

New Alliance Policy Acceleration Support: Malawi Project (NAPAS:Malawi)

AN ANALYSIS OF MALAWI'S PIGEON PEA VALUE CHAIN

By

Nathalie M. Me-Nsope and Flora J. Nankhuni



Food Security Policy *Research Papers*

This *Research Paper* series is designed to timely disseminate research and policy analytical outputs generated by the USAID funded Feed the Future Innovation Lab for Food Security Policy (FSP) and its Associate Awards. The FSP project is managed by the Food Security Group (FSG) of the Department of Agricultural, Food, and Resource Economics (AFRE) at Michigan State University (MSU), and implemented in partnership with the International Food Policy Research Institute (IFPRI) and the University of Pretoria (UP). Together, the MSU-IFPRI-UP consortium works with governments, researchers and private sector stakeholders in Feed the Future focus countries in Africa and Asia to increase agricultural productivity, improve dietary diversity and build greater resilience to challenges like climate change that affect livelihoods.

The papers are aimed at researchers, policy makers, donor agencies, educators, and international development practitioners. Selected papers will be translated into French, Portuguese, or other languages.

Copies of all FSP Research Papers and Policy Briefs are freely downloadable in pdf format from the following Web site: www.foodsecuritypolicy.msu.edu.

Copies of all FSP papers and briefs are also submitted to the USAID Development Experience Clearing House (DEC) at: <http://dec.usaid.gov/>.

AUTHORS

Nathalie M. Me-Nsope is Assistant Professor, International Development, Dept of Agricultural, Food and Resource Economics, Michigan State University and Flora J. Nankhuni is Associate Professor, International Development (AFTRE, MSU) and Senior Policy Advisor to the Ministry of Agriculture, Irrigation and Water Development in Malawi.

Authors' Acknowledgment:

The authors are grateful for the financial support that made this study possible which was provided by the Malawi mission of the United States Agency for International Development through the New Alliance Policy Acceleration Support:Malawi Project (NAPAS:Malawi). NAPAS:Malawi is implemented by Michigan State University (MSU), the International Food Policy Research Institute and the University of Pretoria under the Global Feed the Future Innovation Laboratory for Food Security Policy in the Department of Agricultural, Food and Resource Economics at MSU. The team is grateful for reviews and comments provided by Dr. Todd Benson (IFPRI) and the maps he produced. The team is also thankful to stakeholders that were consulted for individual interviews, key informant interviews and focus group discussions and the team of research assistants that helped with data collection, particularly Dr. Sera Gondwe and Mr Zephania Nyirenda for their data collection supervisory role, Mr. Joshua Kafoteka for supervising data entry, and Mr Kennedy Mwene Munyapala for supporting the NAPAS team in identifying pigeon pea farmers and farmer groups. We also thank Patricia Johannes for editing and formatting assistance.

This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future initiative. The contents are the responsibility of the study authors and do not necessarily reflect the views of USAID or the United States Government.

Copyright © 2018, Michigan State University. All rights reserved. This material may be reproduced for personal and not-for-profit use without permission from but with acknowledgment to MSU.

Published by the Department of Agricultural, Food, and Resource Economics, Michigan State University, Justin S. Morrill Hall of Agriculture, 446 West Circle Dr., Room 202, East Lansing, Michigan 48824, USA.

TABLE OF CONTENT

LIST OF TABLES	vi
LIST OF FIGURES.....	vii
LIST OF ACRONYMS.....	vii
1. INTRODUCTION.....	1
1.1. Background.....	1
1.2. Context for the Value Chain Study.....	1
2. METHODOLOGY AND DATA.....	3
3. PRODUCTION.....	5
3.1. Pigeon Pea Production in Malawi.....	5
3.1.1. Where is Pigeon Pea Produced in Malawi?.....	5
3.1.2. Pigeon Pea Cultivation Practices.....	6
3.2. Trend in Global Pigeon Pea Production.....	9
3.3. Trend in Pigeon Pea Area Harvested and Yield.....	10
4. PIGEON PEA TRADE AND PRICES.....	12
4.1. Global Pigeon Pea Trade (Exports and Imports).....	12
4.2. Global Price Trends for Pigeon Pea.....	14
4.3. Regional Pigeon Pea Trade.....	16
4.4. Domestic/Local Market Trade.....	16
5. CONSUMPTION.....	18
6. MARKETING/COMMERCIALIZATION.....	19
7. ACTORS IN MALAWI'S PIGEON PEA VALUE CHAIN.....	22
7.1. Input Suppliers.....	22
7.1.1. Pigeon Pea Seed System: Breeding, Production and Distribution.....	22
7.1.2. Chemicals—Pesticides/Insecticides.....	24
7.2. Farmers.....	25
7.3. Agricultural Extension Officers.....	26
7.4. Farmer Organizations or Groups.....	27
7.5. Intermediate Traders/Buyers.....	31
7.6. Retailers.....	32
7.7. Large Buyers/Assemblers and Processors/Exporters.....	32
7.8. Commodity Exchange Systems.....	33
7.9. Other Service Providers—The Business Innovation Facility (BIF).....	36
7.10. Profitability Analysis and Prive Value Changes along some Nodes of the Value Chain.....	37
8. RELATIONSHIPS ALONG THE VALUE CHAIN.....	39
8.1. Horizontal Linkages.....	39
8.2. Vertical Linkages.....	39
9. CHALLENGES IN MALAWI'S PIGEON PEA SECTOR.....	40
9.1. Production Challenges.....	40
9.1.1. Insufficient Supply of the Volume and Quality of Grain Desired.....	40
9.1.2. Availability, Access to and Utilization of Improved Pigeon Pea Seed Varieties.....	40
9.1.3. Poor Farm Management Practices and Weak Extension Services.....	49
9.1.4. Climate Change.....	49
9.1.5. Insect Pest Damage.....	50
9.1.6. Livestock Damage.....	51

9.1.7. Labor Availability and Access to Land	52
9.1.8. Recommendations for Dealing with Production Challenges	52
9.2. Marketing Challenges	56
9.2.1. Farm-Level Marketing Challenges.....	56
9.2.2. Retail Level Challenges	61
9.2.3. Large Exporters/Processors	62
9.2.4. Additional Recommendations for Dealing with Pigeon Pea Marketing Challenges.....	64
10. OPPORTUNITIES IN MALAWI'S PIGEON PEA SECTOR	66
10.1. Growing Demand for Pigeon Pea in the Global Market	66
10.2. Highly Efficient Decorticators	69
10.3. Regional Demand for Malawi's Pigeon Pea.....	69
10.4. Declining Tobacco and Cotton Prices	70
10.5. Potential for Pigeon Pea as a Feed Ingredient	70
11. DYNAMIC TRENDS –THREATS TO THE COMPETITIVENESS OF MALAWI'S PIGEON PEAS.....	72
11.1. Global Market	72
11.1.1. Intense Competition from Myanmar, Tanzania and Mozambique.....	72
11.1.2. Surging Demand for Substitutes	73
11.2. Domestic Market	74
12. CONCLUSION	76
12.1. Issues in the Production of Pigeon Peas.....	77
12.2. Issues in the Marketing of Pigeon Peas.....	78
REFERENCES.....	81

LIST OF TABLES

TABLE	PAGE
1. Survey Location and Participants.....	4
2. Area Cultivated for Pigeon Peas–Acres	6
3. Pigeon Pea Varieties in Malawi.....	8
4. Total Volume and Value of Pigeon Pea Imports by Country of Origin in 2014-2016.....	13
5. Form in Which Pigeon Pea is Sold at the Farm Level	19
6. Buyers of Pigeon Peas at the Farm Level	20
7. Pigeon Pea Marketing Channels for Farmers Groups	21
8. Inclusiveness of Farmer Groups	28
9. Criteria/Requirements for Group Membership	29
10. Share of Total Pigeon Pea Production Sold through the Commodity Exchange Systems—2012-2016.....	35
11. Pigeon Pea Farmer Profitability Analysis per Acre	37
12. Price Changes along Some Nodes of the Value Chain	38
13. Production of Groundnut and Pigeon Pea Seed through a Revolving Fund Scheme Managed by ICRISAT in Malawi–(1999-2008).....	41
14. Distribution of Legume Seeds Redeemed with FISP Vouchers (Nearest Metric Tons)	43
15. Regional Distribution/Breakdown of Type of Legume Seeds Sold (Metric Tons).....	43
16. Common Pigeon Pea Varieties Cultivated by Smallholder Farmers.....	46

LIST OF FIGURES

FIGURE	PAGE
1. Pigeon Pea Production (Metric Tons) and Area Cultivated (ha) in Malawi: 2004/05-2016/17	5
2. Pigeon Pea Production in Malawi by Agricultural Development Division, 2006-17	6
3. Estimated Pigeon Pea Production in Malawi by District, 2016/17 Cropping Season, Metric Tons.	7
4. Suitability Map for Pigeon Pea Grown under Traditional Management in Malawi.....	7
5. Pigeon Pea Production (Tons): 2005-2014.....	9
6. Share of Major Pigeon Pea Producing Countries on Total Global Output: 1961-2014.....	10
7. Trend in Pigeon Pea Yield in Malawi Compared to Competitors: 2005-2017	11
8. Total Volume and Value of Pigeon Pea Imports into India—2014-2016	12
9. Total Volume and Value of Pigeon Pea Imports into India from Malawi.....	14
10. Average Price per Unit of Pigeon Peas Imported into India (All Sources): 2014-2016.....	14
11. Average Price per Unit of Pigeon Imports into India from Malawi.....	15
12. Average Price per Unit of Pigeon Imports into India from Mozambique	15
13. Average Price per Unit of Pigeon Imports into India from Tanzania.....	15
14. Malawi’s Pigeon Pea Annual Average Nominal and Real Retail Prices in Local Markets (MK/ kg) – 2005 to 2017	16
15. Pigeon Pea Marketing Structure	26
16. Relationship between Availability of Certified Pigeon Pea Seed and Pigeon Pea Yields in Malawi.....	42
17. Percentage of Farmers Sourcing Pigeon Pea Seeds or Planting Material from Different Sources.....	47
18. Number of Farmers Experiencing Each Cultivation Challenge (N=231).....	50
19. Suitability Map for Pigeonpea Grown under Improved Traditional Management in Malawi	53
20. Challenges in the Marketing of Pigeon Pea	56
21. Pigeon Pea Production Growth Rate 2005-2014.....	67
22. Pigeon Pea Yield Growth Rate 2005-2014.....	67

LIST OF ACRONYMS

ACE	Agricultural Commodity Exchange for Africa
ADD	Agricultural Development Division
ACHX	Auction Holding Commodity Exchange
ADMARC	Agricultural Development and Marketing Corporation
BASFAM	Balaka Smallholder Farmers Association
BIF	Business Innovation Facility
CES	Commodity Exchange Systems
CF	Clinton Foundation
DARS	Department of Agricultural Research Services
DTIS	Diagnostic Trade Integration Study
EPA	Extension Planning Area
ETG	Export Trading Group
FAOSTAT	Food and Agricultural Organization Statistics
FOL	Farmer Organization Ltd
FGD	Focus Group Discussion
GLAL	Grain Legumes Association Limited
GoM	Government of Malawi
GSL	Grain Securities Ltd
ha	hectare
ICRISAT	International Crop Research
kg	kilogram
LDT	Legume Development Trust
MoAFS	Ministry of Agriculture and Food Security
MoAIWD	Ministry of Agriculture, Irrigation and Water Development
MT	Metric tons
MWK	Malawian Kwacha
NAP	National Agriculture Policy
NAIP	National Agriculture Investment Plan
NAPAS	New Alliance Policy Acceleration Support Project
NASFAM	National Smallholder Farmers Association
NGO	Non-Governmental Organization
STAM	Seed Traders Association of Malawi
SSU	Seed Service Unit
USD	United States dollars
WHRS	Warehouse Receipt Systems

1. INTRODUCTION

1.1. Background

Pigeon pea (*Cajanus Cajan*) is a crop that is well adapted in the semi-arid tropics. The legume is also highly drought tolerant (compared to maize, tobacco and cotton), and its long taproot is advantageous in accessing nutrients in deeper soil profiles (Snapp et al. 2003). The crop is also well adapted to the needs of poor smallholder farmers in the semi-arid tropics (Jones, Freeman, and Le Monaco 2002), because compared to maize, an important cash crop in Malawi, pigeon pea production is less resource intensive.¹ Because of its adaptation to the agro-ecology in eastern Kenya, southern Malawi, northern Mozambique, southern Tanzania and northern Uganda, pigeon pea is a legume of choice grown by local population and the crop is particularly important in the diets in these regions (Jones, Freeman, and Le Monaco 2002).

Smallholder farmers in eastern and southern Africa grow pigeon pea for subsistence and as a cash crop (Jones, Freeman, and Le Monaco 2002). At the household-level, the plant has multiple uses—its dried seed, pods and immature seeds are consumed as green vegetables; the leaves and stems are used for fodder and the dry stems are used as fuel (Simtowe et al. 2010). Compared to the dominant maize crop, pigeon pea grain has a high protein content of 21 to 25 percent (ibid), thus making it a valuable source of protein for many poor families who cannot afford other sources of protein, such as dairy and meat (Me-Nsope and Larkins 2016). The crop is also promoted in Malawi for its potential contribution to soil fertility through biological nitrogen fixation as well as from the leaf fall and recycling of the nutrients (Mhango, Snapp, and Phiri 2012; Snapp et al. 2002).

Pigeon pea also has a strong potential to contribute to national food security through market possibilities. Almost two decades ago, Orr et al (2014) found that in the southern region of Malawi, the legume accounts for approximately 20% of household income among poor farmers. Several studies observe the potential the crop offers to improve livelihoods of resource-poor farmers (Bie 2008; De Schutter 2010); Mula and Saxena 2010). Despite these numerous potential benefits, smallholders continue to face numerous challenges that limit their ability to reap these benefits. Several questions remain about the performance, competitiveness, and profitability of pigeon pea production and marketing, and the ability of the value chain to contribute to the food security and poverty reduction objectives of the country of Malawi.

1.2. Context for the Value Chain Study

The Government of Malawi (GOM) approved the National Agriculture Policy (NAP), which is the overarching policy for the agriculture sector of Malawi, in September 2016. The NAP spells out the vision for a transformed agriculture sector that will be a key engine for economic growth and development of the country.

The goal of the NAP is “to achieve sustainable agricultural transformation that will result in significant growth of the agricultural sector, expanding incomes for farm households, improved food and nutrition security for all Malawians, and increased agricultural exports.” To achieve this goal, the sector must make strategic investments in various value chains that have the potential for sustainable and inclusive economic growth. These investments must deliver on a number of human

¹ For example, Kadale (2013) notes that although fertilizer can be useful to a pigeon pea crop, it tends to promote biomass and not necessarily, pod filling and so offers little benefit to yields

development outcomes spelled out in detail in the NAP document, including improving the food and nutrition security of Malawi, empowering women, youth and vulnerable groups in agriculture and enhancing institutional efficiency, coordination and capacity in the sector among other outcomes.

As part of making the right investments, the GOM is in the process of developing the National Agriculture Investment Plan (NAIP), using an evidence-based approach to prioritize investments in the sector. Therefore, the GOM with the support of the New Alliance Policy Acceleration Support Project (NAPAS) ordered a series of value chain studies to help the process of identifying priority value chains for investment in the agriculture sector during implementation of the NAIP. Among the identified value chains is the pigeon pea value chain.

2. METHODOLOGY AND DATA

The methodology for this value chain study mirrored the tasks in the Terms of Reference (TOR). The study began with a review of literature on Malawi's pigeon pea sector. The purpose of this review was to assess existing knowledge on the sector, and to identify knowledge gaps that had to be filled in order to achieve the overall purpose of the value chain study as outlined in the TOR. Specifically, the literature review examined secondary material on pigeon pea production, trade (international and export market) and consumption/demand in Malawi. The literature review also included a quick analysis of secondary data on pigeon pea to understand trends in production, productivity, marketing, pricing, processing and consumption/demand.

The literature review was proceeded by fieldwork in February of 2017, the purpose of which was to collect data from value chain actors on the knowledge gaps identified from the review of literature. In particular, primary data was collected through individual interviews with pigeon pea farmers, extension agents or agricultural officers, and pigeon pea retailers. Focus group discussions (FGDs) were held with members of farmer groups organized around pigeon peas. These groups include farmers clubs, farmer associations and cooperatives. The team worked with a representative of the Grain Legume Associations Limited (GLAL) of Malawi to select districts and Extension Planning Areas (EPAs) that were dependent on pigeon pea production. Still in consultation with the representative of GLAL, the team selected villages within the EPA and worked with the extension agent for the village to invite farmers who were willing to participate in the individual surveys as well as in the FGDs. The team also strived for a gender balance in the representation of men and women pigeon pea farmers in the individual surveys and in the FGDs. While the selection of farmers may not have been random (based on availability), there is no doubt that information direct from farmers is useful in informing the analysis and grounds the findings in reality.

Two-hundred and thirty-one (231) individual surveys were conducted with pigeon pea farmers across regions, districts and EPAs (Table 1). Twelve focus group discussions were also held with pigeon pea farmer groups across the districts. In each of the villages/EPAs visited, the team conducted a survey with extension agent/officer (N=9). A survey was administered to 41 pigeon pea retailers (20 in the Central, 21 in the South; 12 men and 28 women) across the regions. The retailers were randomly identified in the markets within the districts covered in the study. The enumerators also scanned the villages to identify intermediate traders/buyers (N=6; 2 in the Central and four in the South) and agro-dealers/input suppliers (N=4). The retailers, intermediate traders/buyers and agro-dealers who agreed to participate in the study were interviewed. Key informant interviews (KIIs) were also conducted with other value-chain actors. These actors include seed systems actors, exporters and processors, government officials, representatives of non-governmental organizations (NGOs) and other stakeholders involved in this value chain.

The rest of the report is structured as follows: Section 3 examines pigeon pea production from the global, regional and domestic perspective. Section 4 conducts an end market analysis for pigeon peas from Malawi—it examines global, regional and domestic pigeon pea trade and price trends in the different markets. Section 5 examines pigeon pea consumption in Malawi. Section 6 analyzes marketing and commercialization of pigeon peas in Malawi. Section 7 includes a mapping of the pigeon pea value chain—who are the actors, their roles/functions along the value chain. Section 8 examines relationships along the value chain. Section 9 examines challenges in production and in marketing of the legume, and ends up with recommendations on how to deal with the challenges to expand production and improve performance and gains from trade.

Table 1. Survey Location and Participants

Region	District	EPA	Number of Farmers	Number of Farmer Groups	Number of Non-Farmer Groups	Number of Extension Workers
South	Thyolo	Khonjeni	15	0	0	0
South	Thyolo	Matapwata	17	2	0	0
South	Balaka	Mpilisi	6	0	0	0
South	Mulanje	Milonde	15	1	1	1
South	Mulanje	Msikawanjala	32	2	1	1
South	Mulanje	Thuchira	12	0	0	0
South	Balaka	Ulongwe	36	2	1	1
South	Mangochi	Namkumba		0	1	1
Central	Kasungu	Chipala	35	1	0	2
Central	Ntcheu	Sharpe Valley	4	1	0	0
North	Karonga	Lupembe	21	1	1	1
North	Karonga	Nyungwe	27	1	0	1
North	Mzimba	Zombwe	11	1	1	1
Total			231	12	7	9

Source: Survey data.

Section 10 examines opportunities in Malawi's pigeon pea sector. Section 11 examines dynamic trends facing the sector in Malawi, i.e., external factors with a potential to threaten the development of this sector in Malawi. Section 12 is the concluding section.

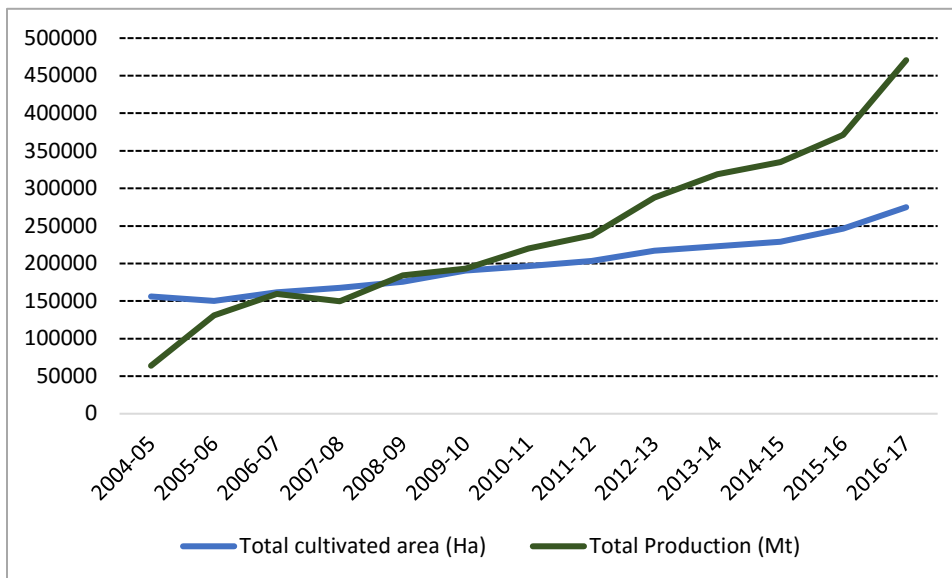
3. PRODUCTION

3.1. Pigeon Pea Production in Malawi

3.1.1. Where is Pigeon Pea Produced in Malawi?

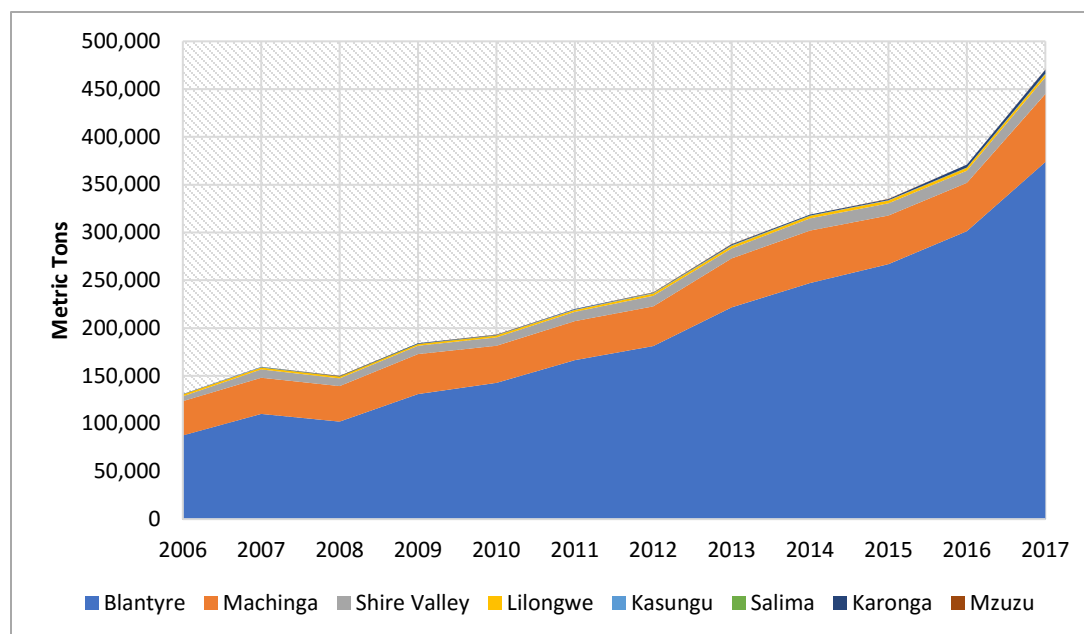
Pigeon pea production statistics by Ministry of Agriculture, Irrigation and Water Development (MoAIWD) for 2005-2017 supports growing production and an expansion in the area cultivated for the legume over time (Figure 1). The 2016/17 Agricultural Production Estimates Survey (APES) show that pigeon pea is the most important legume in Malawi, in terms of volume produced (35% of all legumes), followed by groundnuts (29%), soya beans (16%) and common beans (15%). Traditionally, production has been geographically concentrated in the South region (Figure 2), characterized by short rainfall duration, terminal droughts with high temperatures; as well as high population density and high land pressure (Makoka 2009; Mula and Saxena 2010). Although still minute, relative to the Southern region, production has been increasing in the Northern and Central regions (Karonga, Mzuzu, Lilongwe, Salima, and Kasungu). Consultations with stakeholders and individual interviews with pigeon pea producers during fieldwork also supported an expansion in these areas, an expansion that was attributed to farmers' desire to diversify their income sources (particularly true for cotton and tobacco farmers), as well as the expansion of large scale buyers/processors into the non-traditional pigeon pea growing zones, thereby providing a market for farmers to sell their produce. Figure 3 also shows estimated pigeon pea production in Malawi by district for the 2016/2017 cropping season while Figure 4 shows the areas that are suitable for pigeon pea production under traditional management practices. The maps clearly show that the Central region that has huge tracks of land moderately suitable for pigeon pea production is not being fully exploited.

