly impacts food security and poverty reduction within the household—especially in the Central and South regions where female respondents reported the use of pigeon pea revenue for alcohol and/or prostitutes. Given the primacy of food provisioning to women's daily lives (Snapp et al. 2002), this tendency can discourage women's participation in the market. Further, gender inequality has been shown to impact the success of nutrition enrichment programs throughout sub-Saharan Africa (Kerr et al. 2005).

Overall, there exists a strong potential for pigeon peas to address food security, increase incomes, and improve nutrition in Malawi at the producer level. However, interventions to increase pigeon pea cultivation will need to take into account intra-household and unequal gender relations as described above. For example, the finding that gender differences exist in preferences for legume type within the household—women prioritize food consumption benefits of the legume, while men prioritize cash benefits—is of concern given men's general control over cultivation decisions. While strengthening women's role in cultivation decision making could increase the chances of growing the legume, women's access to and participation in markets must be improved to enhance overall household food security. This is primarily a function of the potential for increased earnings that would be used to purchase food; however, given the relative protein content of legumes compared to maize, greater consumption rates can also improve nutrition outcomes.

Yet, market participation must be coupled with control over this revenue. Otherwise as our findings demonstrate, it is unlikely that any additional earnings will go toward food or household security needs as men's spending habits differ markedly from women's. Respondents were clear that food provision was the responsibility of women, and that men would prioritize spending on farm needs, labor, and possibly personal needs. As discussed briefly in the preceding section, programs or interventions that seek to address the gender-based constraints faced by women must specifically target men as important agents of change. For example, while group ownership or cooperative schemes are often a popular recommendation to increase entrepreneurial opportunities for women, to succeed in this context, it would be necessary to address the general patriarchal culture that limits women's social and physical mobility, in addition to including financial literacy training, access to credit, and market transport.

Retailers and Local Processors

Women's ability to participate in the value chain as local processors can be attributed to the fact that processing mainly involves cooking, a task perceived to be suitable for women and one they

can easily perform with the assets available to them. When men participate, they are more likely to be retailers than local processors. Most men described pigeon pea retailing as a profitable business due to the increased demand for the legume in the Southern region, and the high availability of the legume during harvest season. Men retailers were also involved in other income generating activities; they often invested funds generated from other activities into the legume during harvest season because they were relatively certain to obtain good prices off-season.

While men saw their participation in pigeon pea retailing as an opportunity for capital accumulation, women's decision to participate as retailers/local processors was driven by the necessity to generate income. One retailer stated she participates in pigeon pea retailing because she needs to earn income to pay school fees for her daughters as her husband found it inappropriate to educate girls (they were meant for marriage). Two of the women interviewed were heads of their household, one through separation and the other because her husband was in jail. This made their businesses a major source of income for household and childcare expenses.

Married women at this node who described themselves as business owners report joint decision making with their husbands when it came to the allocation of revenue generated from pigeon pea sales. However, discussions over allocation is not the same as control over spending, or the ultimate use of funds. In most cases, men's control over income from their wives' businesses was maintained, given the role men play in providing capital for these ventures—which is a constraint similar in nature to that faced by married women farmers.

Female heads of households seemed to have more control over business income. However, the size of their businesses were observed to be smaller than that of married women (likely due to resource differentials). Interventions to promote entrepreneurship for women must take into account intra-household dynamics or gender relations that have implications for the success of their businesses. Improving women's direct access to business capital could contribute to enhancing their role in decision making and control over revenue, assuming that these accounts would not be accessible to their husbands or male relatives, which may be unlikely in some of the more patriarchal regions of the country. However, given our findings that support the link between women's greater control over business income and greater food security and nutrition gains for their families, it is critical that measures be taken to increase women's financial literacy and revenue control. This could be accomplished through access to cooperative structures wherein financial resources have greater protection.