Figure 1. Pigeon Pea Production (Metric Tons) and Area Cultivated (ha) in Malawi: 2004/05-2016/17



Source: MoAIWD Agricultural Production Estimates Survey (APES) data.

Figure 2. Pigeon Pea Production in Malawi by Agricultural Development Division, 2006-17



Source: MoAIWD Agricultural Production Estimates Survey (APES) data.

Note: Blantyre, Machinga and Shire Valley Agricultural Development Divisions (ADDs) are in the Southern region, Lilongwe, Kasungu and Salima ADDs are in the Central region while Karonga and Mzuzu ADDs are in the Northern Region.

3.1.2. Pigeon Pea Cultivation Practices

In Malawi, sowing/planting of pigeon pea takes place between November and December across the three agro-ecological zones (high, medium, and low), while the harvesting period is July-September in the high agro-ecological zones, June-August in the medium zones, and May-June in the low zones (FAO, Crop Calendar).² The legume is also mostly intercropped with other crops (for example, maize,³ cassava, beans), and its production is dominated by smallholder farmers who are unable to significantly expand cultivated area, and most of them are women (Makoka 2009). Primary data collected from the survey with individual farmers show that about 58% of these pigeon pea farmers surveyed cultivate less than 1.0 acre of land (Table 2).

Table 2. Area Cultivated for Pigeon Peas—Acres

Area (acres)	Frequency	Percent
0 to 0.5	41	17.7
0.5 to 1.0	93	40.3
1.0 to 2.0	53	22.9
2.0 to 5.0	39	16.9
> 5.0	4	1.7
Missing	1	.4
Total	231	100.0

Source: Authors' computation using survey data.

² <http://www.fao.org/agriculture/seed/cropcalendar/cropcalendar.do>

³ Maize is the dominant intercrop for pigeon pea in the South region of Malawi.

Figure 3. Estimated Pigeon Pea Production in Malawi by District, 2016/17 Cropping Season, Metric Tons

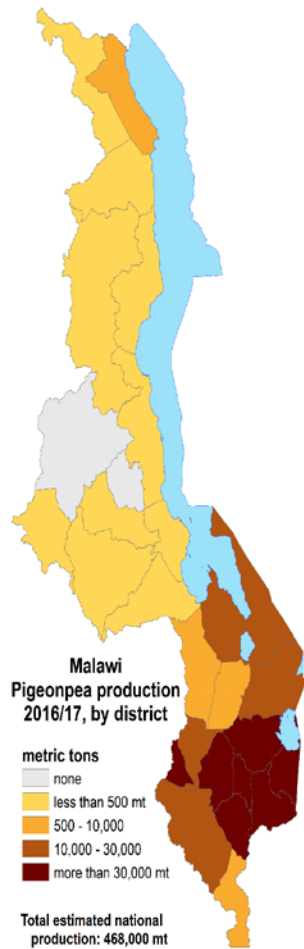
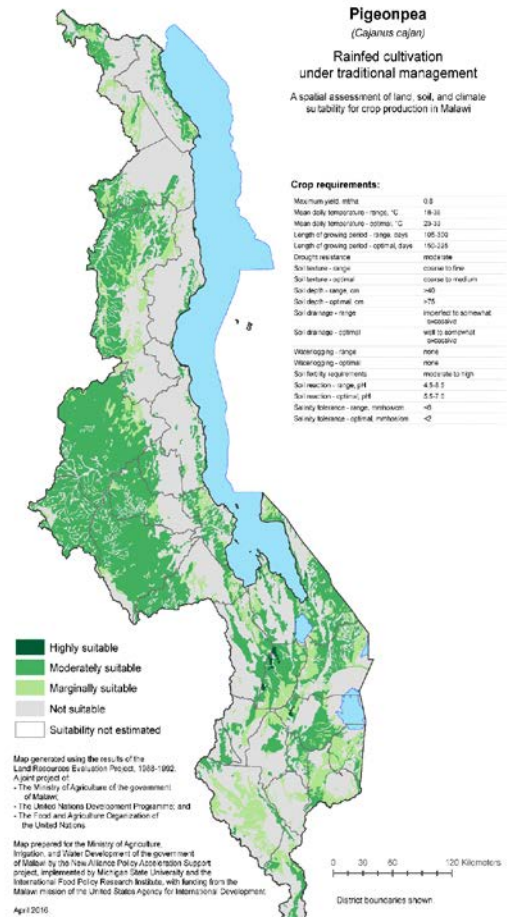


Figure 4. Suitability Map for Pigeon Pea Grown under Traditional Management in Malawi



Source: Maps produced by Todd Benson (IFPRI) using APES and Department of Land Resource Conservation data.

Ninety percent of the pigeon pea farmers surveyed (N=207) across all three regions indicated that they grow pigeon peas both to sell and for home consumption; sixty-eight percent of the farmers (157) observed that there was no difference between the varieties cultivated for home consumption and the varieties that they grow for commercial purposes. Pigeon pea varieties in Malawi are commonly distinguished either by the source of the variety—local versus improved varieties; or by the length of time taken for the variety to mature—long, medium and short duration varieties. Long-duration varieties are those that take 8-9 months to mature. Most local or traditional pigeon pea varieties are long duration (Me-Nsope Larkins 2016; Jones, Likoswe, and Freeman 2000). Medium-duration varieties are those that take about 5-6 months to mature or be ready for harvest (Me-Nsope and Larkins 2016). Short-duration varieties usually mature in about 120 days or less than four months to be ready for harvest (ibid). Traditional/local pigeon pea varieties are indeterminate long-duration types well adapted to the farming systems where they are grown (Jones, Freeman, and LeMonaco (2002).

For example, mthawajuni is the most popular traditional pigeon pea variety in the Central and the Southern regions of Malawi (Jones, Likoswe, and Freeman (2000)). (2000) and Kadale (2013) observed that the earlier maturing varieties were more susceptible to pest damage. Kananji et al (2009) also observe that for short duration varieties to give high yields there is need to spray against insect pests at flowering and pod filling stages of production.

The government of Malawi (GoM) through its Department of Agricultural Research Services (DARS), also known as the Chitedze and the International Crop Research Institute for Semi-Arid Tropics (ICRISAT) has developed several improved varieties that are high yielding and disease resistant for deep soils and short maturing types for drought prone areas. See Table 3 for a list of varieties identified in Malawi.

Table 3. Pigeon Pea Varieties in Malawi

Variety Name	Duration	Important Attributes	Year Released
ICP 9145 (<i>Sauma</i>)	Long	resistant to <i>Fusarium</i> wilt; and harbor high yield potential an improved variety	1987
ICEAP 00040 (<i>Kachangwi</i>)	long	Also, disease resistant; with yield potential at 1.9 ton/ha; seed size is much larger than Sauma Seed coat is much easier to remove during processing—preferred by processors Preferred for consumption Cooks very easily Is tastier than the rest Improved variety	2000
ICPL 93027	Short	less tolerant to <i>Fusarium</i> wilt; consumed as grain as well as a vegetable; opportunity for double cropping in regions with long or bimodal rainfall seasons.	2003
ICPL 87105	short	Same as previous	2003
ICEAP 00557 known locally as <i>Mwayi wathu alimi</i>	Medium	It is medium maturing (six months), so suitable for most agro-climatic conditions in Malawi; Yields up to 1.5 MT/ha can be obtained with good management. Preferred as a sale crop, because its early maturity affords farmers the opportunity to maximize returns Seed can be recycled for 3 years; Grain size is medium to large and its cream/white color is preferred by processors for toor dhal; It cooks quickly and farmers prefer it for its flavor.	
ICEAP 01514/15 Mthawajuni	Medium	Local variety	

Source: Rao et al. 2012.

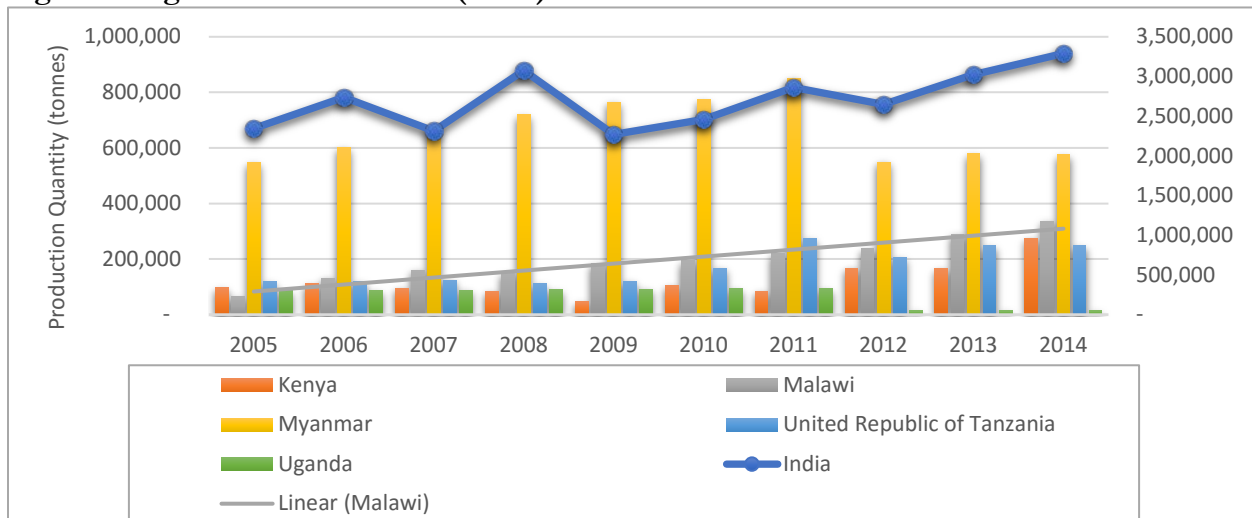
3.2. Trend in Global Pigeon Pea Production

Average production of pigeon pea by region in the period 1994-2014 shows that Asia accounts for about 86% of the world's production, Africa in second place with 12% and the Americas in third place with about 2% (FAOSTAT 2017). By country, India is the world largest producer of pigeon peas. In the period 2005-2014, India alone accounted for over 60% of global pigeon pea production, while Myanmar in second place contributed between 12% and 19% of the global pigeon pea production (FAOSTAT 2017). Pigeon pea production has generally been on the rise in India since 2005 (Figure 5, blue line with markers), meanwhile Myanmar's production has been declining since 2012 (Figure 6).

In Africa, pigeon pea production is concentrated in the eastern and southern countries; and major producing countries are—Malawi, Kenya, Tanzania, and Uganda (Simtowe et al. 2010). More recent pigeon pea production data in Africa shows that Malawi is the leading producer of pigeon pea in Africa, producing over 250,000 tons per year since 2012 and the growth in production has continued to increase to more than 450,000 tons in 2017 (Figure 2). Personal communications with key informants in Malawi suggest growing pigeon pea production in Mozambique, although the Food and Agricultural Organization Statistics (FAOSTAT) does not report pigeon pea data for Mozambique. Walker et al. (2015), using data from the TIA/IAI surveys, also supports growing pigeon pea production in Mozambique, with the highest levels of production in the district of Milange which borders Malawi.⁴ In Mozambique pigeon pea rose from the fifth ranking grain legume in 2001-02 to the first position in terms of production quantities in 2011-12, an increase that was also accompanied by rising market sales (ibid).

In terms of share in global pigeon pea production, recent data from FAOSTAT (2017) shows that Malawi has been facing strong competition in world production (Figure 6 the secondary vertical axis measures India's share in global pigeon pea production). Prior to the 1990s, Malawi dominated Myanmar and other African countries in terms of share in world production.

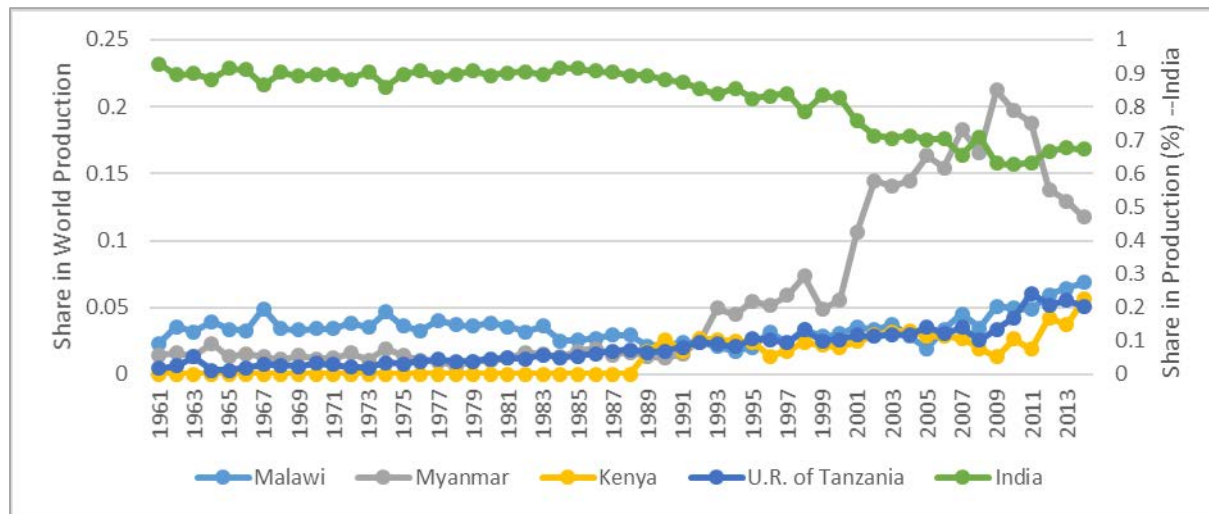
Figure 5. Pigeon Pea Production (Tons): 2005-2014



Source: Author's computation using FAOSTAT (2017) data.

⁴ Nationally representative agricultural surveys (known as the TIAs now called the IAIs) in Mozambique. Used data for 2002, 2003, 2005, 2006, 2007, 2008, and 2012.

Figure 6. Share of Major Pigeon Pea Producing Countries on Total Global Output: 1961-2014



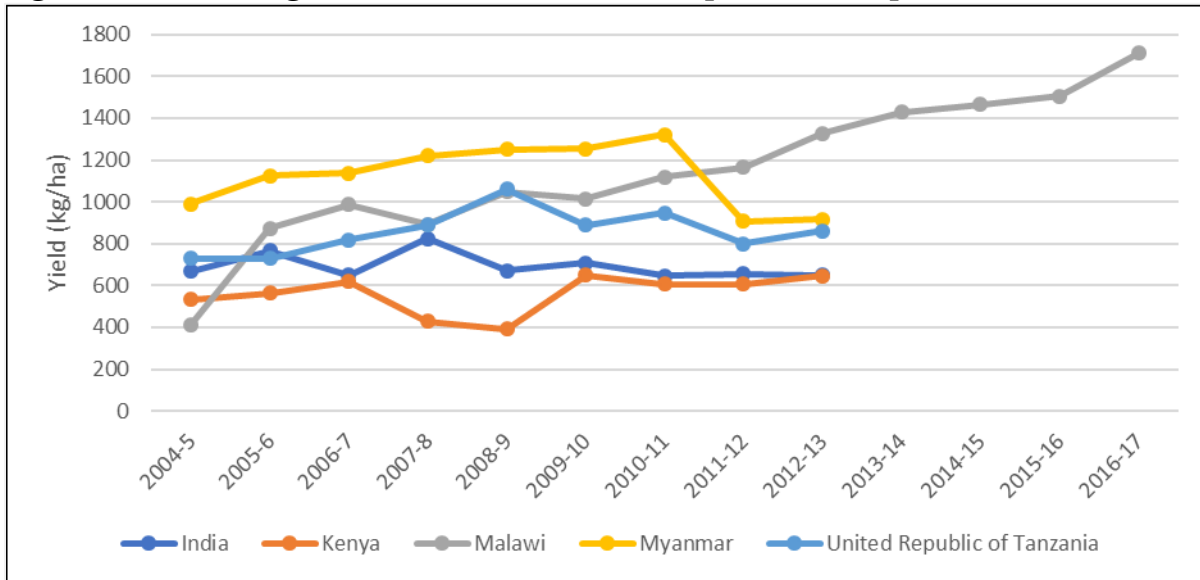
Source: Author's compilation using FAOSTAT 2017 data.

However, since 2000, Myanmar has multiplied its share in total world production, coming second place to India. Malawi's world production share decreased from 3.3% in the 1961-1989 period to 2.6% in the period 1990-2007, a decline that was attributed to a substantial increase in Kenya's and Myanmar's production share in the same period (see for example Lo Monaco 2003). Since 2011, Malawi's production shares have been on the rise and are still the largest in Africa, though still much lower than they were prior to 1990s (Figure 6).

3.3. Trend in Pigeon Pea Area Harvested and Yield

Figure 7 shows trend in pigeon pea yield for Malawi compared to other major pigeon pea producers (Tanzania, India, and Myanmar). The data supports yield increases for Malawi between 2006 and 2017, ranging from 400 kg/ha to 1712 kg/ha. In India yields were less than 800 kg/ha in the same period, and there has been a decline in yield since 2009. Tanzania also experienced declining yields in the period 2009 and 2012. However, yields in Tanzania resumed a positive trend in 2012, although still less than 1000 kg/ha. Yield per hectare has declined in Myanmar since 2011. The figures suggest that Malawi has experienced a more favorable trend in crop yield compared to its competitions (with moderate yield increases).

Figure 7. Trend in Pigeon Pea Yield in Malawi Compared to Competitors: 2005-2017



Source: Author's compilation using FAOSTAT 2017 data for 2004-5 to 2012-3.

Malawi's data for 2014-2017 is from MoAIWD (APES). APES data and FAOSTAT data from 2004-5 to 2012-3 is similar for Malawi.

4. PIGEON PEA TRADE AND PRICES

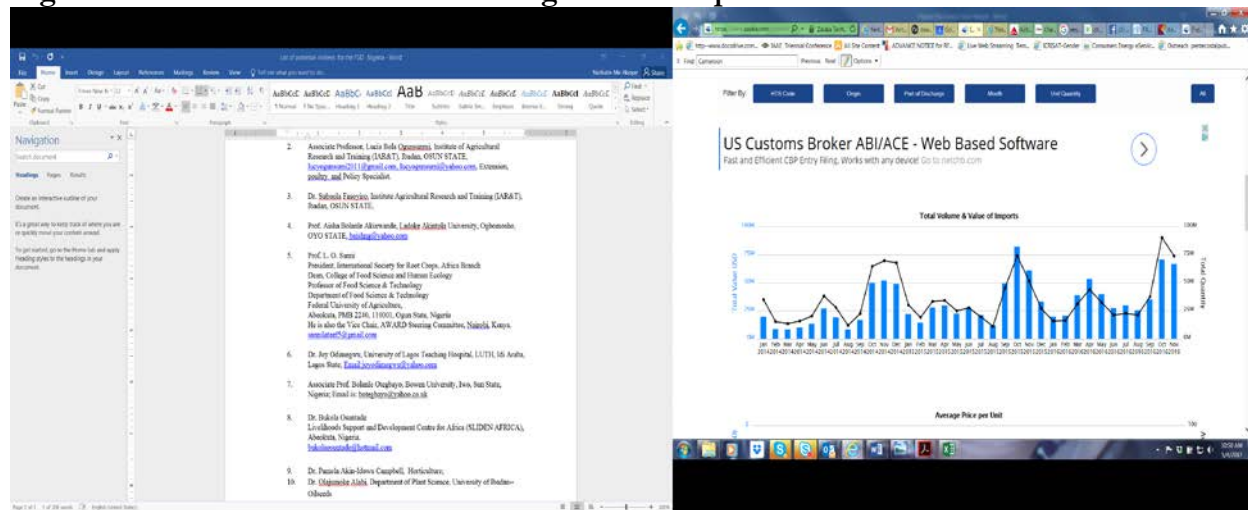
4.1. Global Pigeon Pea Trade (Exports and Imports)

There are challenges in the estimation of global pigeon pea trade. According to Mula and Saxena (2010), the complexities associated with knowing or gathering pigeon pea data are because most countries, even the major producing countries, do not separate pigeon pea from other pulses when reporting trade figures. Furthermore, the fact that only small amounts of processed and unprocessed pigeon pea enter world trade makes it difficult to estimate the international market potential for processed pigeon pea (decorticated and split, commonly known as dhal) and whole seed of pigeon pea (ibid).

India is the dominant destination for global pigeon pea exports since she is the largest producer and the largest consumer (Jones, Freeman, and Le Monaco 2002). Malawi exports dried whole pigeon pea grains and decorticated split peas to India, the dominant market for pigeon pea exports from Malawi (Makoka 2009). Other major exporters of pigeon pea, include Myanmar, Dominica Republic, and Nepal (Simtowe et al. 2010), and Mozambique, as will be shown below.

Global pigeon pea exports witnessed a substantial increase in the 2000s, an increase that was attributed to the aggressiveness of Myanmar in exporting its pigeon peas around the world (Mula and Saxena 2010). India remains the major importer of pigeon pea in the world. Prior to the 1990s, its import share was about 50% of global imports. Other major importers during this period were Venezuela (36%), Nepal (8%) and Trinidad (5%) (Simtowe et al. 2010). The share of global pigeon pea imports to India increased in the period 1990-2005, to about 87% (Simtowe et al. 2010). More recent import data (2014 to 2016) from www.zauba.com reveals seasonality in the quantity of pigeon pea imports into India (Figure 8). Total quantity imported is largest in September through November. This seasonality in imports is consistent with India's pigeon pea production calendar—i.e., planting/sowing occurring in June-July, growth stage in August-September, and harvesting occurs in October-November.⁵

Figure 8. Total Volume and Value of Pigeon Pea Imports into India—2014-2016



<https://www.zauba.com/user>

⁵ <http://agropedia.iitk.ac.in/content/pigeonpea-demand-and-supply>

As observed by KHCP (2012) India's production can only supply domestic consumption for the first 6-8 months of the year. This is supported by the observed pattern of imports reaching peak in the September to November window is sensible.

Overall, India's annual demand for pigeon pea imports from other countries is strongly negatively correlated with her own production of the legume. Total quantity of imports is much reduced in a year of high production; meanwhile a bad crop/production year is likely accompanied by increased demand for imports to meet consumption needs in India. Furthermore, trade policies could affect the volume of pigeon peas exported by Malawi to India. For example, in August of 2017, the Government of India restricted pigeon pea imports to a maximum of 200,000 tons, an order which was motivated by the Government of India's desire to protect local prices following a record production (Jadhav 2017). Such a move is likely to affect local exporters and farmers who may not have the capacity to store the legume in anticipation of more favorable trade environment.

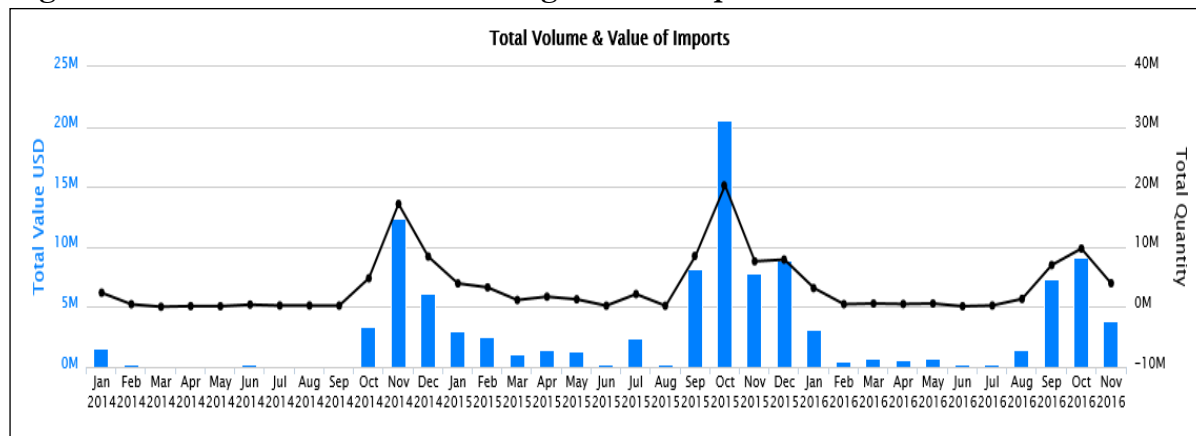
Total value of pigeon pea imports in India in the period 2014-2016 was estimated at \$1,129,823,365, for a total quantity of 1,207,377,889 metric ton (MT), an average value per shipment of \$128,098 and an average price per unit of \$0.94 per kilogram (kg). A breakdown by country of origin (Table 4) shows that in Africa, Tanzania is first place in terms of contribution to pigeon pea imports into India, accounting for 21.2% of India's total pigeon pea imports in the period 2014-16. Mozambique is second place to Tanzania in Africa, supplying 17.5% of total pigeon pea imports into India in the same period. Malawi comes in third place, supplying approximately 10% of total pigeon pea imports into India. See Figure 9 for a month-to-month movements in the value and volume of imports from Malawi to India. The graph illustrates that Malawi pigeon pea imports to India are usually at their peak between September and January.

Table 4. Total Volume and Value of Pigeon Pea Imports by Country of Origin in 2014-2016

Country	Total Quantity (KGS)	Total Value USD	Average value per shipment USD	Average price per unit USD
Myanmar	449,110,555	430,901,927	125,117	0.96
Tanzania	272,487,020	239,033,836	120,846	0.88
Mozambique	224,949,149	198,005,001	137,695	0.88
Malawi	120,166,648	109,903,510	116,547	0.91
Sudan	81,070,312	90,983,771	189,945	1.12
Kenya	33,365,032	30,990,409	109,507	0.93
Uganda	17,066,938	19,809,138	133,846	1.16

Source: Author's computation using data from <https://www.zaubacom/user>.

Figure 9. Total Volume and Value of Pigeon Pea Imports into India from Malawi



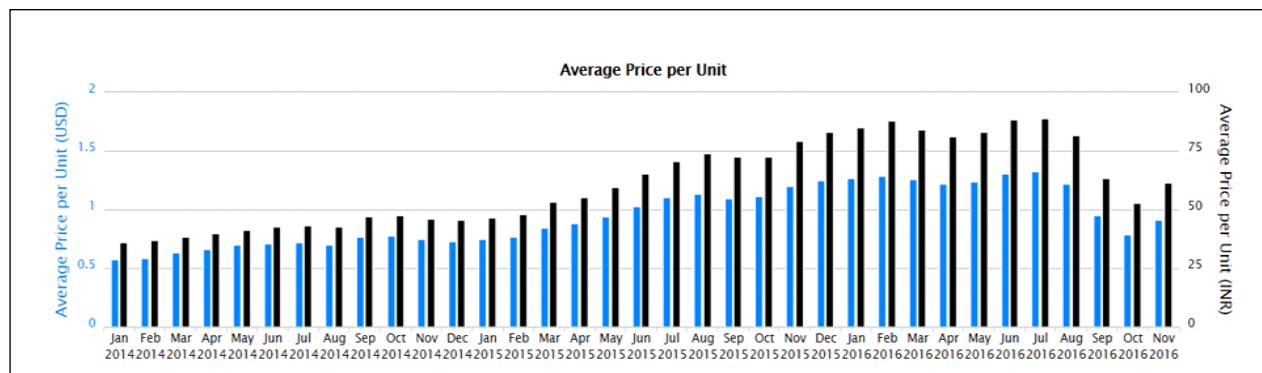
Source: <https://www.zauba.com/user>

4.2. Global Price Trends for Pigeon Pea

As the major producer and consumer of pigeon pea around the globe, the Indian market plays a very important role in the global pricing of pigeon pea. Pigeon pea prices in Malawi and in the other exporting countries in Africa are correlated with export prices linked to India’s market price, which in turn is linked to India’s harvest (Kadale 2013). A poor harvest in India pushes up the market price and encourages farmers in Malawi to produce the crop or vice versa (ibid). An import ban in India, such as the recent one is also likely to leave farmers in a disadvantaged position by pushing down the price offered for their grains.

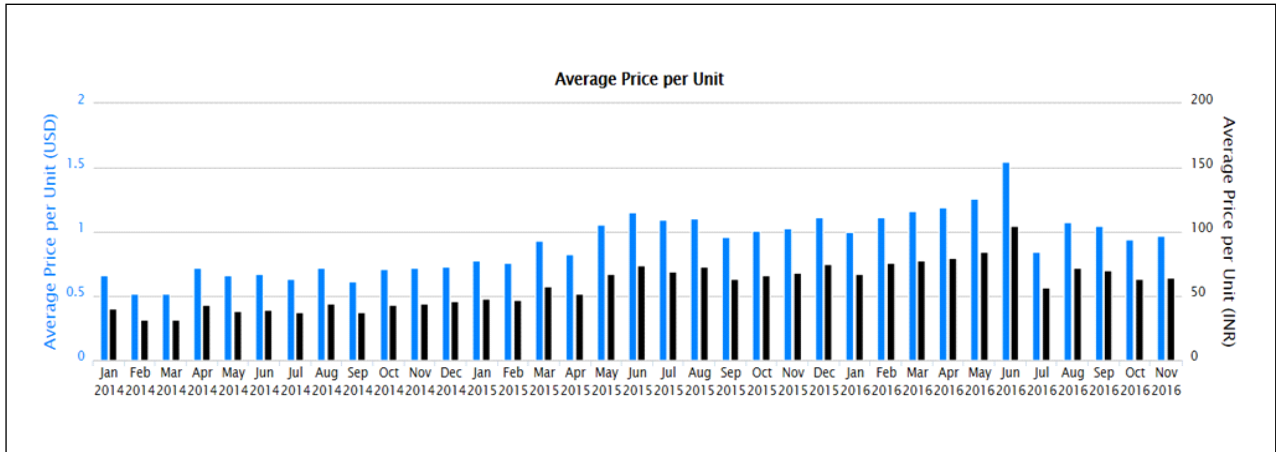
Export prices for pigeon pea for Malawi or competing countries were not easy to find. Simtowe et al. (2010) observe an increasing trend for pigeon pea prices for Malawi from 0.30 US Dollar (USD) per kilogram in 1990 to 0.60 USD per kilogram in 2006. Also as shown in Table 4, the price per kilogram in 2014-2016 was 0.91 USD per kilogram, and this was higher than 0.88 USD for Mozambique and Tanzania, Malawi’s strongest competition in Africa in terms of total quantity of pigeon pea exported into India. This positive price trend reveals a growing global demand for pigeon pea. (See Figures 10, 11, 12, 13.)

Figure 10. Average Price per Unit of Pigeon Peas Imported into India (All Sources): 2014-2016



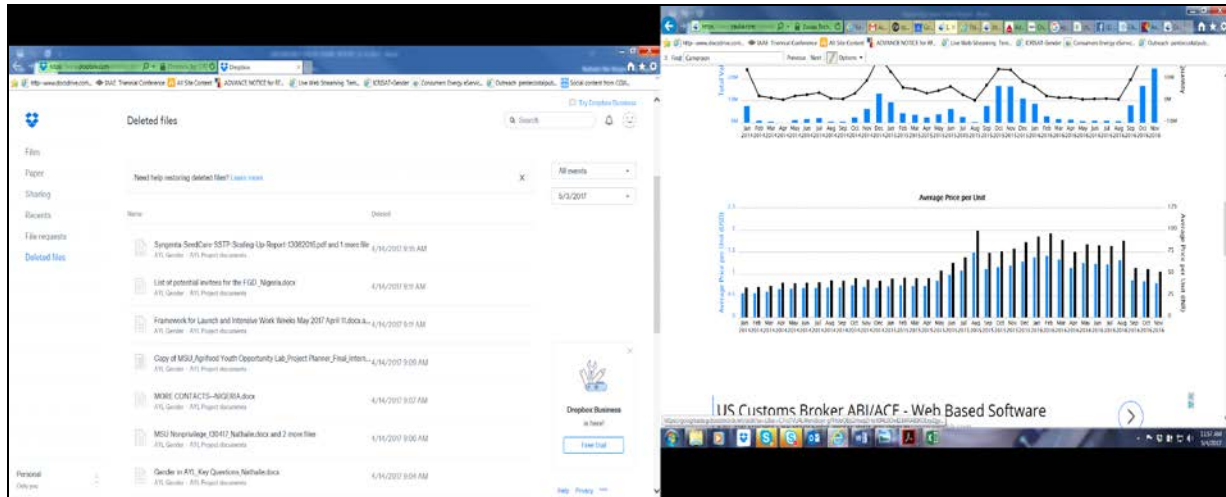
Source: <https://www.zauba.com/user>

Figure 11. Average Price per Unit of Pigeon Imports into India from Malawi



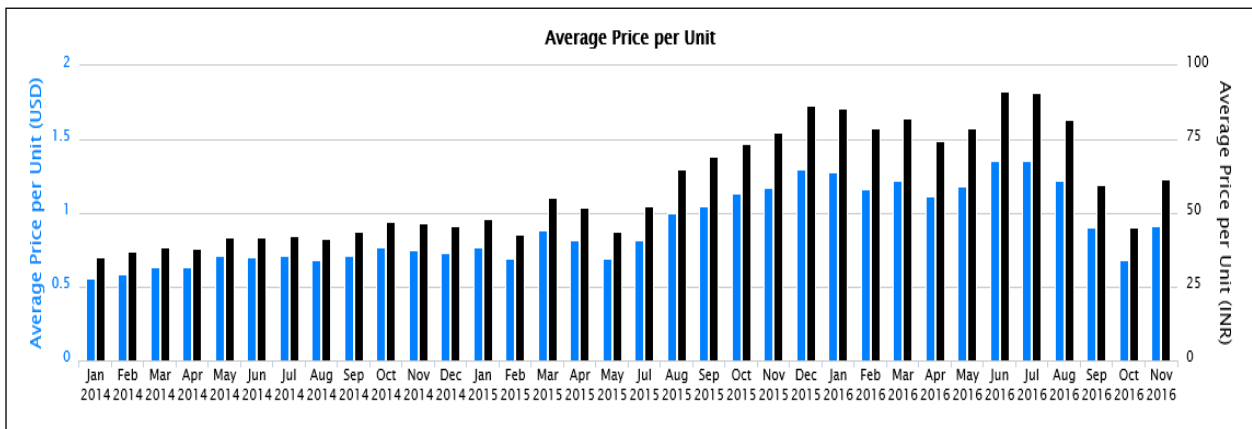
Source: <https://www.zauba.com/user>.

Figure 12. Average Price per Unit of Pigeon Imports into India from Mozambique



Source: <https://www.zauba.com/user>.

Figure 13. Average Price per Unit of Pigeon Imports into India from Tanzania



Source: <https://www.zauba.com/user>.

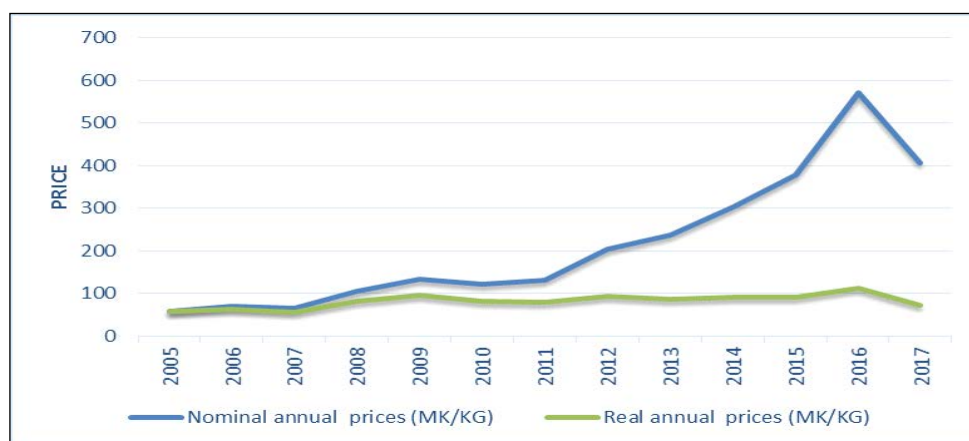
4.3. Regional Pigeon Pea Trade

Malawi's pigeon pea is also traded regionally. Key informant interview with the Agricultural Development and Marketing Corporation (ADMARC) and the Nandolo Farmers Association of Malawi (NFAM) revealed that some buyers of pigeon peas come from other countries in the region, for example Tanzania. Unfortunately, much of the regional trade in pigeon pea is largely unofficial and remains unrecorded in official trade statistics. This makes it difficult to estimate actual volume/size of trade with regional markets and to know how this is evolving over time. According to key informants, pigeon pea sold to buyers from other countries in the region loses its original identity in the export market as it is labelled with a new origin, e.g., *Tanzanian pigeon pea* and counted in the total volume of exports from the exporting country. Furthermore, large buyers/processors of pigeon peas in Malawi could go as far as some regions in Mozambique to source pigeon peas and vice versa. This finding highlights a need for better recording of trade statistics/data.

4.4. Domestic/Local Market Trade

Local market demand for pigeon pea as a share of total production has for about a decade been estimated to be ten percent (10%), compared to sixty-five (65%) going to home consumption—personal use and twenty five percent (25%) going to the export market (Lo Monaco 2003; Mula and Saxena 2010). These numbers are highly disputed by large-scale buyers who export and process pigeon pea, as they believe that home consumption of pigeon pea is not up to 65% as claimed by existing literature. Few studies have attempted to understand local demand for pigeon pea in Malawi, probably because of the heavy focus on the export market potential of the legume. It is still widely assumed that the legume is consumed primarily in the Southern region of the country, where it is also heavily produced and exported. Me-Nsope and Larkins (2016) found some evidence of shifting consumption patterns for pigeon pea, which they attribute to the adoption of pigeon pea in non-traditional pigeon pea locations (Central and Northern regions), and also potentially from migration of people from the South to the Central region of Malawi where they continue to keep their food consumption habits. Pigeon pea prices in the local/domestic market in the period 2005 and 2016 have been increasing (Figure 14).

Figure 14. Malawi's Pigeon Pea Annual Average Nominal and Real Retail Prices in Local Markets (MK/kg) – 2005 to 2017



Source: Unpublished data from MoAIWD Agricultural Market Information System (AMIS) 2017.

Figure 14 is an estimate based on available 2017 data in the AMIS. However, most recent data shows falling prices for pigeon pea since 2016 (for example, ACE's data shows that pigeon pea prices was on average MK 314 per kg as of February 2017). This declining trend was made worse by India's announcement curtailing imports in August 2017 (Jadhav 2017) AICC (2017) reported the price to be MK 130 per kg in early August 2017, which is way below government's announced minimum buying price of MK 320 per kg.

5. CONSUMPTION

Conventional wisdom supports that consumption of the legume is greatest in the Southern region where it is part of the traditional diet. An analysis of the 2010/11 Integrated Household Survey (IHS) for Malawi showed that although groundnut and pigeon pea dominate production, groundnut alone dominates local consumption, a pattern that the authors attribute to the strong export market for pigeon pea (Dzanja et al. 2016). National consumption shares showed that groundnut had a share of 34% in total legume consumption, while the share of pigeon pea was 14%. Disaggregating by region, Dzanja et al. (2016) found a high regional specialization in consumption shares. Pigeon pea consumption shares were highest for the Southern region. The authors concluded that markets lead to more spatially dispersed consumption of soybean and groundnut but not of pigeon pea.

More recent qualitative evidence such as that outlined in Me-Nsope and Larkins (2016) and consultations with stakeholders in Malawi's pigeon pea sector during fieldwork for the current study suggests growing consumption and production of pigeon pea in non-traditional pigeon pea zones/areas, e.g., Karonga and in the Central region. Notwithstanding, there is a lack of quantitative evidence supporting these claims. Production of pigeon pea has increased by about 3-fold in these non-traditional regions in the past three years (MOAIWD, APES data). There is, therefore, a need for more up to date household budget survey data to quantify any changes in food consumption across regions and time. A quantitative analysis of pigeon pea consumption in Malawi will also be best complemented with qualitative research to understand the factors driving the demand for pigeon peas and how these differ across regions, place of residence, and income group.

6. MARKETING/COMMERCIALIZATION

Data from fieldwork suggests that at the farm level pigeon pea is mostly marketed/sold in the form of dried grain (Table 5). The legume is also available in fresh pods (boiled or uncooked) during harvest. At the retail level, we observe both the whole dried grains and the split/dehulled dried grains. The split-dried grains originate from the large-scale processing companies, since small-scale processing of the legume is minimal (i.e., for individual/home uses). Primary data collected during fieldwork revealed that there is not much scope for value addition with pigeon peas. Essentially, value-adding activities include drying, sorting and grading, application of pesticides (applying actelic), bagging and labelling. There is a need to understand the demand for the different forms of pigeon peas as well as a characterization of the factors driving demand for the different forms of pigeon peas and variability across place of residence and income group.

The most prevalent grain legume marketing system involves individual farmers selling small quantities of grain legume products to intermediate buyers (Simtowe et al. 2010). Other prevalent marketing systems involve: (i) individual farmers selling pigeon pea to local markets; (ii) farmers organizing themselves into groups which pool together their products, identify buyers (often a company) and sell at negotiated prices; and (iii) farmers selling their grain legumes to NGOs and private buyers (ibid). Table 6 shows major marketing channels used by farmers, aggregating across all three regions.

Just as production of pigeon pea is geographically concentrated in the Southern region, market development for pigeon peas is also advanced in the south, where an export industry is developing for processing the crop into mashed pigeon peas (or dhal) which is exported to India (Simtowe et al. 2010). According to Waldman et al. (2017) the limited area planted to pigeon peas in the Central and Northern regions is the result of lack of marketing infrastructure (since consumer demand in these regions was presumed to be low compared to the Southern region). However, primary data collected during fieldwork for this study revealed some changes in availability and access to markets in the non-traditional pigeon pea producing areas (North and Central). Specifically, individual interviews with farmers suggests a growing presence of large buyers such as Rab Processors and Farmers World (Agora) in the Northern region. Previously, farmers in the north would produce and sell pigeon peas to buyers who came from across the border. More recently, continuous increases in production has attracted large buyers from the Southern region to set up buying branches in the Northern and Central regions.