While women local processors identified themselves as business owners, it was also observed that within the household, men were mostly responsible for cultivation decisions—the husband decides which crop to grow. This is important because the fresh pigeon pea pods which are cooked for sale are obtained from the family farm (cultivated jointly by husband and wife). According to women in this group, limited access to seeds reduced production and affected the volume of the legume available to cook for sale.

Further, the gendered division of labor within the household and the cultural expectation that women take care of children and household chores reduces the time/labor women may commit to their businesses. Women retailers reported having to close their businesses early to carry out

culturally-influenced domestic responsibilities. In contrast, male pigeon pea retailers reported that the business was their primary focus; they could rely on their wives to handle domestic chores and did not have to limit store hours because of household responsibilities. Cultural expectations of women's domestic responsibilities restrict travel to regional markets where supplies are cheaper—thus limiting the scope, size, and profitability of their businesses.

Capital was identified as an important requirement to participate as a retailer of pigeon peas, and access to formal credit and loans for agriculture and related businesses is generally low in Malawi. High interest rates were reported to discourage borrowing and few retailers could secure group loans from FINCA (a microcredit institution). Instead, loans are given from friend and family networks. Limited access to capital hinders business expansion even when there are opportunities—it limits the size of inventory and the ability to buy in bulk for discounts. Women are more likely to buy on credit; however, they quite often do not break even, thus finding themselves in revolving debt to their creditors. The difficulty to repay debt in spite of the profitability of the business can be attributed to the common practice of diverting profits to other businesses and household needs.

Buyers and Traders

The intra-household divisions of labor and cultural restrictions on mobility described previously also limit women's effective participation in the value chain at this level. Even when women buyers are able to travel to heavy production zones to procure supplies, the perception that women are weaker than men places them at a greater risk of theft and vandalism. This limits their ability to buy larger volumes of grain at lower cost, affecting the performance of their business.

Like other nodes, capital is a requirement at this level, especially to purchase the grain from farmers. Gender differentials with respect to access to capital were identified as a major reason for the difference in men's and women's participation at this level. A male trader explained that: "Men usually have more business capital which is essential in this business." As discussed earlier, access to formal credit and loans in Malawi is generally low. However, men have greater access to cash resources, either through specialized networks or opportunities to earn cash income away from home. Cash is needed to build or rent storage facilities and to acquire vehicles used in transporting the grains to export buyers and processors. Men at this node owned warehouses separate from their homes, whereas the single woman used the house her family lived in for legume storage. Poor storage conditions have implications for the quality of the grain and the price received. Supporting women's participation as buyers and traders will require improving their access to credit so that they may invest in storage, other infrastructure, and/or business training as needed. However, as mentioned above, credit opportunities must be combined with training on financial literacy and business support.

Promoting traditional credit opportunities is complicated however, as women's ability to participate in income generating opportunities is restricted by cultural expectations of their productive and reproductive labor. Much like other nodes of the value chain discussed, it will be necessary to address local gender norms that reinforce inequalities through educational programming with both men and women. However, while education can complement other

interventions, education alone is not sufficient to increase women's access to credit. Options for group loans that could be administered through women's cooperatives should be explored, along with other microcredit schemes that can help to foster economic empowerment and business acumen.

Frequent price fluctuations impact profitability for actors and increase the risk of doing business. Men mentioned this as one of the factors limiting women's participation. Men described potential women colleagues as unlikely to negotiate better prices, easily taken advantage of by other actors in the market, and less able to withstand the pressure that business exerts. Women discussed fears of being cheated by the exporters/processors, therefore often relying on their husband or other male relatives for the selling of grains to large-scale export buyers.

Large Scale Buyers and Processors

As noted previously, there are no women currently engaged at this level of the value chain. However, the discussions did reveal that even when women were successfully trained to perform business related tasks, the requirement to stay in the rural areas and sometimes away from family stopped women from performing the role of a buying agent.

Buyers for large scale export/processing companies observed differences in the quality and quantity of grain purchased between women and men, where women were perceived to sell higher quality. This difference was attributed to the common practice of men stealing grain from their wives before she had winnowed the crop (winnowing is women's work). However, as vendors or farmers, men brought in larger quantities for sale than women. If women's cooperatives were able to scale up their supply, it could be possible for them to capitalize on the market preference for their grain.