Table 5. Form in Which Pigeon Pea is Sold at the Farm Level

Form	Frequency	Percent
Dried	212	91.8
Fresh	3	1.3
No response	16	6.9
Total	231	100.0

Source: Author's computation using survey data.

Table 6. Buyers of Pigeon Peas at the Farm Level

Type of Buyer	Number of farmers who sell to buyer	Percentage of farmers who sell to buyer
Large buyers (ETG, Rab Processors, Transglobe, BIF, ADMARC, NASFAM, ACE, MULI, etc.)	35	15.2
Vendors/middle men	101	43.7
Did not report any buyer	95	41.1

Source: Survey data.

Data also highlight some changes in how farmers organize in the marketing of pigeon peas. Specifically, surveys with individual farmers and focus group discussions with farmer's groups revealed an increasing role of farmer's groups in the commercialization of pigeon peas at the farm level in Malawi. This is not surprising because poor organization amongst farmers has been severally cited as a major factor limiting the profitability of the legume to farmers (e.g., Me-Nsope and Larkins 2016, using data collected in 2014).

Several factors influence how farmers sell their harvest—the scale of their production, membership in a farmers' group, distance away from markets and associated transportation cost, and availability of vendors/middlemen in their area. Individual farmers who are not members of a farmer group are more likely to sell to vendors because they lack the volume to sell to large-scale buyers and/or are unable to incur any transportation cost associated with marketing the legume directly to a large buyer. Most large-scale buyers have branches located close to major roads. For farmers to sell to these buyers, they must incur transportation cost to get to the road. Under such circumstances, selling to vendors gets more attractive to the farmer because the farmer does not have to incur transportation cost. The downside to this is that farmers may not get the price that they deserve for the grain—vendors' awareness of the limited options available to the farmer influences the price the farmer gets for the grain. Farmers can receive from village vendors a price that is up to 40 percent less than what they will get if they sold directly to large-scale buyers in their branches. Vendors are also more likely to get better prices than farmers, and the price difference could be in the range 5-15 Malawian Kwacha (MWK) per kg depending on the quantity offered.

Depending on the size and structure/organization of the farmers' groups, some may sell to vendors or directly to large buyers (including the commodity exchanges). The volume of the legume brought in for sale remains an important determinant of the price received. While there has been a recent proliferation of farmers' groups organized around pigeon pea in Malawi, most of the groups are yet to profitably practice collective marketing. The volume of the grain available for sale is an important determinant of the channel used in the marketing of the grain. While most farmers (90% of the farmers surveyed) are members of a farmers' group, and there seems to be a requirement across most of the groups for members to sell their crop through the group, the practice of side selling is a challenge to effective and profitable collective marketing. Farmers desiring to earn quick income after harvest are always tempted not to sell through the group. Groups with larger volumes are also more likely to attract large-scale buyers and practice collective marketing than groups with fewer members (Table 7).

Table 7. Pigeon Pea Marketing Channels for Farmers Groups

Name of Farmer Group	Location	Group Size (# of members)	Buyer of pigeon pea from the farmers' groups
Nandolo Farmer Association (NFAM)	South	6,600	Exporters/large processors (ETG, Rab, Transglobe, HMS, Yashi (a Kenyan company) and ACHX
Umodzi Club	North	20	Large buyers/exporters--ADMARC (Agricultural Development and Marketing Cooperation)
Lughano Association	North	106	ICRISAT (International Crops Research Institute for The Semi-Arid Tropics)
Nyungwe Smallholder Farmers Association	North	40	Vendors
Lower Makwangwala Farmers' Cooperative	Central	47	Concern Universal CADECOM (Catholic Development Commission in Malawi)
Mkanganya Cooperative	Central	894	Vendors
Talandira Cooperative	South	110	Agricultural Commodity Exchange)
Goliati Cooperative	South	61	Vendors Large Independent buyers (Wholesalers)
Nkhonde cooperative	South	340	Bakhresa Malawi
Mkumbidza Cooperative	South	318	Vendors
Lichenya Cooperative	South	457	Vendors
Kajavo Producers and Marketing Cooperative	South	374	Export Training Group (ETG), Transglobe, Rab processors

Source: Survey data.

7. ACTORS IN MALAWI'S PIGEON PEA VALUE CHAIN

7.1. Input Suppliers

7.1.1. Pigeon Pea Seed System: Breeding, Production and Distribution

Seeds are a major input into pigeon pea production. The legume seed system in Malawi consist of the formal and informal sectors. The formal sector is comprised of public or government entities/units that are involved in the making of seed laws/policies and regulations, and in seed breeding. These units include the Department of Crop Development in the Ministry of Agriculture (DCD), the Department of Agricultural Research Services (DARS), also known as the Chitedze Research Station and the Seed Service Unit (SSU).

DARS has a strategic partnership with the International Crops Research Institute (ICRISAT), where the latter is involved in building the capacity of Malawi researchers and farmers' organizations in legume crop breeding, especially groundnut and pigeon pea, and in facilitating commercial seed production. Significant work was undertaken by ICRISAT in co-ordination with DARS to develop new varieties of pigeon pea with adaptive characteristics to climatic conditions, as well as disease resistance and high productivity (Kadale 2013). Although currently heavily involved in the seed systems in Malawi, ICRISAT's original focus/mandate in Malawi did not include the development of new seed varieties. Her initial role was to conduct research and not breed seeds. Due to limited human resource capacity at DARS, ICRISAT's role in supporting DARS in the development and evaluation of new seed varieties has become more and more prominent.

ICRISAT manages the Malawi Seed Industry Development Project (MSIDP), a project funded by the Irish Aid, which has as objective to improve the quality of seed available to smallholder farmers, thereby contributing to the country's legumes and cereal seed systems to support smallholder farmers to improve their food and nutritional security. The first phase of the MSIDP was launched in 2008. In September of 2016, phase II of the MISDP project was launched and the aim is to reach 200,000 farmers by 2020. The crops covered in the project are groundnut, pigeon pea, common bean, rice, sorghum and pearl millet.⁶

Under the MISDP, ICRISAT developed the Seed Revolving Fund (SRF) model for improving groundnut and pigeon pea seed systems to address the issue of seed access; and it involved public and private partners at each stage of the seed value chain (ICRISAT Annual Report 2014). ICRISAT sells foundation/breeder seeds to private seed companies and contract seed growers for the production of basic seeds. The seed produced by the contract farmers is bought by ICRISAT using the project's SRF. Some of the contract farmers used by ICRISAT in the production of basic seeds are members of NGOs (e.g., NASFAM). Local seed companies buy basic seeds from ICRISAT for their own certified seed production. These seed companies multiply the basic seed into certified seeds that are sold to farmers for grain production. The seed companies distribute certified seed through agro-dealers in all parts of the country. Interviews with ICRISAT revealed that there are about eight local seed companies that are engaged in the production of certified seeds from basic and certified seeds production. Any profits made by ICRISAT from the sales of basic seeds is ploughed back into the revolving fund to provide for its growth. Key informant interviews with ICRISAT suggest that the prominent variety promoted by ICRISAT, MoAIWD, NASFAM, and associated NGOs is Mwayiwathualimi.

⁶ <http://www.icrisat.org/boost-for-malawi-farmers-from-improved-seed-systems-and-root-and-tuber-crops-technologies/>

Seed certification is the responsibility of DARS. The Seed Service Unit (SSU), which is under the DCD, is responsible for seed quality assurance. ICRISAT is also involved in creating awareness on newly developed seed varieties. ICRISAT's SRF is argued to have increased the supply/availability of legume certified seeds in Malawi, thereby facilitating the adoption of improved varieties (ICRISAT Annual Report 2014; Simtowe et al. 2010).

In the informal sector, ICRISAT is also involved in community-based seed multiplication—communities receive certified seeds from ICRISAT that they multiply through their community-based seed multipliers to produce quality declared seeds. The quality declared seeds are then distributed to farmers within the communities with the expectation that the farmers bring/pay back double of the seeds received upon harvest. Under the MISDP, ICRISAT also works in partnership with NGOs to establish seed multiplication groups for Mwaiwathualimi. Specifically, this involves delivering extensive extension to organized farmer groups for the specific variety that they are multiplying. Some of the NGOs with which ICRISAT works include NASFAM, CADECOM, World Vision, CARE, and Ekwendeni Mission. The objective is to reach as many smallholder farmers as possible. These NGOs buy certified seeds from ICRISAT that they distribute to farmers for multiplication into quality declared seeds in the areas where these NGOs work. Farmers receive the quality declared seeds through a revolving fund and are expected to pay back double of the quantity of seeds received upon harvest to ensure that good quality planting material is always available. In addition to its role in supplying seeds, ICRISAT also provides training on good agronomic practices.

The United States Agency for International Development (USAID) has also invested in strengthening the seed system in Malawi through the Malawi Improved Seed Systems and Technologies (MISST) Project and the Scaling Seeds and Technology Partnership Project implemented by the Alliance for a Green Revolution (AGRA).

The Farm Input Subsidy Programme (FISP)—Role in Seed Distribution: As indicated above, the Government of Malawi through its FISP-Legume program is working to make available legume seeds to farmers. The FISP started in 2005/2006 and the initial focus was on fertilizer and maize seeds. However, the legume component of the FISP program started in 2008-09 when in addition to fertilizers and maize seeds, the voucher could be redeemed for cotton, beans, groundnuts and pigeon pea seeds. In 2010-11, other legumes were incorporated into the voucher (beans, cowpeas and soya), and the voucher was no longer used to redeem cotton. Under this program, the GoM gives contracts to seed companies registered with the Seed Traders Association of Malawi (STAM) and are certified by the Seed Service Unit (SSU) of Malawi to supply quality legume seeds to farmers through the companies' retail outlets/shops. As of 2014-2015 crop year, seventeen seed companies took part in the distribution program. These include Agri- Inputs Supplies Ltd (AISL), Association of Smallholder Seed Multiplication Action group (ASSMAG), CPM Agri Enterprises, Demeter Agriculture Ltd, Funwe Farms, Mbeu Seed Investments, Mgomera Seed Co, National Small holder Farmers' Association of Malawi (NASFAM), Nema Seeds, Pannar Seed (MW) Ltd, Panthochi Seed Farms, Peacock Enterprises Ltd, Phindulani Seed Co, Premium Seeds, Seed Co, Seed Tech, Women in Agri Business in Sub-Sahara Africa Alliance (WASSA).

FISP only allows for seeds that are produced in Malawi. The farmer can redeem the coupon for their choice of legume seeds as long as their choice is available at their chosen seed retail outlet. For example, with the 2016/17 coupon, a farmer could get up to three kilograms of soybean seeds and up to two kilograms of pigeon peas, groundnuts, cowpeas and beans seeds.

7.1.2. *Chemicals—Pesticides/Insecticides*

Until recently, use of pesticides on pigeon peas and other crop protection techniques was argued to be very low amongst pigeon pea farmers. This is not surprising because, traditionally, pigeon pea farmers cultivated local varieties that were more resistant to pest damage and because the legume is mostly planted as intercrop.

Key informant interviews were held with Farmers Organization Limited (FOL), a leading supplier of inputs and crop protection in Malawi. The company supplies pesticides for legumes (pigeon pea, soybeans and groundnuts) and other key crops in Malawi (such as sugar, coffee, maize, macadamia, tea and tobacco). FOL works mostly with smallholder pigeon pea producers since there are very few commercial pigeon pea farmers in Malawi. A major activity undertaken by FOL is the marketing of pesticides. The company has branches in three locations—Mzuzu, Blantyre and Lilongwe and works with about 100 different organizations/entities who stock FOL products. These include private input dealers and retail outlets—e.g., Farmers World (AGORA) and Kulima Gold (Rab processors). Each of these organizations have their own outlets, which can add up to about 500 outlets carrying FOL's products throughout the country. Most of the big organizations buy their products on credit, sell and pay FOL afterwards. Nevertheless, individual retailers or traders buy in cash. Farmers can buy crop protection products directly from FOL or from retailers. However, retailers charge farmers 15% on top of the purchase price of the product, a charge that accrues to the retailers as profit since FOL delivers products to the retailers at FOL's cost or using FOL's van for transportation.

FOL has a crop protection package that was designed to provide an integrated solution to the problem of pest damage in legumes. This package, commonly referred to as the Nyonga pack, includes chemicals that kill leaf eaters (e.g., grasshoppers), sucking pest (e.g., aphids), termites, diseases (e.g., leaf rust), as well as protect the crop against post-harvest losses from weevil damage. The pack comes with an instruction sheet to guide farmers on how to apply the products. Farmers who are unable to purchase the entire pack can purchase the products individually. In addition to its role in the marketing/distribution of crop protection products, FOL is also involved in training—they hold demonstrations with farmers during which farmers are trained on how to use the products, how to identify quality products, and also gain awareness on new products. FOL also provides spray service.

Several factors limit the adoption of crop protection products by farmers. While the shift by farmers from traditional pigeon pea varieties to improved pigeon pea varieties has made the use of crop protection products inevitable, farmers' demand for crop protection is still low, notwithstanding the strong potential of the legume to generate income.

Most pigeon pea farmers are yet to know that the adoption of improved varieties of pigeon peas should be accompanied by the adoption of crop protection (particularly pesticides) for the new varieties to yield at their maximum. There is need for farmers to understand that these improved varieties are more susceptible to insect pest damage compared to the local varieties that they have been accustomed to cultivating for several years. Furthermore, according to FOL key informant, farmers who grow pigeon pea for income generation have no trouble adopting crop protection methods. While many of farmers expect to sell some of their products, they lack an understanding of crop production as a business. This finding highlights the need for farmer education programs to educate farmers on the difference between pigeon pea varieties in terms of susceptibility to pest

damage and a need to train farmers on how to maximize profits from the cultivation of improved varieties. Additionally, farmers need to shift from subsistence mentality to seeing crop production as a business.

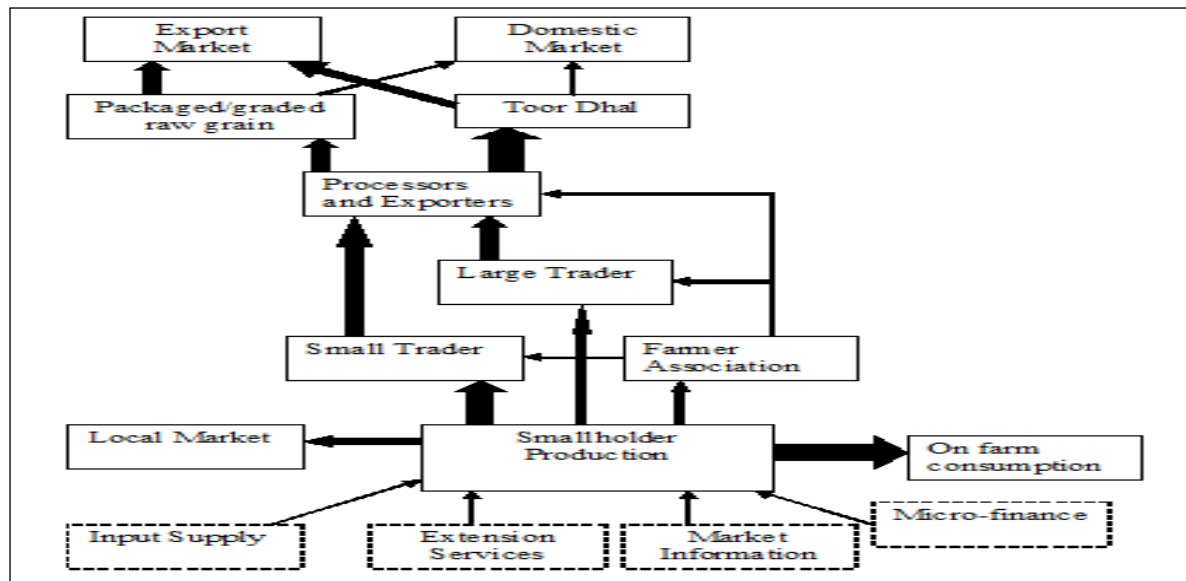
The lack of appropriate incentives also affects farmers' demand for crop protection products. According to the key informants, the lack of incentives makes it hard for farmers to sustain the demand for crop protection products. A major incentive here is the price of the legume. Low grain/output prices, limits the profitability of the legume to the farmer and hence the farmer's incentive to invest in crop protection products. Linked to the output price risk is the lack of visible markets for the grain. According to key informants, in the past, the government marketing board called ADMARC had several buying branches that were in close proximity to the farmers. ADMARC used to buy and store for food in times of shortage. However, today there has been a drastic reduction in the number of ADMARC buying branches through which farmers can sell their products. Currently, ADMARC has fewer branches compared to the past and limited financial resources to buy farmers' products, leaving farmers at the mercy of the vendors. Lack of remunerative markets was found to discourage investments in crop protection. The findings here suggest that access to profitable markets is necessary to stimulate investments in crop protection. In addition, poor organization amongst farmers affects profitability of the legume. Thus, for farmers to benefit from pigeon pea production, they must be willing to engage in profitable collective marketing that is central to increasing gains from the legume.

A major threat to the supply and demand of crop protection is the presence of fake/expired pesticides in the market. There are many retailers/organizations supplying generic products (products that were previously under property rights restrictions, but the license or the property rights have expired). Some of the products sold are fake and may not contain the correct ingredient. There is therefore a need for regulations, and or the monitoring and enforcement of existing regulations (if any) governing the distribution of pesticides. Malawi's Pest Control Board (PCB) must ensure that pesticides sold are registered and contain the right ingredients. The absence of such regulations and their enforcement will eventually discourage the demand for pesticides from farmers since they cannot be sure of the quality of the products on the market.

7.2. Farmers

Farmers in Malawi cultivate pigeon pea for both consumption and commercial reasons, and production is dominated by smallholder farmers—with farm sizes below two acres per household (Me-Nsope and Larkins 2016). Farmers sell dried grains directly to intermediate traders, exporters/processing companies (at the local branches) or other organizations involved in the commercialization of the grains, if these organizations are in their areas (Makoka 2009; Me-Nsope and Larkins 2016). Figure 15 below shows the structure of the pigeon pea value chain from Simtowe et al. (2010). Data from fieldwork suggest that the structure has not changed.

Figure 15. Pigeon Pea Marketing Structure



Source: Simtowe et al. 2010.

7.3. Agricultural Extension Officers

In Malawi, as in many other African countries, the provision of agricultural extension services is considered a public role—one to be undertaken by government hired extension workers. However, the 2000 Agricultural Extension Policy encouraged pluralism in provision of extension services that resulted in NGOs and projects increasingly working with farmers in the delivery of extension advice, although government still dominates. NGOs provide extension services either through government extension officers or through their employees. Public extension workers are often assigned to an Extension Planning Area (EPA), where their job involves amongst others, to educate farmers on new production technologies and to provide farmers with information on best agricultural practices.

Interviews with extension agents (EAs) suggest that government EAs are ill equipped in the resources they need to effectively do their jobs. Lack of access to transportation assets limits their mobility and hence their ability to respond in a timely manner to farmers' request for extension assistance/advice. Other resource constraints faced by EAs include the lack of stationary and other training materials. According to the EAs, they sometimes have to rely on NGO's working within the EPA to sponsor their activities. Related to this, the existence of government EAs alongside multiple NGOs sometimes results in farmers receiving conflicting information from the different sources. There is need for better organization and coherencies between the different suppliers of extension advice in order not to overwhelm and confuse farmers with conflicting information.

Other issues identified by the EAs during the interviews include: Farmers unwillingness to attend meetings organized by government EAs because, unlike in meetings organized by NGOs, farmers do not perceive potential gains to themselves (NGOS more often would provide resources and refreshments during training); Farmers not willing to apply information learned during training—they are resistant to change or try new technologies.

7.4. Farmer Organizations or Groups

There are three major types of farmer groups or organizations in Malawi: a farmer club, which is simply a grouping of farmers (possibly 10 - 15) who have informally come together for a specific farming adventure; a farmer association—an amalgamation of several farmer clubs who pool resources together in order to pursue a specific objective; a farmer cooperative, that is a formal farmer organization with legally constituted structures. Farmer associations are usually differentiated from a cooperative in that the latter is a legally constituted organization of farmer clubs while an association is just an informal organization of farmer clubs into a single organization.

Previous research on pigeon pea conducted in 2014 showed very little organization of farmers in groups (Me-Nsope and Larkins 2016). However, data gathered during fieldwork for the current study showed an increase in the number of farmer groups organized around pigeon pea in recent years in Malawi. FGDs with pigeon pea farmer groups reveal that most of the groups are less than three years old, with the exception of one of the farmers group that was formed in 2009. Thus, the growing membership of farmers in farmers groups is a recent development in Malawi's pigeon pea value chain.

Seven of the twelve focus groups began as farmer clubs initiated by the farmers themselves, and gradually evolved into cooperatives; two were initiated by the EAs of the ADD; three of them were initiated by non-governmental organizations (for example DISCOVER, Project Concern Africa) or had NGO involvement in their birth. For example, the Nandolo Farmers Association of Malawi (NFAM) was birthed during a workshop organized by Christian AID in 2013. During the workshop, pigeon pea farmers were engaged in discussions about the challenges they faced and their perceptions of opportunities in the pigeon pea the value chain. Two years after this workshop, fifty-seven farmers spread across the Southern region came together and contributed money that was used to register the association. The association was launched in July of 2015, and the members immediately began to mobilize other farmers to join the association. With the exception of one of the twelve farmer groups, the rest of the groups are diversified in terms of crop focus. Groundnuts is a main crop across all 11 groups. Other crops include soya, beans, cowpeas, cassava, potatoes, cotton, vegetables (tomatoes and peppers) and of course maize.

Table 8 shows a breakdown of membership in the twelve farmer groups interviewed across the three regions. The groups include one club; nine cooperatives, and two associations. FGD participants were mostly the leaders of the group, and in some cases regular members with no leadership positions also participated in the discussions. These FGDs were not disaggregated by sex. However, the team ensured that women participated in the discussions to the extent possible.

Farmer groups were evaluated for their *inclusiveness* using data collected from the FGDs. Specifically, data was collected on the types of membership and associated membership requirements as well as the gender-breakdown of each of these groups. All farmer groups are mixed groups (male and female farmers). The NFAM is a large association with 6,600 members. The NFAM has three types of membership—individual level, club level, and cooperative-level membership. In all other farmer groups, membership is on an individual basis. The group cuts across the three regions of the country, though 93% of its membership is in the south. For the rest of the groups, total group membership ranged from 20 to 894 members, with the average share of female members at 49%.

Table 8. Inclusiveness of Farmer Groups

Region	Total Number of Members	Share in membership Female	Minimum Quantity to participate in collective marketing
South	457	74%	100kg
	318	67%	250kg
	374	64%	50kg
	340	62%	25kg
	61	52%	N/A
	110	49%	100kg
	6,600	N/A	2,000kg
North	20	60%	100kg
	40	45%	400 Kg for 1 acre 15 Kg if < 1 acre
	106	26%	50kg
Central	894	18%	0
	47	17%	5,000kg

Source: Author's computation using survey data.

Individual surveys showed that ninety-one percent (210 out of 231) of the pigeon pea farmers interviewed belong to a farmer group.⁷ A principal motivation for joining a farmer group was to deal with the challenges faced in the marketing of pigeon peas. These challenges include finding a reliable market and obtaining a good price for the legume.

Membership requirements vary across groups. All types of farmer groups charge a cash fee to join a group. For ten out of twelve groups, members pay a one-time membership fee that is valid for one year. For one of the twelve groups, a one-time fee is required for the lifetime of the farmer's membership. For another of the twelve groups, members pay fees to join the group, and in subsequent years pay an annual registration fee in an amount less than the fee paid to join. Annual membership fee required from individual farmers range from 350 MWK to 5,000 MWK. The individual membership fee is highest in the NFAM. There appears to be a positive correlation between the size of the membership fee and the benefits provided by the farmer group. FGDs with the NFAM revealed that in order to encourage collective marketing and reduce marketing cost, the NFAM makes individuals to pay a higher membership fee (5,000 MWK) as opposed to what they will contribute if they sought membership in the association through a club (15,000 MWK/year shared between 10-25 farmers) or a cooperative (25,000 MWK/year shared with more than 25 farmers). In addition to membership and registration fees, five of the twelve groups require members to buy shares and to participate in collective marketing (members must sell their produce through the cooperative). For 11 of the 12 groups, there is a minimum quantity requirement for a member to sell through the group (Table 8). For example, with the NFAM, the minimum quantity requirement to sell through the association is 2,000kgs (40 bags of 50kgs each). Thus, individual members who cannot supply this minimum are encouraged to seek membership in clubs or cooperatives in order to market through NFAM.

⁷ The research team collaborated with the GLAL of Malawi in the selection of pigeon pea producing areas and farmer groups. As a result, most of the farmers interviewed were members of a farmer group. Focus Group Discussions were also held with farmers who did not belong to a group to understand their specific situation.

In addition to the above-mentioned financial obligations, all groups require members to regularly attend meetings, participate in elections, participate in social activities (e.g., death/funeral, visits to sick members) and comply with the by-laws/constitution of the group. Table 9 shows the membership criteria by group interviewed.

Table 9. Criteria/Requirements for Group Membership

Group Name	Annual Membership fee	One time membership fee	Buy Shares	Participate in group sales	Attend meetings and participate in group activities	Participate in social activities (funerals, visits to sick)	Comply with by-laws constitution
Nandolo Farmer Association	yes			yes			
Umodzi Club	yes				yes		yes
Lughano Association	yes			yes	yes		yes
Nyungwe Smallholder Farmers Association	yes			yes	yes		yes
Lower Makwangwala Farmers Coop	yes						
Mkanganya Coop		yes	yes		yes	yes	
Talandira Coop	yes		yes	yes	yes		
Goliati Coop	yes				yes	yes	
Nkhonde coop	yes		yes		yes		
Mkumbidza Coop	yes				yes		
Lichenya Coop	yes		yes		yes		
Kajavo Producers and Marketing Coop	yes		yes	yes		yes	

Source: Authors.

Farmers' groups play an important role in improving access to crop production inputs and extension services for their members. These activities include promoting the adoption of improved varieties and the use of pesticides in production, facilitating access to inputs (seeds, insecticides and to fertilizers),⁸ facilitating access to farm equipment/tools (e.g., sprayers), and facilitating access to extension services and trainings (on cultivation and farm management practices, and on farming as a business) provided by NGOs (e.g., CADECOM).

Differences exist in the model used to improve members' access to inputs (especially seeds) across the groups. For example, in 2016, the NFAM conducted an upfront assessment of each member's seed needs for the crop season prior to its start. Members were later asked to make financial contributions to cover the needs for the crop year. NFAM then played the role of finding a seed multiplier who could supply the quantity of certified seeds demanded by the association's members.⁹ According to representatives of the NFAM, while bulk buying of seeds can help reduce the unit cost, certified seeds continue to be very expensive. As a result, NFAM's plan for the future is to engage in the production of certified pigeon pea seeds. Other models used by farmers groups to facilitate members' access to seed/planting material include:

- Farmer group gives seed loans to needy farmers from seeds purchased or saved/recycled by the group. Member farmers are expected to payback double or the same quantity of seeds received as a loan after harvest.
- Farmer group provide small cash loans to member farmers before the planting season for the purchase of seeds/planting material;
- Farmer group saves recycled seeds, which are then distributed free of charge to needy members during planting season.
- Farmer group purchases seeds and other inputs and sells these to its members for cash. Members, who cannot afford to pay cash, obtain the inputs on credit and pay their debt at the end of the season (after harvest).

Farmers groups also play an important role in the marketing of pigeon peas, including:

- Searching and linking farmers to buyers. In some cases, the group benefits a 2% commission on the total value of the farmer's grain that is sold through the group;
- Conducting market surveys and price information searches on behalf of its members;
- Price negotiations/bargaining (most of the groups have marketing committee members, who are responsible for this activity);
- Provision of other marketing services (storage). Only one group provide such services. NFAM has a warehouse in its main branch in the village of Mpemba (Southern region). Members who are located close to the Mpemba area deposit their grain in the NFAM warehouse. Most farmer groups also do a quality control on the grain supplied by members for sell. Such controls mostly involve ensuring that all grain supplied is dry and sorted/graded by color.

Generally, there are very few opportunities for farmers to get loans directly from the banks in Malawi. A few farmer groups are therefore involved in facilitating member's access to finance

⁸ By getting fertilizer or insecticides on credit, distribute to members, and members pay for these inputs after harvest with interest. Some of the cooperatives are involved in group purchase of pesticides to get a cheaper price.

⁹ White/small variety from Khamalathu cooperative.

through the provision of small loans from the group's savings or revolving funds account. The interest rate charged to farmers on loans received range from 0% to 15% depending on specific characteristics of the loan (size and period during which loan is sought). Interviews with the NFAM revealed that the association is currently working with financial institutions (FINCA and FDH) to design a financial product that is suitable for farmers' conditions. Farmer groups have also served as a platform through which members gain access to training on farming as a business and on developing of business plans.

7.5. Intermediate Traders/Buyers

Intermediate traders are mostly village-based businessmen who buy and aggregate small quantities of dried grains from smallholder farmers and sell to large buyers, processors and exporters (Me-Nsope and Larkins 2016). Primary data collected during this study showed that intermediate buyers also buy from farmers' clubs, depending on the size of the club's total output and if these clubs have no alternative buyer. There are two types of intermediate traders: those who buy with their own resources and sell to processors (private); and those who are commissioned buyers, i.e., they buy directly from farmers with resources from processors (act as buying agents) and they get a commission for their work (Makoka 2009).

Key informant interviews with large-scale buyers revealed that some farmer associations also act as buyers/traders. For example, the Balaka Smallholder Farmers Association (BASFAM), a member of the National Smallholder Farmers Association (NASFAM), gets a commission from NASFAM to buy pigeon pea grains from BASFAM member farmers. In 2016 for example, the commission was 10 MWK/kg of pigeon pea purchased by BASFAM for NASFAM. The commission is shared between the BASFAM officer and the members of BASFAM (farmers). BASFAM also buys pigeon pea from farmers (members and non-members) with its own money to sell to NASFAM or store in its warehouse to sell when pigeon pea prices are high. However, BASFAM members are paid 10 MWK/kg above the price that is paid to non-members.

Surveys with individual farmers suggest that most farmers (43.7%) sell their pigeon pea grains to vendors or intermediate buyers, and this could be as individuals or in their groups. FGDs also reveal that some farmer groups sell their grains to intermediate buyers/traders or vendors. Intermediate buyers who buy pigeon pea for exporting companies are less prevalent in locations where there are other institutions buying pigeon peas, such as NASFAM (Makoka 2009). They are also more prevalent in the Southern region of the country (ibid).

A couple of factors influence the volume of pigeon pea that an intermediate buyer/trader can buy during a season. These include access to financial resources, the available storage capacity, and demand from downstream actors. According to the intermediate traders, the buying price is determined by working backwards from the price that the downstream actors (larger-scale buyers) are paying for the legume at any point in time. Irrespective of the buying arrangement, intermediate traders/buyers are profit maximizers.

7.6. Retailers

Individual surveys were administered to 41 retailers (12 men and 28 women; 20 in the South and 21 in the Central region).¹⁰ As discussed above, there is very little opportunity for adding value to pigeon peas. Retailers sell pigeon pea in two major forms –dried whole grains or split and decorticated dried grains. The dried grain is procured directly from farmers or other retailers, while the decorticated split grains are from other retailers.¹¹ Retailers distinguished pigeon pea cultivars by their colors—red versus white. Data collected from retailers suggests that major factors influencing consumer preference for different cultivars include good taste, good flavor/aroma, appearance and ease of preparation (shorter time to cook). Almost all the retailers interviewed indicated that they procure their pigeon pea inventory as individuals not as groups.

7.7. Large Buyers/Assemblers and Processors/Exporters

These include private individuals and companies who buy large volumes of pigeon pea for commercialization, processing or exporting. Large-scale buyers are often in close proximity to major producing areas. Private traders are often independent individuals who buy dried pigeon pea grain from farmers and intermediaries to sell to the large exporters/processors (Me-Nsope and Larkins 2016). The majority of the large traders are located in the Southern region, and this is due to high pigeon pea activity in this region (Me-Nsope and Larkins 2016). Most of the traders interviewed had informal relationships with vendors or intermediate traders who supply them with a specified quantity of the legume at a guaranteed price per bag (*ibid*).

Some NGOs also operate as large buyers. For example, NASFAM through its subsidiary NASFAM Commodity Marketing Exchange buys pigeon peas and other agricultural produce from its member associations or clubs. The purchased grain is sold to processing companies who are also exporters (*ibid*). Interviews with BASFAM revealed that NASFAM continues to buy pigeon peas through its member associations but on a commission basis, although intermittently (depending on availability of funds).

Exporters have buying branches scattered around major pigeon pea producing areas. They buy large quantities of dried pigeon pea grains directly from farmers and vendors, from NGOs or from associations such as NASFAM. We were not able to get data on the volume of pigeon pea purchased by all exporters of pigeon pea in a year. However, interviews with two major exporters of pigeon pea in Malawi revealed that volume of pigeon pea purchased averaged over the past five years has been between 10,000 and 15,000 metric tons. India was identified as the major destination for dried pigeon pea exports from Malawi.

The Agricultural Development and Marketing Corporation (ADMARC) is a government-owned corporation or parastatal. It was established to promote the Malawian economy by increasing the volume and quality of agricultural exports, develop new foreign markets for the consumption of Malawian agricultural produce, and to support Malawi's farmers. ADMARC has over 350 permanent buying branches and 1,000 seasonal buying branches around the country. Key informant interview with representatives of ADMARC suggests that ADMARC buys 100% of its dried pigeon pea purchases directly from individual farmers. Last year ADMARC purchased approximately 2000 MT of pigeon peas. Unlike other large buyers, ADMARC does not export pigeon peas; the grain

¹⁰ Data is missing on the gender of one of the retailers interviewed.

¹¹ Retailers of decorticated split grains obtain it from larger urban wholesalers who in turn purchase from large-scale processors.

purchased is sold in local markets, prisons, hospitals and to exporters/processors such as Rab Processors.

Most exporters of pigeon peas are also involved in pigeon pea processing. However, unlike other legumes (for example groundnuts), there is not much scope to add value to pigeon peas, other than that the grain can be split to make toor dhal. Compared to other countries in the Eastern and Southern Africa regions, Malawi has a well-developed processing industry with the largest concentration of processing companies for pigeon peas (Simtowe et al. 2010) with over 12 pigeon pea millers –Transglobe Produce Exports, Rab Processors, Bharat Trading Company, AGORA, Muli Brothers, Export Trading Company, and others). Most of these companies have their processing plants/facilities in Blantyre—the country’s commercial capital. Key informants estimated a total processing capacity of 25,000 to 30,000 MT, aggregating across all processors. This is not much different from what was reported over a decade and half ago – Soko (2001) estimated the processing capacity of these companies at approximately 20,000 MT of toor dhal per annum. For example, in the 2016 cropping year, Transglobe alone processed about 6,000 MT of the 18,000 MT of dried pigeon pea grains that it purchased. Overall, total pigeon pea exports to India is estimated at about 40% processed and 60% dried raw grain (Simtowe et al. 2010).

7.8. Commodity Exchange Systems

Malawi currently has two commodity exchange systems—Agricultural Commodity Exchange for Africa (ACE) and the Auction Holding Commodity Exchange (AHCX). ACE was established in 2004 as an initiative of NASFAM. In 2006, ACE began its operations as a non-profit operation depending on donor funding and grant support, and its goal was to improve market access for farmers. The ACE strategy focuses on three interlinked and interdependent strategic components—the warehouse receipt system (WHRS), trade facilitation and price information. ACE has designed an online trading platform where market participants (from smallholder farmer to institutional buyers) can post *offers to sell* and *bids to buy* commodities; a price information system where market participants can receive market information on the internet and the mobile phone; and a WHRS that allows market participants to access finance and end markets.

The WHRS is the core activity of ACE, and ACE strives to facilitate marketing of grains through the WHRS (ACE website). ACE plays the role of facilitating the value chain ecosystem, while a broad range of commercial partners including storage operators, banks and trade partners are offering the essential services. The storage operators register with the WHRS to provide storage and handling service to the depositors (including small and rural operators), they receive the commodity, and issue a warehouse receipt upon guaranteeing the quality and quantity of the grain. The banks trust that the storage operator can keep the commodity secure and will provide finance with the commodity as collateral. ACE’s role is as a facilitator, software provider and registry (ibid).

Key informant interviews with representatives from ACE reveal that there are 57 ACE certified warehouses across the country—ACE does not own any warehouses but certifies and operates the warehouses in partnership with various companies including Kulima Gold (Rab Group), Export Trading Group (ETG), Grain Securities Ltd, TransGlobe, NASFAM, and Sunseed Oil.¹² Thirty-two of these warehouses are located in the rural areas. ACE also works with independent associations,

¹² Grain Securities Ltd is a 12,000mt grain storage facility, which opened for business in July 2010. Presently, only one facility is active and is based in Lilongwe. The Lilongwe facility is a pilot project that will be expanded to other parts of Malawi.

cooperatives and banks (e.g., Enterprise Development Holdings (EDH), First Merchant Bank Limited (FMB), and CDH Investment bank). According to a key informant at ACE, there are no price premiums for quality pigeon pea grains during trade, not even when trading with the export market. Poor quality grain is simply sent back at the warehouse. Notwithstanding, the volume of the grain traded was important in determining the final price of trade—larger volumes increase the seller’s bargaining/negotiating power.

Similar to the ACE model, the Auction Holding Commodity Exchange (AHCX) is an electronic marketplace where buyers and sellers can transact trade of commodities with an assurance on quality, delivery and payment.¹³ AHCX also uses the WHRS as a risk mitigation strategy to encourage financial institutions to loan money to smallholder farmers and to increase farmers’ access to credit for urgent expenditures while they wait for better prices on the market. AHCX seeks to empower farmers by disseminating market information in real time to all market players; and at a later stage, to provide the market with options for risk management by offering futures trading (AHCX website). AHCX leverages on its several years of experience working on financial inclusion for tobacco farmers in Malawi. Specifically, AHCX has replicated the payment of sell proceeds through the banking system that was used with tobacco to other crops, one of which is pigeon peas. As observed by a key informant at AHCX, the rationale is to give farmers of other crops a chance to follow in the footsteps of tobacco farmers, by becoming bankable, creating their own credit history, and overall improving farmers’ access to finance from lending institutions. Commodities that can be deposited at AHCX warehouses include maize, soya beans, beans, sunflower, pigeon peas and rice. Key informant interviews with AHCX revealed that AHCX has about 20 warehouses throughout the country. Major Auction Holding Commodity Exchange (ACHX) warehouses are located in Mzuzu, Kasungu, Dedza, Balaka and Blantyre.¹⁴

With both commodity exchange systems (CES), sellers (farmers or traders) of grain take their grains to the warehouse of their choice (AHCX or ACE certified warehouse). If the farmer is satisfied with the current price on offer at that location, he/she can deposit his/her pigeon pea and immediately obtain cash from the available buyer in return for his/her grain. If the seller is dissatisfied with the spot market price at the warehouse and sees prospects for price improvements in the later months of the year, he/she can decide to deposit the grain at the warehouse in anticipation that the prices will improve. The seller is issued with a warehouse receipt showing the volume and the color of the grain that he/she has deposited. The seller can then use the warehouse receipt to access a bank loan of up to 70% of the value of the pigeon pea deposited, based on spot market prices, and using their produce as a collateral. The loan amount received from the bank depends on the tonnage of the commodity stored, the spot market price of the grain and the day of the transaction, as well as the conditions of each financial institution. If at the time of actual sale, the price is higher than the market price used for the loans, the farmer gets the excess but has to pay the interests on the loan obtained prior to sale. According to key informants, this interest rate is about 28%.

Challenges with the Commodity Exchanges (ACE and ACHX): The WHRS discussed above seem to have a strong potential to facilitate the marketing of pigeon pea and to increase gains from trade (by providing storage and empowering the farmer to wait for better prices). However, major questions remain about the extent to which smallholder farmers are using these commodities exchange systems, whether the systems are benefiting farmers, and how the systems can be improved to increase benefits for smallholder farmers. Are they actually functioning as described above and in their documents (i.e., facilitate trade through an online platform that brings buyers and sellers of

¹³ AHCX website.

¹⁴ AHCX website.

pigeon pea together) or are they actually operating as large-scale buyers (i.e., use their own money to buy grains from farmers after harvest and eventually sell the grains purchased to exporters/processors while making profits)?¹⁵

According to the key informant affiliated with ACE, ninety-nine percent (99%) of the users of the ACE WHRS are aggregators who use the WHRS to get financing. While the WHRS appears to be working for aggregators by enabling them to access finance and increase their liquidity, which in turn allows them to purchase larger volumes of grains from farmers, it is not clear how the system is actually benefiting smallholder farmers. At the core of both ACE and AHCX is the hypothesis that the use of warehouses and commodity exchange in selling commodities will allow for aggregation, stimulate the demand for pigeon peas in rural areas, and as a result lead to fairer or more competitive prices being offered to smallholder farmers. Key informant interviews with NGOs working with pigeon pea farmers (e.g., Chinansi Foundation in Balaka) suggest that the WHRS has helped some smallholder farmers who do not have storage and have urgent need for money soon after harvest. However, to date, there has not been any systematic, quantitative and qualitative assessment of the impact of the WHRS on gains to smallholder farmers—for example through better prices received from aggregators. Most farmers and farmers’ groups are yet to sell their grains through these exchange systems. Interview with ACE supports the fact that that the utilization of ACE WHRS is still very low amongst smallholder farmers. According to the key informant, the WHRS is not working for farmers. Table 10 shows the share (percentage) of total pigeon pea production that was sold through the commodity exchange systems (CES) in the past five years. The figures reveal that less than 5% of total pigeon pea production in Malawi goes through the exchange systems.

Data collected from FGDs with farmers’ groups reveal that only two of these groups (the Nandolo Farmers Association, and a cooperative) have ever sold pigeon peas through the CES. According to the NFAM, the handling and storage fee charged by the ACE or AHCX warehouses discourage sales of pigeon peas through the WHRS. The handling fee is a fixed fee, while the storage fee is proportional to the volume of legume that is stored in the warehouse.

Table 10. Share of Total Pigeon Pea Production Sold through the Commodity Exchange Systems—2012-2016

Year	Volume sold through ACE (mt)	Volume sold through AHCX (mt)	Total traded through CES (mt)	Total volume traded (mt)*	Share traded through CES
2012	11,533	–	11,533	83,073	13.9%
2013	1,135	85	1,220	100,769	1.2%
2014	6,786	1,803	8,589	111,590	7.7%
2015	4,078	9,750	13,828	117,282	11.8%
2016	2,768	987	3,755	129,890	2.9%
Total	26,300	12,625	38,925	542,604	7.2%

Source: Computed using production data from APES (MOAIWD) and sales data for ACE and AHCX as reported by Gondwe 2017. *Total volume of pigeon peas traded is estimated to be 35% of what was produced.

¹⁵ At which point ownership of the grain is transferred from the farmer to the CES.

Furthermore, while the WHRS enables farmers to obtain a loan from the bank of up to 70% of the value of their grain at spot market prices, high interest rate (about 28%)¹⁶ charged on the loan received pending the actual sales of the legume often discourage the use of the CES. Furthermore, access to these warehouses is particularly challenging for farmers who are located far distances from the closest warehouse.

To improve the use of these WHRS by smallholder farmers, several measures/actions are necessary. First, smallholder farmers need to be organized. Aggregators are able to obtain finances from banks through the WHRS because they aggregate large quantities. Aggregators also have a stronger bargaining power and are more likely to fetch higher prices because they bring in larger tonnage. Farmer groups, if well organized, can also enjoy all the benefits that aggregators are getting. Second, the GoM can subsidize the storage cost for smallholder farmers who are in groups, as it appears to be a major factor discouraging the use of the WHRS. Third, to increase profits for smallholder pigeon pea producers when they sell through the WHRS, the GoM will need to work with financial institutions to lower the interest rate that is charged on warehouse receipts.

7.9. Other Service Providers—The Business Innovation Facility (BIF)

The Business Innovation Facility (BIF) is a five-year (2014 - 2019) DfID-funded market systems development programme that aims to improve the lives of the poor in three countries: Malawi, Myanmar and Nigeria (BIF website).¹⁷ In Malawi, Imani Development implements the programme. BIF works to identify and address constraints in selected markets, and to provide technical assistance (and some grant funding) to businesses and other market players. The goal of BIF is to provide support to develop and replicate business models that make markets more inclusive, resulting in greater opportunities, better access and improved growth for the poor and disadvantaged people who engage in them (ibid).