Respondents from these companies jointly agreed that the current pigeon pea production level in Malawi is insufficient to meet the demand for local consumption as well as for the export market; thus there is huge growth potential for this value chain. Notwithstanding the opportunities, they observed that the lack of certified/branded seeds remains a major challenge to the pigeon pea value chain in Malawi. Other challenges identified include variable access to irrigation; the lack of storage facilities among traders (affects the quality of grain brought to sell as well as the price they receive); increased transport costs due to the landlocked nature of the country; differing cultivation strategies amongst farmers (farmers have a subsistence mentality and do not see agriculture as a business); and high competition amongst export market buyers.

CONCLUSION AND RECOMMENDATIONS

Innovations to scale out multipurpose legumes in Malawi must take into consideration gender specific factors that have implications for adoption and expansion at the farm level, and business performance at post-farm stages of the value chain. The link between legume adoption/expansion, food security, and poverty reduction is mediated by intra-household dynamics and gender relations. As household heads, men control income from pigeon pea sales, limiting women's incentives to expand production beyond household consumption needs and decreasing the potential for this legume to contribute to improved food security and poverty

reduction. Existing evidence supports the linkages between increased income for women and better food security and nutritional outcomes (Kerr 2007). Empowering women economically is essential for the harvesting of the potential food security and poverty reduction benefits of legume expansion and commercialization.

Efforts to support retailing and to promote greater participation of women in the value chain should identify micro-lending schemes that support women's access to loans. However, for microfinance schemes and other capital investments to succeed, there is a need to pay attention to the competing cultural demands on women's time and labor, and to train women on business and financial management. For example, collective action amongst farmers³, if properly designed, has the potential to increase bargaining power, increase saleable volumes⁴, and increase access to capital. Group action could be particularly beneficial to women who face mobility constraints—providing an incentive for buyers to travel to them given the increased quantity of pigeon pea available. However, for these potential benefits to be harnessed, the design of collective groups must facilitate gender equitable participation and benefit sharing mechanisms amongst members.

Future research should investigate gendered differences in the acquisition and utilization of price and other market information in order to better design and target gender-sensitive innovations for improving reliable access to these business needs information.

The tables below summarize the specific gender-based constraints identified at each node of the value chain and recommendations for dealing with each constraint.

³ Compared to other countries in Sub-Saharan Africa, group action amongst farmers is very limited in Malawi, and this was explained by lack of trust among smallholder farmers.

⁴ Only about 10kg of seeds are required to plant 1 hectare of land as opposed to a legume like common bean which requires about 80kg to plant a hectare.

Table 2. Gender-Based Constraints in Pigeon Pea Cultivation and Marketing: Farm Level