The BIF programme follows the Market Systems approach that is summarized as follows:

- Undertake market assessments to inform the selection of focus markets;
- Develop in-depth Market Analysis and Strategies;
- Design interventions to address identified constraints;
- Identify partners and co-create projects;
- Select expert consultants to support the delivery of projects;
- Pilot the projects;
- Monitor and evaluate; and
- Support adoption, adaption, and expansion of the commercially sustainable innovations.

Interviews with the Marketing Director of BIF in Malawi revealed that pigeon peas, rice and solar products are the major focus of the programme in Malawi. The BIF works with several actors/partners along the pigeon pea value chain. These include, the DARS (Chitedze Research Station), ICRISAT, and seed companies (Peacock seeds, Global seeds, Pindulani Seed Investment; Funwe seeds and MUSECO seeds) in the production, packaging and distribution of certified seeds of improved varieties of pigeon peas. Through its Markets for the Poor (M4P) approach, BIF

¹⁶ Commercial lending rates by banks declined in 2016/17, from around 40% to around 25% in 2018 due to reduction in the Reserve Bank lending rate from 25% to 16%. However a representative of one of the commodity exchange markets indicated that the WHRS lending rate to farmers has not declined; negotiations are still ongoing with the banking sector.

¹⁷ <http://www.bifprogramme.org/about-bif>

provides technical assistance to partners in the seed system. For example, BIF conducts research to understand farmers’ needs and identifies actors to meet the needs. Based on findings from their research, BIF was able to advise seed companies to package pigeon pea seeds in smaller quantities that farmers can easily buy or pay for. BIF also covered up to 15% of the additional packaging cost in order to encourage seed companies to adopt smaller packages (2 kg bags) in seed distribution.

BIF is also involved in the dissemination of information on agronomic practices to pigeon pea farmers. For example, based on research conducted on pigeon pea farmers, BIF identified a need for training on agronomic practices. BIF then went forward to identify NGOs who can provide the training needed by farmers. BIF also works with Farmers’ Organization Ltd (FOL) to facilitate the supply of crop protection inputs (pesticides and other chemicals) to farmers.

BIF is engaged in the marketing of pigeon peas. It does so by providing a platform through which ACE can provide pigeon pea farmers with market information, e.g., buying price at different locations. BIF also works directly with farmers’ associations and cooperatives. At the time of fieldwork, BIF was conducting a market assessment for pigeon peas in Malawi the purpose of which is to analyze environmental forces, market trends, entry barriers, competition, risks, opportunities and the resources and constraints in the pigeon pea sector in Malawi.

7.10. Profitability Analysis and Prive Value Changes along some Nodes of the Value Chain


Profitability analysis was done on producers of pigeon peas as shown in Table 11 below. Although profitability analysis was not conducted for retailers, on average they handled larger volumes of pigeon pea (~1050 kgs per annum) and received an average of MK474, 806 per annum. The average price they received was MK 452.56 per kg in the normal season and MK 647.32 in the lean season (Table 12), which is double the price that farmers received on average (MK 323.76). Based on the average quantity the farmers sold, they made a revenue of MK 66,513.18 per acre and a gross profit margin of 42%. Intermediate buyers (N=6) were not asked what price they received when they sold their pigeon pea, but they reported providing an average price of MK 513 to whoever they bought pigeon peas from.

Table 11. Pigeon Pea Farmer Profitability Analysis per Acre

Yield per acre (Kg/acre)		222.02
Selling price per kg	MWK	323.76
Reported Revenue per acre	MWK	66,513.18
Production cost per acre	MWK	38,727.10
Gross Margin	MWK	27,786.08
Profit Margin		42%

Source: Authors’ calculations from survey data

Table 12. Price Changes along Some Nodes of the Value Chain

	Farmer	Retailer	
		Normal season	Lean season
Prices (MK/kg)	323.76	452.56	647.32
Price value change	Base	40%	100%
Farmer-to Retailer			

Source: Authors' calculations from survey data.

8. RELATIONSHIPS ALONG THE VALUE CHAIN

The pigeon pea value chain in Malawi has a buyer-driven governance structure—importers' prices offered to Malawian exporters influence the prices that all the actors will get along the chain (Makoka 2009). Prices offered to small-scale farmers are dictated by the prices that processors offer to intermediate traders. (ibid).

8.1. Horizontal Linkages

As observed earlier, the number of farmers' groups organized around pigeon pea has been on the rise. It is common to find farmers organized by projects—membership in specific project groups—e.g., Total Land Care, Concern Universal, Action Aid, and most farmers groups were initiated by NGOs focusing on the legume. In addition, surveys with farmers suggest that access to profitable markets was a major motivation for seeking membership in farmers' groups. In spite of farmers' organization in groups, several factors still limit farmers from enjoying the full gains of participating in collective action or group marketing of their pigeon peas. These factors will be discussed below.

8.2. Vertical Linkages

The relationship between actors on different stages of the pigeon pea value chain in Malawi is mostly informal. At the farm level, there is no formal marketing or supply relationship between the farmers and the vendors/intermediate traders. However, price information and price signals are received from downstream actors (processors, exporters). None of the farmer groups interviewed had a formal relationship or contract with the buyers of their pigeon peas grains. The decision to sell and the terms of trade are often negotiated on the spot. Price is the main factor that influences a group's decision to sell to a particular buyer—he/she who pays more gets the produce. However, farmer groups that are involved in seed production/multiplication have a formal relationship with ICRISAT (the seed buyer). For example, the contract states that ICRISAT will buy all seeds produced for a period of four years. Key informant interviews revealed that even when such formal relationships exist, breach is still very likely.

The relationship between large buyers and intermediate traders is also largely informal and it is mostly based on trust developed over years of doing business together. Prior to the buying season, large buyers and exporters make known to the intermediate buyers the price they are willing to pay per kilogram of dried pigeon peas.¹⁸ The price offered to the intermediate trader/buyer may change or renegotiated depending on how much of the grain he offers (larger quantities fetch a better price).

One reason cited for the lack of formal relationships in pigeon pea marketing is the fluctuations in prices. The frequent fluctuation in prices was noted to increase the transaction cost of contracting with one buyer over multiple periods—since contracts would have to be revised on an annual or even less than an annual basis.

¹⁸ Intermediate traders called large-scale buyers and processors/exporters prior to the buying season to find out the price they are willing to pay for specified quantities of the pigeon peas. There are no official contracts.

9. CHALLENGES IN MALAWI'S PIGEON PEA SECTOR

9.1. Production Challenges

9.1.1. *Insufficient Supply of the Volume and Quality of Grain Desired*

Primary data collected from large-scale buyers/exporters and processors reveal that low pigeon pea productivity remains an important challenge for Malawi's pigeon pea sector. They noted further that they expected the FISP to increase both the quantity and the quality of pigeon pea and other legumes available for sell. However, this has not been the case.

A historical analysis of pigeon pea yields (Figure 7) shows growth over time, with an estimated yield of 1.71 MT/ha in 2016/2017 (MoAIWD APES.)¹⁹ This productivity data if accurate, suggests that pigeon pea yields have increased over time but it is still below the estimated yield potential of 2.5 MT for improved varieties.²⁰ Thus, it appears that in spite of the growth in productivity experienced over time, higher yielding varieties are required to meet the high demand for the legume. Several factors have been cited to influence pigeon pea yields in Malawi. These factors are discussed below.

9.1.2. *Availability, Access to and Utilization of Improved Pigeon Pea Seed Varieties*

The factors limiting the effectiveness of the pigeon pea seed systems in Malawi can be grouped into supply side and demand side factors.

A. Supply Side Factors

Rainfed Seed Production: As noted earlier, the production of breeder seeds in Malawi is the responsibility of Chitedze/DARS (with support from ICRISAT). Seed production at Chitedze/DARS is 100 percent rainfed. As a result, variability in rainfall or insufficient rainfall are likely to lead to insufficient production of basic seeds for further production and multiplication. Key informant interviews with ICRISAT also highlighted the difficulty faced by DARS/ICRISAT in accurately projecting in advance the demand for seed in each planting season. According to the key informants, seed demand often comes in late, which makes it hard for them to respond in a timely manner, partly because of limited resources and partly because of weather related factors.

Limited Capacity for Seed Certification at DARS: DARS is the only entity authorized by the GoM to certify seeds. As the demand for quality increases, so does the demand for certification and quality assurance. However, the challenge is that DARS does not have sufficient capacity to supervise all local seed companies, contract growers and farmers involved in the production of certified seeds. Interviews with ICRISAT observed the critical role that ICRISAT is playing to support DARS in the delivery of its responsibility. However, as observed by the informants, the demand for certification is much bigger than DARS can currently satisfy. A recently approved seed policy proposes establishment of a semi-autonomous seed services unit to rectify DARS capacity constraints.

According to the Executive Director of the Grain Legume Association Limited (GLAL), a member of the Legume Development Trust Consortium (LDT) in 2014 GLAL and LDT conducted a needs assessment for Malawi's legume sector.²¹ The assessment revealed that seed availability was a major

¹⁹ In reality, this will vary depending on whether the crop is intercropped with maize or it is monocropped.

²⁰ Yields are calculated as total production divided by total harvested area.

²¹ Other members of the consortium include NASFAM, OXFAM, Farmers Union, Seed Companies, Chemical suppliers, e.g., Farmer Organization Limited, and Agricultural Research Limited.

challenge in legume production in Malawi. This finding led to a model whereby farmers were engaged in contract seed production. Under this model, seed companies such as Peacock Seeds and Mgomera Seed Company would make available to farmers basic seeds for the production of certified seeds. Farmers in turn sign a contract with the seed company to produce and sell back to the company the certified seeds produced. Following the signed agreement, the farmer is trained on seed production. Each seed company uses its own seed inspector to supervise the farmer in the seed production process, and a technical staff from DARS is responsible for verifying that the seed is produced following the correct procedure for certified seed production. The success of this attempt to increase the availability of certified legume seeds was choked by the inability of Chitedze/DARS to provide the personnel required for seed certification process. More than thirty seed companies with numerous farmers involved in seed multiplication are relying on Chitedze/DARS for seed certification. The lack of personnel at Chitedze/DARS was therefore noted to have slowed down the certification process –seed companies did not recover the certified seeds from contract farmers well enough in time to make the seeds available to farmers and to recover their expenditures.

Insufficient Supply of Seeds at the Farm Level: As observed by Simtowe et al. (2010) limited supply of sufficient quantity of good quality seed could limit the adoption of improved varieties. Kadale (2013) also observed that smallholder yields and total production of pigeon peas are constrained by poor access to quality seeds. ICRISAT’s SRF project is argued to have increased smallholder farmer access to improved high-yielding and fast-maturing varieties of pigeon peas (ICRISAT Annual Report 2014). The project is noted to have accomplished this through the training of 1000 seed producers per year (approximately 49% female producers) and the training programs on Seed Sector Development which are organized to equip stakeholders to efficiently handle their seed businesses (women’s participation ranging from 20-50%) (ibid). According to the report, many farmers have started growing pigeon pea due to availability of improved seeds, replacing crops such as tobacco. In spite of these achievements, key informant interview with ICRISAT suggest that a big gap in seed production continue to persist between pigeon peas and other legumes such as groundnuts. Table 13 compares the production of pigeon pea and groundnut seeds. The figures show that quantity of pigeon pea seeds produced are by far lower than that of groundnut seeds. During 2007-10, a total of 21.18 MT breeder, and 440.2 MT foundation and certified seed of ICEAP 00040 (Kachangu) and ICP 9145 was produced at research stations and farmer fields (Rao et al. 2012).

Table 13. Production of Groundnut and Pigeon Pea Seed through a Revolving Fund Scheme Managed by ICRISAT in Malawi–(1999-2008)

Season	Groundnut seed quantity (tons)		Pigeonpea seed quantity (tons)	
	Certified Seed	Breeder Seed	Certified Seed	Breeder Seed
1999-2000	61	8	12	3.0
2000-2001	56	15	30	0.4
2001-2002	194	17	35	17.0
2002-2003	116	8	12	2.0
2003-2004	45	3	16	0.4
2004-2005	89	6	34	2.0
2005-2006	64	2	7	0.2
2007-2008	76		23	0.0
Total	801	58	169	25

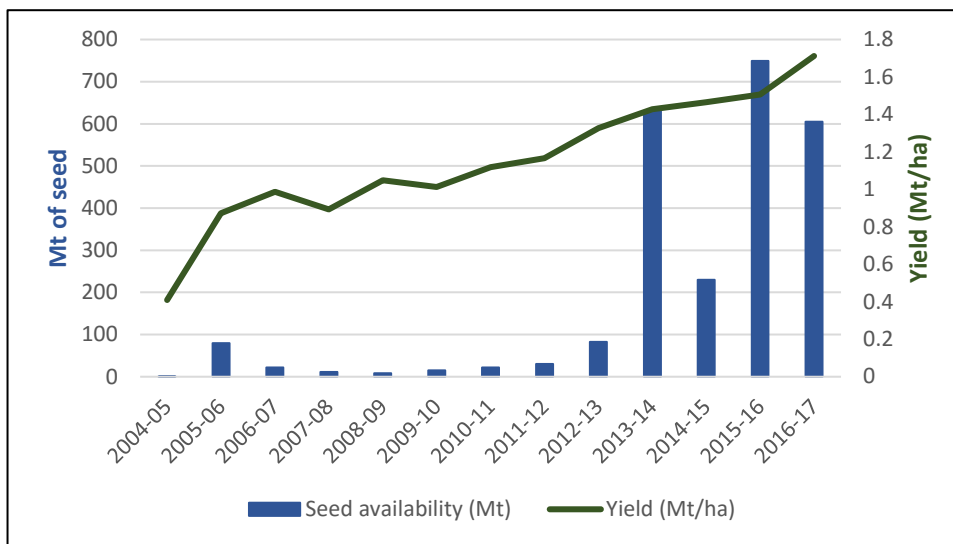
Source: ICRISAT (2006)

NGOs involved in the pigeon pea sectors were noted to play an important role in improving the availability of improved seed varieties—they purchase basic seeds from ICRISAT/DARS and give the seeds available to their farmers for multiplication. The seed multiplier returns either all or a portion of the seeds multiplied to the NGO. The NGO then distributes certified or quality declared seeds to farmers participating in NGOs as a seed loan. Farmers are expected to pay back with interest in the form of seeds to the NGO. However, such interventions are limited to the target areas of the NGOs, and the effectiveness of the NGOs in increase the availability of certified seeds depends on the availability of certification capacity from DARS. The challenges associated with making available certified seeds to farmers raises questions about quality declared seeds (QDS) as the next best option. However, fieldwork did not reveal much with respect to the availability of QDS for pigeon peas in Malawi. Adoption of improved pigeon pea varieties will only increase if improved seed varieties were more readily available to farmers.

Key informant interviews with seed systems actors suggest a general increase in the availability of improved pigeon pea seeds in recent years, though with variability across regions. Estimates of pigeon pea seed availability from STAM are shown in Figure 16. The data suggest an increasing trend since 2004/2005. Twenty three percent of the available seeds distributed to farmers between 2010/11 to 2016/17 was from the FISP. The rest must have been from NGOs that supplied the seeds free of charge or at a reduced cost. Conversation with STAM officials indicated that there is no market for legume seeds in Malawi except through NGO and government programmes.

This increase in seed availability is often attributed to donor programs or investments (such as the Malawi Seed Industry Development Program) and the GoM's FISP. The FISP programme has been lauded for increasing the availability of legume seeds in Malawi (Sichali, McLean, and Botha 2013). The program is said to have stimulated private seed companies' interest in the production/ multiplication of improved seed varieties for legumes, an activity that these companies would otherwise not be interested in because of non-excludability and the open-pollinated nature of most legume seeds (Simtowe 2010).

Figure 16. Relationship between Availability of Certified Pigeon Pea Seed and Pigeon Pea Yields in Malawi



Source: STAM data for seed availability (<http://www.seedtrademalawi.com/estimated-seed-availability-over-years>). Yield data is from MoAIWD APES data.

Table 14. Distribution of Legume Seeds Redeemed with FISP Vouchers (Nearest Metric Tons)

	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Pigeon Peas	1	4	467	48	17	131	164	98
Cow Peas	6	2	0.2	41	14	47	33	25
Common Beans	341	316	340	652	475	1,039	1,345	438
Soya	645	375	596	358	384	867	531	327
Groundnuts	397	2,029	1,579	1,867	2,151	944	753	776
Total in tons	1,391	2,727	2,562	2,973	3,042	3,027	2,827	1,664

Source: FISP Implementation Reports for 2009-2016/17.

The distribution of legume seeds (metric tons) redeemed with FISP vouchers (Table 14) shows an increasing trend in the quantity of pigeon pea seeds redeemed with the FISP voucher since 2009. This may suggest that the FISP vouchers have created a demand for quality seeds.

However, compared to other legumes, the consumption of pigeon pea seeds is about the lowest. A breakdown by region (Table 15) also shows that over 90% of the vouchers redeemed for pigeon pea came from the south.

Key informant interviews with ICRISAT also revealed that growing demand for improved legume seeds is likely to grow more in the years ahead. Factors cited as driving the growing adoption of improved seeds include deliberate intervention/efforts and awareness creation by stakeholders, market forces, the collapse of tobacco industry (declining tobacco prices are causing farmers to look for alternative crops), increased attention to nutrition, and climate change (farmers are increasingly demanding improved varieties because local varieties are not adapted to climate change). The interviewees noted that the positive trend in the adoption of improved varieties is likely to continue if farmers can fully perceive or understand the economic benefits of investing in improved varieties.

Thus, while overall, the FISP may have contributed to increasing smallholder access to quality pigeon pea seeds, it is noteworthy that the challenges facing ICRISAT (discussed above) also have implications for the effectiveness of the FISP. Challenges remain with respect to widespread or broad scale availability of pigeon pea seeds. Surveys with farmers reveal that pigeon pea seeds are not always available from the seed retail outlets in their locations that are accepting the FISP coupons.

Table 15. Regional Distribution/Breakdown of Type of Legume Seeds Sold (Metric Tons)

	South	Central	North	Total in 2015-16*
Pigeon Peas	154	10	0	164
Cow Peas	23	6	4	33
Common Beans	568	585	193	1,345
Soya	172	287	72	531
Groundnuts	340	337	76	753
Total in tons	1,257	1,225	345	2,827

Source: FISP Implementation Report for 2015/16 season.

*The region breakdown of legume seed distributed in the 2016/17 season was not available at the time of compiling this report.

This may limit farmer's utilization of improved pigeon pea seeds if they choose to grow the legume. FGD with farmers in Mzukuzuka, Kasungu in the Central region revealed that the decline of the tobacco market is causing many farmers in the Central region to want to switch to other crops, pigeon pea being one of these alternative crops. However, access to pigeon pea seeds remain an important challenge or factor limiting their ability to grow the legume in this location. This is because the seed retail outlets that accept the FISP coupon in the area do not stock pigeon pea seeds. Such differences in legume seed availability across different areas imply that data on the type of legume seed that have been redeemed with the FISP coupons cannot be interpreted as revealing farmers' preference for specific types of legume seed. This is because farmers redeem the coupons for what is available from the retail outlet and not necessarily for what is preferred for cultivation.

Key informant interviews with the FISP Coordinator in the Ministry of Agriculture, Irrigation and Food Security (MoAIFS) divulged that a major challenge facing the FISP is the issue of seed reselling. This challenge was observed to be more common with very poor farmers. As a result, the FISP is considering strategies to address this challenge. For example, the FISP is piloting a potential solution to this challenge in the regions of Dowa (Central) and Rumphi (Northern). The main idea is to select only productive farmers to participate in the subsidy program (that is, to receive coupons). Specifically, households are classified according to their level of productivity, where productivity is measured by looking at landholding size, availability of labor, access to inputs and commercial price of the inputs, and ownership of livestock and other assets. Households are then grouped by quintiles based on individual household level productivity measure/score. Farmers are randomly selected from quintiles 2, 3, and 4 to receive the coupons. Households in quintile 1 are not selected for the program because there is a high risk that these will eat or resell the seeds due to high level of poverty amongst them. Such households are referred to the social protection programs, for example, cash transfers and food for work programs. According to the key informant, if effective, this pilot approach to solving the issue of eating or reselling seeds will be expanded to other districts.

Untruthful/Dishonest Seed Labelling: Discussions with key informants suggest that the incorporation of legumes into the Farm Input Subsidy Program (FISP) has led to an increase in the demand for certified or quality seeds from farmers. This in turn has generated a lot of interest in the multiplication and distribution or marketing of legume seeds. Accompanying this has been an increase in untruthfully labelled seeds in the market. According to BIF, sales of grains labelled as seeds have become a very common problem in the rural areas. Recently, there has been several cases where farmers have accused ICRISAT of selling to them untruthfully labelled seeds that did not perform as expected. Investigations revealed that these seeds were not from ICRISAT, even though they were labelled so. Key informant interview with an agrodealer and a retailer of seeds produced by Clinton Foundation farmers also revealed instances where farmers have accused the agrodealer of selling seeds that did not germinate. Further, it was alleged that some companies were sourcing seeds from neighboring countries that they supply directly to farmers without passing through government systems for clearance, even though the law currently forbids such actions. Ultimately, farmers are deceived and this affects crop yields.

These findings suggest the absence of regulations or policies on seed distribution/marketing or a lack of enforcement of regulations on truthful labelling of seeds, if there are regulations. The absence of such a regulatory environment perpetrates dishonesty in the labelling of seeds, thereby creating a disincentive amongst farmers to invest in quality seeds and negative spillovers for companies who produce good quality seeds. This finding suggests a need for policies and regulations on seed distribution and sale.

Weaknesses of the Public Extension System: Amongst others, key functions of agricultural extension include educating farmers and supporting the uptake/adoption of improved seeds to farmers (for example by empowering them to recognize good planting materials). According to IFPRI (2017), about 50% of households had no contact with extension services in the the 2015/16 cropping season. ACB (2016) also notes that a characteristic of Malawi's agriculture is weak public-sector extension system, and one of the strategies that have been used to remedy this weak extension has included the promotion of agro-dealers as private enterprises. Consequently, agro-dealers are increasingly playing an important role in the distribution of pigeon pea and other legume seeds, a role that has been facilitated by the FISP. ACB (2016) asserts that agro-dealers are a private sector model for extension that emphasizes the product rather than the farmer. As a result, they cannot be used to replace public extension services for several reasons including the fact that agro-dealers are structured on a private for-profit basis that makes it difficult for them to serve a public purpose—i.e., agro-dealers have no links with R &D and cannot facilitate direct farmer engagement with the R&D system.

Lack of Collaboration between the Different Entities Involved in the Seed Systems: According to Jones, Freeman, and Le Monaco (2002), there has been a lack of collaboration between the different entities involved in the seed systems (national governments, the private sector, agricultural researchers and extension workers). This lack of collaboration has been evident in that many of the technologies developed by agricultural research were/are irrelevant to the needs of smallholder farmers, thereby exposing a need for closer farmer involvement in technology development (participatory varietal development) (ibid).

Two types of pigeon pea markets are distinguished in Malawi—the local market and the industrial market. Industrial markets (agro-processing and food manufacture) require standardized products with high yields and in high and consistent volumes. Local markets focus on local adaptation and varieties that are more diverse at different times of the year to meet changing local demands (ACB 2016). According to ACB (2016), the differences between the two markets implies that Research and Development (R&D) have to be shaped by these different needs, depending on the focus of the intervention.

Existing evidence highlights that the primary focus of pigeon pea breeding in Malawi has been to produce seed varieties that are preferred by India, the principal destination of Malawi's pigeon pea exports. ACB (2016), for example notes that most projects targeting pigeon pea in Malawi have emphasized formal, commercial markets for processing standardized products—not as local markets for local consumption, offering products that would have been more appropriate for the conditions faced by farmers. A recent evaluation of AGRA's project on pigeon peas highlights the need to include farmers in the R&D and seed production processes, as well as in discussions about the varieties they would prefer to use, rather than thinking of them as passive recipients of crops and varieties that were decided without their involvement (ACB 2016). The tendency has been to present improved varieties to farmers as final/accomplished solutions. According to ACB (2016), these might be certified varieties from the public sector or locally enhanced varieties with farmer-based quality controls. The development of different varieties should be based on farmer priorities; else, the consequence will be a discontinuation (ACB 2016).

Efforts geared towards achieving outcomes of food, income, and nutrition security for smallholder pigeon pea-producing households must begin with a thorough understanding of farmers' preference for different pigeon pea varieties. As a result, primary data was collected from individual farmers to understand why they grow pigeon peas (consumption versus commercialization), and how the attributes in the variety sold differ from those in the varieties eaten. The data suggests that most

farmers grow pigeon pea for both consumption and commercialization. Most farmers grow more than one variety of pigeon pea, and for 68% of the farmers, the variety cultivated for consumption is not different from the variety cultivated for sell. For 26% of the farmers, the variety sold is different from the variety consumed at home.

Very few farmers were able to articulate their reason for growing the varieties that they do grow. Notwithstanding, the figures reveal that good taste/aroma and suitability for processing into flour were the most important attributes sought for in the varieties that farmers chose to eat or cultivate for their own consumption. The data also suggest that the quality of the grain was an important attribute sought for in varieties cultivated for commercialization. However, it must be noted that quality attributes defined here include the color of the grain, the level of brokenness, and moisture content or dryness. Key informant interviews with downstream actors revealed that the white grain is of higher quality than the red grain since it fetches a higher price. However, the price differential between the white and the red color pigeon pea was not noticeable at the farm level—farmers reported receiving the same price irrespective of the color. It appears that the quality premium was mostly applied at higher levels of the value chain and not at the farm level.

The survey administered to farmers during this study also collected data on the specific pigeon pea variety cultivated by farmers in the sample. The data revealed that most farmers grow more than one variety of pigeon peas. As shown in the Table 16 below, the three top most cultivated varieties are Mthawajuni, Mwayiwathu alimi (ICEAP 00557), and Namanjo. However, only Mwayiwathu alimi is an improved variety.

Thus, while the sample for this study may not necessarily be a representative sample of all pigeon pea farmers in Malawi, this finding suggest that farmers cultivate several local varieties of pigeon peas, some of which are of unknown origin. There is need for research to understand the source of these varieties and the characteristics of these varieties that make them attractive to farmers compared to the varieties that have been developed by research for Malawi.

Overall, several factors influenced farmers’ choice of pigeon pea variety. Sixty percent of the farmers interviewed indicated that yield potential (high yield) is an important factor that influence their choice of growing a particular variety. The choice of variety to grow was also influenced by the length of maturity. Sixty-two percent (62%) of the farmers indicated that they selected varieties that were early maturing and better adapted to climate change (drought resistant). Other factors influencing farmers’ decision to grow different varieties include access to market (14.3%), fetch higher prices (6%), and preferred for consumption (customer demand) (14%) of the farmers.

Table 16. Common Pigeon Pea Varieties Cultivated by Smallholder Farmers

Variety Name	Frequency	Percent
Namanjo	77	33.3
Mwayiwathu alimi	76	32.9
Mthawajuni	38	16.4
Local	26	11.3
Loti	17	7.3
Mthawamanja	11	4.8
Makolo	9	3.9
Other	73	39.6

Source: Author’s computation from survey data.

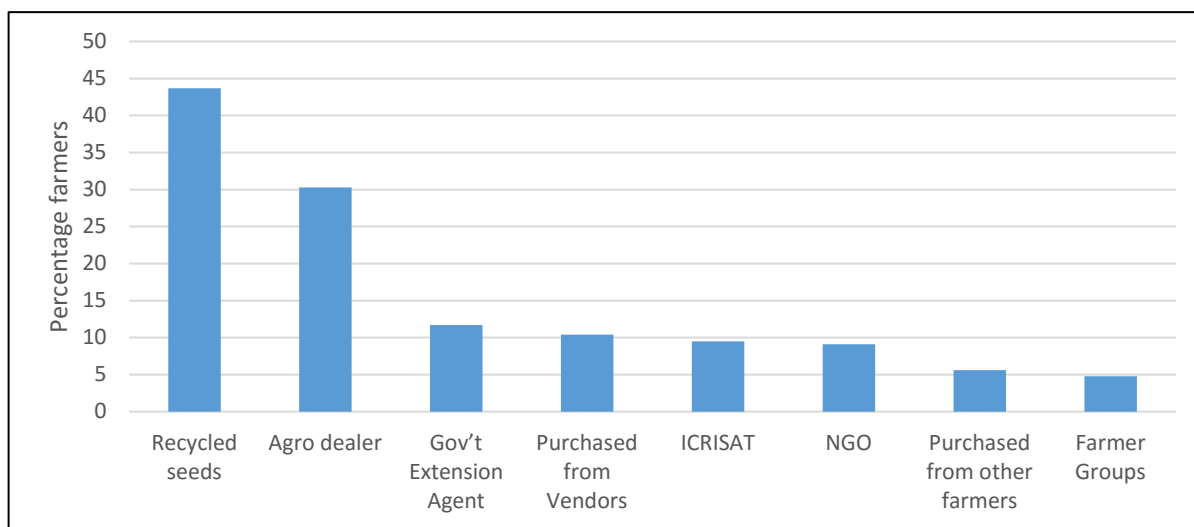
This finding supports the assertion by Kadale (2013) that climate change was an important determinant of pigeon pea variety. Specifically, Kadale (2013) examined the impact of actual and potential climate change on the pigeon pea value chain in Malawi. He found that climate change is causing farmers to move away from local, long maturing pigeon pea varieties and farmers are showing a strong preference for short maturing varieties, e.g., Kachangu (ICP 9145). The authors observed that *Kachangu* is red in color and matures in June/July rather than in August, as was the case with traditional, long maturing varieties. However, in the past three years, the *Mvaimathu alimi* variety (ICEAP 00557), another early maturing variety, has emerged and is gaining popularity, although some farmers reported it having lower yields than *Kachangu*.

B. Issues in the Demand for Seeds

Heavy Use of Recycled Seeds: According to Kadale (2013), farmers’ heavy reliance on recycled seeds from existing varieties has limited adoption of improved seeds, this in spite of the many attempts to widen the distribution of improved seed varieties. Data collected during fieldwork for this study (Figure 17) revealed recycled seeds as the most important source of seeds, with about 44% of the farmers surveyed reporting use of recycled seeds. It should be noted that not all seeds categorized as recycled seeds are necessarily of poor seed quality. This is because most NGOs train farmers that quality seeds can be recycled for 2-3 planting seasons before losing their viability or before restocking.²²

Agro-dealers emerged as the second most important source of seed, with about 30% of the farmers reporting that they obtained their seeds from agro-dealers. Government extension officers were identified as a seed source by 11.7% of the farmers surveyed. Agro-dealers stock quality seeds from

Figure 17. Percentage of Farmers Sourcing Pigeon Pea Seeds or Planting Material from Different Sources



Source: Authors’ computation using survey data.

²² It should be mentioned that farmers who identified ICRISAT as the source of their seeds were mostly producers of certified seeds (receive basic seeds from icrisat that they multiply under supervision to produce certified seeds).

multiple sources. For example, Farmers Hub, an agro-dealer in the Central region (Mchinji–Kamwenda), is the only authorized outlet or retailer of Clinton Foundation (CF) seeds. The Clinton Foundation buys basic seeds from ICRISAT and gives it to CF farmers to produce certified seeds. The Government Seed Services Unit and the CF extension workers supervise the production of the seeds. The seeds are then certified and sold to farmers through Farmers Hub. Seeds produced by the CF farmers include pigeon pea, soybean, and groundnuts.

Lack of Incentives to Invest in Improved Seeds—Markets and Prices: The ability of agricultural research alone to create adequate incentives to spur the adoption of technological innovation is limited. Yet, the adoption of technological innovation is essential for future growth and development (Jones, Likoswe, and Freeman 2000). According to Mula and Saxena (2010) promoting pigeon pea will not happen just by demonstrating outstanding yield performance, but it will also take a market with remunerative prices. ACB (2016) examined the implications of AGRA sponsored activities for small-scale farmers in Malawi. This research highlights that market access is an important factor that influence farmers' decision to adopt new varieties. Granted, there are many potential benefits of growing pigeon pea, e.g., soil fertility, nutrition, economic benefits, etc. However, these benefits are only accessible if the markets can be secured (ibid). Markets are important to farmers who seek to realize value from surplus production but, with many sellers and relatively few buyers, farmers are forced into the position of price 'takers' and consequently receive low prices for their products (ACB 2016). ACB's research demonstrated that farmers are not keen to adopt new varieties that require costly inputs without more certainty that there will be markets for their output. Me-Nsope and Larkins (2016) also found that in the North and Central regions limited access to pigeon pea markets created a disincentive to invest or purchase any type of seeds, such that farmers in these regions were yet to experience the income generating potential of the legume. The current study found that opportunities to market the legume has been increasing in these region (growing presence of large buyers in these regions) and farmers (tobacco and cotton) are interested in diversifying their crops). However, access to seeds was observed to be a challenge.

FGDs held with farmers in 2014 (Me-Nsope and Larkins 2016) revealed that farmers' incentives to purchase these improved seeds were further limited by frequent price fluctuations, low output prices, and limited and varied access to output price information. Thus, adoption of improved seeds was circumscribed by the low profitability of the legume to smallholder farmers. Me-Nsope and Larkins (2016) found that in spite of having many opportunities to sell their pigeon pea, producers in the Southern region were discouraged from purchasing pigeon pea seeds because of the low profitability of the legume.

Data gathered during fieldwork for the current study suggest that access to reliable markets was an important factor influencing the decision to grow any variety of pigeon peas for 14.3%. Only 5.6% of the farmers interviewed identified the price of the legume as an important variable in their decision to cultivate pigeon peas of any variety. To most of the farmers interviewed, the definition of a reliable market also included (in addition to being available when needed) offering a reasonable price for the legume. This implies that the combined effect of prices and markets on farmers' demand for improved varieties of pigeon peas sums to about 20%. Access to markets and prices were widely discussed by NGOs and other value chain actors as important determinants of investments in improved seed varieties.

According to Simtowe et al. (2010) the development of a commercial seed sector should go in parallel with the development of a commercial grain market, which is poorly developed in most parts of the country. In the absence of a commercial grain market, it is unreasonable to expect a commercial seed market to emerge. The demand for improved seeds will be stimulated by

opportunities to sell these crops, and by markets that reward grain quality and types (ibid). Investments in seed systems without restructuring the output marketing systems to improve pricing and gains for farmers may not generate or stimulate any adoption of improved seeds.

9.1.3. Poor Farm Management Practices and Weak Extension Services

To reduce risk of pest damage, pigeon pea farmers need to adopt good farm management practices. A critical factor affecting yields is the spacing of the plants Kadale (2013). Sufficient spacing of one meter between rows and stations with two plants per station is necessary to ensure adequate branching of the plants. Branching is directly correlated to yields and so insufficient spacing leads to lower yields. Branching is also important to deliver high woody biomass to the pigeon pea stems (ibid). Me-Nsope and Larkins (2016) also note that the spacing interval must allow for effective application of pesticides.

The cultivation of improved varieties requires farmers to make investments in pest management (since these varieties are noted to be more susceptible to pest damage), as well as gain knowledge on how to cultivate these varieties. Key informant interviews with input suppliers and extension officers suggest that while farmers are switching to improved varieties expected to be better adapted to climate change, farmers lack the knowledge on how to grow these varieties. As observed by Kadale (2013) significant extension advice and seed marketing services are needed to facilitate the uptake of the emerging varieties. The interviews highlighted a need to train farmers on how to grow these varieties for reduced pest/disease damage and better income benefits.

Unfortunately, the ability of the public extension system to carry out this role of educating farmers is influenced by many factors. Key informant interviews with extension agents revealed factors that plague the effectiveness of extension system in Malawi. First, EAs observed a lack of interest and a corresponding low participation of farmers in extension activities (such as training) organized by the EPA. This was attributed to the perception amongst farmers that activities organized by public extension agents will be of low gains to them because unlike NGOs, the public extension workers lacked resources required to facilitate training. Second, even when farmers participate in extension activities, extension agents observed that farmers are not always willing to apply information learned during training. Farmers are resistant to change or to trying new technologies. Overall, data revealed that extension agents face severe lack of resources, which limits their ability to effectively deliver extension advice. Examples of resources cited include means of transport, stationary and refreshments.

9.1.4. Climate Change

Climate change characterized by late onset of the rains in summer month (March/April), a shorter rainy season, prolonged dry spells in the rainy season, and increased mean temperatures is having an effect on pigeon pea yields (Kadale 2013). According to Kadale (2013) pigeon pea planting season has changed from late October or November to December due to the late onset of the rainy season. The critical times in the production cycle are planting, the flowering cycle and pod filling periods. If planting occurs before the rains are sufficient then the seedling becomes vulnerable to disease incidence and is weak throughout the season. If the rains are insufficient in the later part of the season, due to prolonged dry spells, then there can be poor pod set due to lack of moisture and poor pod development and filling which can negatively affect yields. In response to the shorter rainy season, many smallholders are moving away from local, long maturing varieties towards early

maturing varieties aligned to changes in the climate. Use of early maturing varieties benefits farmers because they can have produce on the market earlier and thus take advantage of better early season prices (ibid).

Climate change has also increased the susceptibility of the crop to insect and pest damage. Kadale (2013) notes that weevils and aphids are the two prevalent pests that damage the pigeon pea crop, and the population of these insects increase with higher temperatures and prolonged dry spells, thereby increasing the risk of insect infestation that normally starts in the field and proceeds into storage to generate additional storage loss.

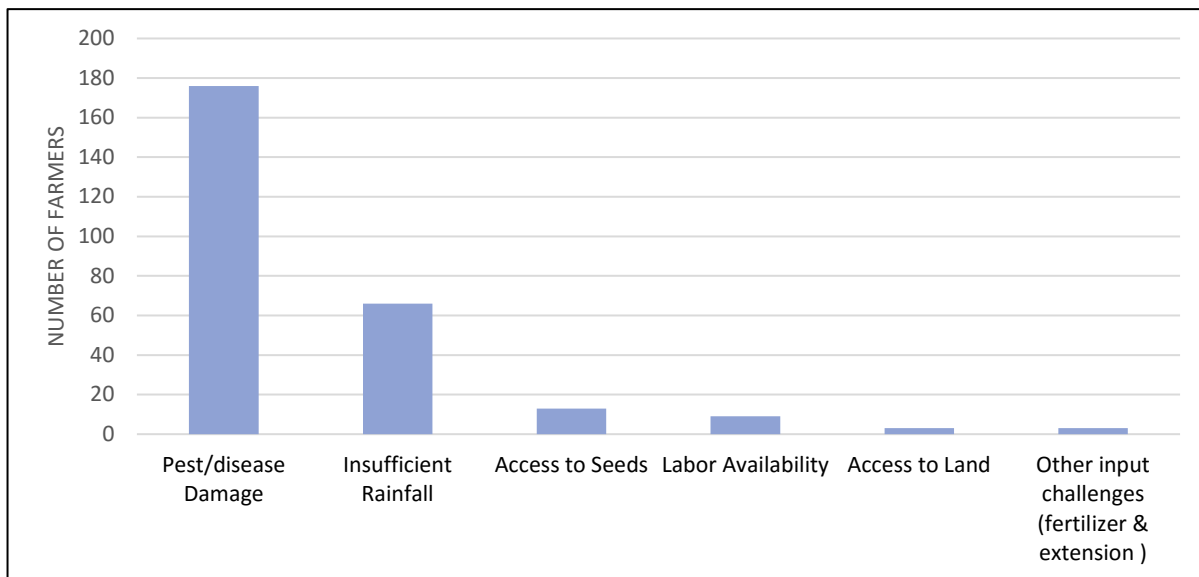
Primary data collected during fieldwork showed that climate change characterized by erratic rainfall (insufficient rainfall, droughts, etc.) was the second most reported challenge in pigeon pea cultivation (29% of the farmers) (Figure 18 below). Few farmers reported doing something about it, and the coping mechanisms identified include the adoption of conservation agriculture practices (crop rotation, box ridges), planting of early maturing and drought tolerant seed varieties, mixed cropping, and planting of trees.

The challenge of climate change can be summarized as being twofold—it is causing a demand for early maturing pigeon pea varieties in some areas in Malawi and it is increasing the susceptibility of the legume to pest and disease damage. The effects of climate change on pigeon pea also differ across agro-ecological zones. In some areas, farmers observed that the challenge was too much rainfall or heavy rainfall. In other areas, farmers complained about droughts. This implies that there is a need for research and extension to develop or identify varieties that are suitable/adapted to different agro-ecological zones as well as resistant to pest and disease damage.

9.1.5. Insect Pest Damage

Pests and diseases considerably affect the yield of legumes in the third world countries (Kelly et al. 2003). Like other legumes, pigeon pea is susceptible to damage from insect pests that occurs mainly

Figure 18. Number of Farmers Experiencing Each Cultivation Challenge (N=231)



Source: Authors' computation using survey data.

during the flowering and podding stages in the field, and later in storage (Jones, Freeman, and Le Monaco 2002). Poor production management practices increase the susceptibility of the crop to insect and pest damage (Kadale 2013) Christian Aid and CISANET (2015) observes that pigeon pea attracts much of farmers' crop management attention for pests and diseases including livestock damage. Chemical treatment for pigeon pea pests remains unaffordable to the smallholder farmers. The production of the legume will not be profitable to farmers if they do not invest in crop protection techniques.

Surveys with individual pigeon pea farmers revealed pest damage as a major challenge in pigeon pea cultivation. The challenge was reported by seventy-six percent of the farmers interviewed. About 47% (n=109) of the farmers interviewed reported spraying chemicals to deal with the problem of pest damage. Other strategies used by farmers to reduce pest damage include: early weeding to prevent termites, reducing the height of ridges to avoid harboring termites, crop rotation to reduce leaf blight, use of plant-based pesticides (e.g., neem leaves), and manual killing of insects. Lack of sufficient money to invest in these chemicals, as well as the inability of pesticides to eliminate all possible plant pests remain major concerns amongst pigeon pea farmers. Pest damage is not only a challenge at the farm level, but also an important challenge during storage. Interviews with retailers identified damage from pests and rodents as a factor affecting the profitability of their businesses.

As observed during interviews with the NFAM and input suppliers, farmers who see pigeon pea production as a business are more likely to invest in crop protection techniques. This is because they have perceived the benefits of investing in pesticides. These interviews also revealed that there is a strong correlation between access to markets and prices and farmers' willingness to invest in pesticides. Thus, to harness the potential income gains from producing the legumes, farmers must be trained on the business aspects of the legume. Farmer organizations or groups provide an important platform for the delivery of such trainings, and their access to profitable markets and competitive prices must be enhanced. This will create incentives for them to invest in crop protection strategies. Individual surveys with farmers and focus group discussions with members of farmers' groups reveal that some groups are already facilitating members' access to pesticides. Two of the twelve groups interviewed engage in group purchase of pesticides –farmers receive insecticides on credit that they pay back with a small interest that in turn serves as profits for the group. However, this is yet to be widespread. Most groups lack the financial capacity to play such a role for the benefits of their members. Cooperatives lack an understanding of the mechanisms through which they can raise income/revenue for themselves. Membership funds are more likely to be spent on social functions (funerals, weddings, etc.) rather than business development. There is therefore a need to build financial and business management capacities for most of the farmers' groups in order for these groups to realize benefits for the farmers.

9.1.6. Livestock Damage

Livestock damage is an important threat to pigeon pea production particularly in the Central region (Me-Nsope and Larkins 2016). Snapp et al. (2002) report the destruction of pigeon pea by goats and cattle as a primary constraint to the adoption of the crop in Central Malawi. Most of the varieties that are cultivated by the farmers in this region are long duration varieties, requiring at least nine months before harvest, that is about five extra months on the field after maize is harvested (Me-Nsope and Larkins 2016). For many of the farmers in the Central region for whom livestock production is also an important income generating activities, the extra five months of pigeon pea on the field implies restraining their goats for an additional five months, something that the farmers perceived would be costly for their livestock enterprises. In conclusion, farmers in the Central region

will expand production of pigeon peas if research can develop shorter duration varieties that are well adapted to the agro-ecological zone, and that can be harvested almost at the same time as maize, the major staple crop in most of Malawi (Me-Nsope and Larkins 2016).