Constraint/Opportunity	Recommendation	Rationale
<ul style="list-style-type: none"> - Across all regions, women play a very limited role in farm management and investment decisions (what combination of crops to grow, area to allocate to each crop, how to plant, inputs to use) due to cultural norms that designate men as household heads, and therefore responsible for most important decisions within the household. 	<ul style="list-style-type: none"> - Invite women (a quota for women) and men to participate in education on farm management/agronomic practices; incorporate in the training activities that will support joint participation in household and farm management decision making. - Support women’s direct access to and participation in markets 	<ul style="list-style-type: none"> - Conflict of interests and gender differences in preferences for different types of legumes and in motives for growing different legumes suggest that decisions made by men do not necessarily reflect the needs of women. Interventions that encourage joint decision making could assert women’s needs and preferences in overall household cultivation decisions. Linking women farmers to markets will increase their direct access to pigeon pea revenue, improving their role in decision making within their household.
<ul style="list-style-type: none"> - Women’s access to markets is limited due to cultural restrictions on their mobility and limited access to transportation assets (e.g. bicycles and carts). - These mobility restrictions also affect their bargaining/negotiation power and consequently the price they receive for their legume. 	<ul style="list-style-type: none"> - Organize women farmers in groups for the collective bargaining/marketing of their produce. - Education and training for both genders regarding benefits to women’s economic empowerment - Train group members on aspects of group functioning and management to achieve best outcomes. - Train group leadership on business management and marketing skills (e.g. negotiation, weighing of grains, etc.) 	<ul style="list-style-type: none"> - Collective marketing will increase the volume of pigeon pea available for sale. Larger volumes will encourage buyers to meet women in the villages. Group marketing can also be helpful in fetching better prices for the legume. - Organized in groups, women farmers can jointly undertake some value-added activities such as drying, winnowing, sorting, and bagging, thereby reducing the time and workload associated with conducting these activities as individuals. Higher quality can be advantageous in terms of helping women fetch better prices.
<ul style="list-style-type: none"> - Women have limited control over crop revenue, even for the crops they grow, as decision making over the allocation of crop revenue is the domain of men in their role as heads of household. 	<ul style="list-style-type: none"> - Identify mechanisms to foster more gender equitable decision making authority in the allocation of crop revenue or in control over crop revenue. 	<ul style="list-style-type: none"> - Increasing women’s control over crop income is likely to support investments in crops that are a priority to them in terms of their roles within the household, and also those crops that are more likely to directly increase their incomes.

Table 3. Gender-Based Constraints in Pigeon Pea Retailing and Processing

Constraint	Recommendation	Rationale
<ul style="list-style-type: none"> – Women have limited access to cash-earning opportunities which impacts the size of their business, and their overall ability to make any business related investments/expenditures, such as hiring transportation. – Culturally influenced roles (household/ domestic chores) for women and the restrictions on their mobility limit market travel opportunities and the time they may invest in their businesses. 	<ul style="list-style-type: none"> – Invest in innovative approaches that will enhance women’s access to credit. For example, using approaches that are based on group membership, and providing women with literacy training to build their capacity in loan application processes. – In conjunction with access to credit, train women on business management practices to increase loan repayment rates. – Investments in technologies that will limit time spent on household chores (maize millers). – Organize women retailers in groups, build trust amongst group members, and promote group transportation of merchandise from point of purchase to markets. – Education and training for both genders regarding benefits to women’s economic empowerment. 	<ul style="list-style-type: none"> – Improving women’s access to cash resources will allow them to make bulk purchases at a discount, hire transport, hopefully enabling them to break even and/or be profitable. Overall, access to credit will improve the performance of women’s businesses. – Technologies that make household chores more time efficient could increase women’s ability to invest time in business pursuits. Promoting group transportation of merchandise could reduce costs/increase profits.

Table 4. Gender-Based Constraints in Pigeon Pea Buying and Trading

Constraint	Recommendation	Rationale
<ul style="list-style-type: none"> – Women have limited access to cash-earning opportunities which impacts the size of their business, and their overall ability to make any business related investments/ expenditures, such as hiring transportation and building storage facilities. – Women’s poor negotiation skills (linked to their need to do business as quickly as possible to return to their families) puts them at a risk of selling at lower prices. 	<ul style="list-style-type: none"> – Invest in innovative approaches that will enhance women’s access to credit. For example, using approaches that are based on group membership, and providing women with literacy training to build their capacity in loan application processes. – In conjunction with access to credit, train women on business management practices to increase loan repayment rates. – Along with the literacy training mentioned above, women need access to training on business related skills. Further, collective efforts may be necessary to counteract domestic/cultural mobility constraints. – Education and training for both genders regarding benefits to women’s economic empowerment. 	<ul style="list-style-type: none"> – Improving women’s access to cash resources will allow them to make bulk purchases at a discount, hire transport and labor, and build transport. Hopefully this will enable them to break even and/or be profitable. Overall, access to credit will improve the performance of women’s businesses. – Business related training can help women to negotiate effectively, and could be especially useful for collective/group efforts. Promoting group transportation of merchandise could reduce costs/increase profits/address cultural mobility constraints.

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