9.1.7. Labor Availability and Access to Land

Surveys with farmers also identified labor and access to land as challenges in pigeon pea production. However, these were an issue for less than 5% of the surveyed farmers. Use of hired labor was reported as a strategy for dealing with labor shortages. However, farmers raised concerns about the rising cost of farm labor.

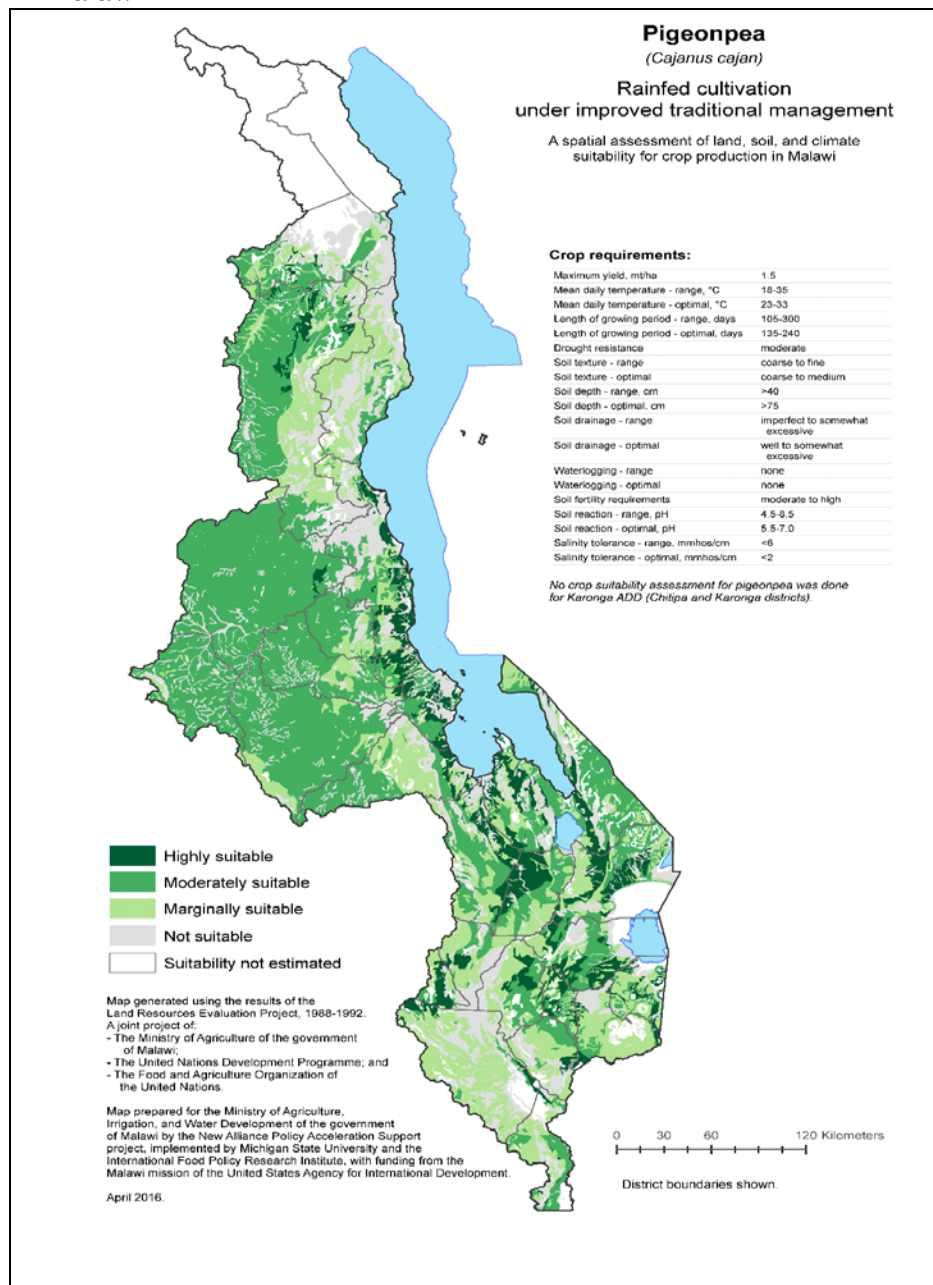
9.1.8. Recommendations for Dealing with Production Challenges

Seed Systems: The challenges discussed above underscore the need to strengthen the seed system (production, certification, distribution and delivery) for pigeon pea in Malawi. As noted by Simtowe et al. (2010) the structural weaknesses in seed and technology delivery and grain marketing system result in challenges in the diffusion and adoption of improved technologies and consequently the on-farm productivity and profitability of pigeon-pea. Investments and interventions are necessary to increase the availability and improve on the diffusion of good quality improved seed varieties that are resistant to climate change and suitable for the various agricultural zones in the country. As observed by Simtowe et al. (2010), improving seed availability, affordability and utilization will require coordinated and collaborative efforts from the public as well as the private sector.²³ Under the MSIDP, ICRISAT has achieved quite some success in increasing the flow of high yielding improved varieties of pigeon pea seeds into the seed value chain. However, effort in the implementation of the market-linked strategies for adoption and Seed Sector Development need to be intensified. These strategies include: i) Understanding farmers' needs by ecological zone in view of market requirements; ii) Producing high quality legume seed to meet farmer needs; iii) Making seed available to the farmer in the right packet sizes and in attractive form and placing it in conveniently located sales outlets for easy access; and iv) pricing the certified legume seed at competitive prices (ICRISAT Annual Report 2014). The challenges faced by DARS (discussed above) must be addressed.

Seed delivery systems must be strengthened to reach farmers who continue to rely on low-yielding and disease-susceptible local varieties. There is also a need to support adoption of these seeds by smallholder farmers. Increasing adoption of improved seed varieties is necessary if smallholder farmers must increase yields and enjoy income increases from pigeon pea cultivation. As shown in Figure 19 below, a sizeable surface area of Malawi is suitable for pigeon pea cultivation if improved traditional methods are used.

²³ Currently the private sector does not have any interest to invest in the pigeon pea seed sector.

Figure 19. Suitability Map for Pigeonpea Grown under Improved Traditional Management in Malawi



Simtowe et al. (2010) highlights several recommendations for strengthening the seed system for pigeon pea in Malawi, most of which are still very valid and need to be pursued. Specifically, the following actions are recommended:

- Build capacity for seed certification. For example, development of short courses to train on seed inspection and certification. This will reduce the heavy reliance on DARS, which is currently ill equipped and under-resourced to handle this function. For example, interviews with Self Help Africa, an NGO that works with pigeon pea farmers, revealed that the NGO

is providing short trainings to build capacity for seed inspection. The trainees would function as Para-legal Seed inspectors after training.

- Establishment of farmer seed multiplication groups that will produce commercial pigeon pea seed. However, these and all other forms of contract seed production will be effective in increasing the availability of quality seeds only if there is a system in place to inspect and certify the seeds produced, in a timely manner.
- Linkages between informal and formal sector to allow regulatory inspection in seed production would improve seed quality.
- Adoption of simpler standards like quality declared seed (QDS) for local diffusion of good quality seed through truthful labeling would enhance seed availability and adoption.
- Previous arrangements such as the establishment of the seed revolving fund scheme managed by ICRISAT in the period 1999-2008, where viable and should be expanded to cover different regions of the country.
- Financial support in the form of seed money to start revolving schemes will be required to promote the establishment of more viable programs;
- Creation of a stable and commercially viable seed sector that meets the seed needs of a diverse group of farmers. For sustainability of the legume seed industry, government and NGO supported input subsidy programs will have to be implemented in a manner that does not displace commercial sales.

Strengthen, Build Capacity for Extension Workers and Equip the Extension System: Key areas for extension intervention are in the delivery of appropriate and timely extension advice to farmers on pigeon pea cultivation and farm management practices for improved pigeon pea seed varieties; utilization of crop protection techniques; and in the marketing of pigeon peas. The need to build Malawi's extension system has been highlighted in many publications (e.g., MEAS publication).

The challenges facing the extension system are not only specific to one crop but are relevant to the entire agricultural system and range of crops produced in Malawi. Investments are necessary to build extension agents' capacity to provide training on crop-specific production techniques. Most extension agents have themselves never received training on pigeon pea production techniques and crop/farm management. The expansion of pigeon pea into non-traditional production zones also highlights the need for such training. Extension agents must be equipped with the skills and knowledge on best practices that can be passed down to farmers, thereby culminating to productivity increases. The Crops Research Institute (ICRISAT), DARS and the Department of Agricultural Extension Services (DAES) collaborate to train extension workers on crop production techniques and best practices for providing farmers with training on the different aspects of pigeon pea production to ensure adoption. As observed by Christian Aid and CISANET (2015) collaborative efforts between public and private institutions are needed to invest enough in extension services. Farmers require the right information and skills in the production of pigeon pea if exports are to be competitive.

Private sector organizations, such as Farmer Organizations Ltd, a leading crop protection company in Malawi is already working with NGOs in conducting plot demonstrations and field days to train farmers on the application of crop protection techniques, raising farmers' awareness on new products and other information. There is an opportunity for the GoM to collaborate with such private organizations in the delivery of training on pest management as well as on raising farmers' awareness on the importance using pesticides when cultivating the improved varieties of pigeon peas.

There is also a need to build extension agents' capacity in the area of agribusiness, i.e., going beyond their involvement in crop production aspects. For pigeon peas cultivation to be profitable to smallholder farmers, farmers must be able to see farming as a business and engage in it as such. Extension workers can play an important role in searching and sharing market information with farmers, and in building capacity for farmers' groups in the area of crop marketing, thereby empowering farmers to benefit from crop production. Furthermore, most farmers' groups are organized around NGOs or donor projects, some of which are involved in training farmers on farming as a business (e.g., CADECOM, CHINASI Foundation). Unfortunately, phasing out of these NGOs or donor projects often result in a discontinuation of services previously provided by the NGOs or donor projects. These farmers' groups struggle to function efficiently and in a profitable manner. Building capacity for extension agents in the area of group functioning and collective marketing is very useful in terms of harnessing the potential income gains of the legume to smallholder farmers.

Strengthening the Role of Farmers' Groups: Focus group discussions revealed that farmers' groups are currently playing an important role in helping farmers overcome some of the production challenges. However, the strategies in place and the effectiveness of these strategies in addressing the challenges vary across groups depending on the group's level of development. Membership in farmer groups was mentioned to help improve access to crop production inputs, especially seeds or planting materials. Various models of access to seeds were observed across the groups investigated. In the 2016 crop season, members of the NFAM were asked to evaluate their seed needs and to contribute to the association for the total amount of pigeon pea seeds needed for the crop year. The NFAM then played the role of finding a seed multiplier who could supply the quantity of certified seeds demanded by the association's members.²⁴ According to representatives of the NFAM, while bulk buying of seeds can help reduce the unit cost, certified seeds continue to be very expensive. As a result, NFAM's plan for the future is to encourage member farmers to engage in the production of certified pigeon pea seeds. Notwithstanding, they note that access to capital for the purchase of basic seeds, land and technical expertise in seed production would be a challenge.

In addition to their role in facilitating access to seeds, farmers' groups provide a platform for the delivery of extension services/advice—it was noted that it is easier to work through groups. Interviews with large processors/exporters also suggest the importance of working with cooperatives in dealing with the challenges in satisfying both the quantity and the quality of the grain demanded by the market. They observed that measures to increase productivity and improve grain quality are more likely to achieve results if targeted at groups instead of individual farmers. According to key informant interviews, the GoM should capitalize on the reduced transactions cost associated with working with cooperatives (compared to when targeting individual farmers) by directly targeting cooperatives with investments or interventions to increase crop productivity. For example, key informants observed that the results achieved from the FISP could have been enhanced if the FISP program targeted cooperatives instead of individual farmers. However, there is a need to build capacity of farmers' cooperatives to function effectively, thereby delivering these outcomes. Some topics for capacity building include communication, financial management and business model development.

²⁴ White/small variety from Khamalathu coop.

9.2. Marketing Challenges

The following marketing challenges were identified at the different stages of the value chain.

9.2.1. Farm-Level Marketing Challenges

A. Poor Access to Storage and Other Marketing Infrastructures

As shown in Figure 20 below, 83.5% of the farmers interviewed identified insects and rodent damage during storage as a major post-harvest challenge. Farmers reported that they lack money to purchase pesticides, they have limited storage space, and they lack knowledge on how to properly store the grains. As observed by Jones Freeman, and Le Monaco (2002) the susceptibility of pigeon pea to pest damage makes access to good storage very important; the lack of which increases the risk of the grain being infested, reduces the quality of the grain and, consequently the price it fetches in the market.

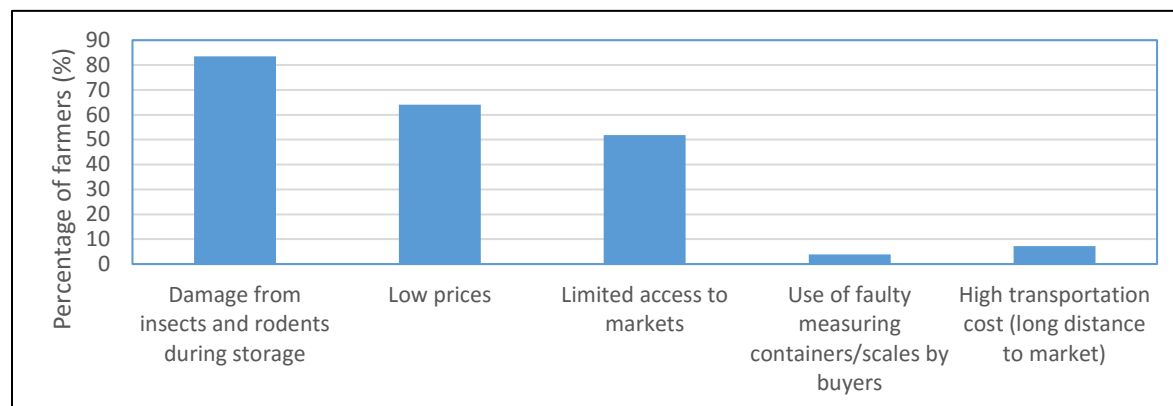
B. Low Farm Gate Prices

Sixty-four percent of the farmers surveyed reported low prices as a major marketing challenge. Per Simtowe et al. (2010), the situation of low prices is worsened by policy and structural weaknesses such as poor storage facilities that force farmers to sell pigeon pea when prices are still low.

Me-Nsope and Larkins (2016) found that differential access to good storage along the value chain had implications for bargaining power and the profitability of participating in the value chain—poor access to storage facilities increased the risk of farmers being cheated with low prices and also deterred smallholder farmers from accessing the export market for green peas (Simtowe 2016).

While over 95% of the farmers surveyed belonged to a farmers' group, and several farmers reported access to better prices as their motivation for becoming members of farmers' groups, information gathered during the survey did not seem to suggest that membership in cooperatives or farmer associations has had any significant impact on the prices farmers receive for their legumes. As discussed earlier, one advantage of group organization and collective marketing is stronger

Figure 20. Challenges in the Marketing of Pigeon Pea



Source: Authors' computation using survey data.

bargaining power and the economies of scale of selling larger volumes in bulk rather than small quantities as individuals. Unfortunately, most groups are yet to realize the gains of collective marketing of the grains.

Furthermore, while many of the groups interviewed indicated that they had a marketing committee that was responsible for searching information on pigeon pea prices at various points of the value chain, frequent price fluctuations and information asymmetries at various nodes of the value chains increased output price risks thereby putting farmers and farmers' groups in a disadvantaged position during trade. Farmers' groups that are affiliated to NGOs receive price information from the NGO staff. Few of the farmers' association observed that they receive price information through their mobile phones.

According to some large-scale processors/exporters, the price paid to farmers for their grain is a function of world market price of the legume. Others observed that each year the government announces on the radio the farm gate price of different legumes, and this is the price they offer to farmers. Few farmers (4.8% of N=231) acknowledged selling their pigeon pea at the price announced by government over the radio. Information on government announced farm gate prices could also be accessed from extension workers. However, there remains questions on the extent to which government announced prices are accessible to farmers, monitored and enforced. Even worse, a farmer's chance of selling at this price is often negatively affected by the quantity sold and his/her distance from the nearest roads. Data revealed huge variability in the selling price across farmer groups and locations. For example, the average selling price for last season (2016) was reported to range from 240 MWK/kg to 710 MWK/kg across locations. Total quantity of dried pigeon peas sold last season by the groups ranged from 0.6 MT to 16,000 MT. Several factors influence the selling price including the quantity sold, competition amongst buyers and proximity to roads/markets, etc.

According to Christian Aid and CISANET (2015), despite the numerous potential benefits associated with growing pigeon pea, small-scale producers have not benefited much from the market share due to lack of market information. Studies indicate that despite an effective market demand regionally and internationally, farmers remain very poor (ibid). Simtowe et al. (2010) observed that albeit the increasing trend observed in nominal and real consumer prices for pigeon pea, high marketing cost and risk tend to lower the prices received by producers.

The lack of price and other market related information puts smallholder pigeon pea farmers at high risk of opportunistic behaviors from intermediate traders to the detriment of farmers. According to Christian Aid and CISANET (2015), the highly fragmented nature of the market makes smallholder farmers vulnerable to exploitation by vendors. In addition to the high risk of receiving unfair prices from intermediate traders, intermediate traders are also cited to have a tendency of using dubious/faulty/weighing scales. Makoka (2009) found that farmers in locations where intermediate traders were the only buyers of pigeon pea were at greater risk of opportunistic behavior than farmers who had the opportunity to sell directly to large buyers in their locations. Although the CES were designed to address the challenge of market access for smallholder farmers, the farmers' proximity to an ACE/ACHX warehouse, the farmer's willingness to pay the handling and storage fee demanded by the warehouses, and their satisfaction with the price expected through the WHRS are likely to influence the farmer's decision to use the WHRS in order to avoid risk of extortion by intermediate traders. Poorly organized farmers' groups fuel the risk of opportunistic behavior. However, only about 7 percent of traded pigeon peas have been traded through the CES.

C. Lack of Reliable Markets

As stated above, a major limitation to promoting pigeon pea in the non-traditional pigeon pea producing areas of the Central and the Northern regions is access to reliable markets. Survey data revealed that limited access to market was the third most mentioned marketing challenge by farmers (52%). Thus, while few farmers reported that their decision to grow pigeon pea was influenced by the availability of reliable markets, many more farmers reported that access to reliable markets was a major challenge in marketing the grain. It is likely that although some large-scale buying companies are now present in the non-traditional zones, many farmers still do not have access to reliable markets.

D. High Transportation Cost and Distance to Market

Related to the issue of limited access to markets at the farm level is high transportation cost and distance to markets. Farmers who are located in villages that are far off the markets or major roads expressed challenges in finding a profitable market for their legume. Opportunistic behavior from vendors is fueled by the fact that such farmers cannot afford to transport the legume to the locations of alternative buyers. Poor roads affect transportation of all crops, not only pigeon peas. As observed by (Chirwa 2011) the lack of competition and competitive services in the road transport sector can have welfare-reducing effects on crop producers.

Promoting the adoption of pigeon pea in non-traditional pigeon pea producing areas such as in the Northern and Central regions (where declining cotton and tobacco prices are currently creating a need for farmers to diversify their crops) will require improving access to markets and competitive prices for farmers. Furthermore Me-Nsope, and Larkins (2016) found gender differential access to markets that originated from gender inequalities in ownership and access to transportation assets as well as cultural norms that restrict women's mobility. Such disparities must be considered in designing interventions to reduce poverty via pigeon pea market development.

E. Poor Organization amongst Farmers

Research conducted in 2014 highlighted that farmers' disadvantaged position in pigeon pea marketing was fueled by the poor organization amongst farmers and the common practice of individual farmers selling small quantities of the legume to intermediate traders (Me-Nsope and Larkins 2016). Me-Nsope and Larkins (2016) assert that for pigeon pea marketing to be profitable to smallholder farmers, there is need for institutional arrangements that strengthen the link between producers and markets, through for example collective action groups (e.g., cooperatives)—such arrangements will help reduce transaction costs, improve the flow and reliability of market information, reduce vulnerability to low prices and cheating, improve bargaining power and increase gains (better prices). According to Christian Aid and CISANET (2015), the pigeon pea market in Malawi is highly fragmented, such that small-scattered units of production make it difficult to form valid associations that would help with collective bargaining.

Since 2014, there has been a proliferation of various types of farmers' group organized around pigeon pea in Malawi.²⁵ Primary data collected during this study revealed that for many pigeon pea farmers, a major factor that motivated them to become members of farmer groups was the desire to

²⁵ The year when the data analyzed by Me-Nsope and Larkins was collected.

fetch better prices for their legumes and to increase access to reliable markets. Data from the FGDs also suggest that farmers' groups play the following major roles in the marketing of pigeon peas, though with varying degrees of effectiveness across the three different types of farmers' groups—farmer club, farmer association and farmer cooperatives. These include:

- Linking of farmers to buyers—searching for markets—in some cases, the cooperative gets a 2% commission on the total value of the grain sold through the cooperative;
- Market surveys and price information search;
- Price negotiations (most of the groups have marketing committee members, who are responsible for this); and
- Provide other marketing services (storage), albeit very few.

While there is tremendous potential for collective marketing to increase the gains that accrue to smallholders from pigeon pea cultivation and marketing, several challenges still plague or hinder the effective performance of farmers groups to deliver the gains of collective marketing. These are discussed below.

Poor Knowledge of Collective Marketing and Poor Group Dynamics: While many farmers are members of farmers' groups and have the opportunity to participate in the collective marketing of their pigeon peas, poverty, characterized by the urgent need for cash often discourage farmer's participation in collective marketing. Side-selling was reported to be very common even amongst groups that mandate that all members must participate in collective marketing of the legume. These groups do not often have the mechanism to enforce this rule. Only one farmer group reported that they had disciplinary measures in place for farmers who engaged in side selling—such members pay a fine of MK 1,500. Side-selling does not only erode the group's ability to sell bulk at better prices for greater gains to group members, but also results in fluctuations/variability in the quantity of the grain that the group is able to offer for sell at each point in time. Huge fluctuations in the quantity available for purchase makes them less reliable as clients to large-scale legume buyers who are always seeking for consistent supplies of the legume.

Another loophole in the way that these farmer groups operate is that although the groups have membership fees, selling through the group is not restricted only to members. Six (6) of the 12 groups interviewed allow non-members to sell through the group, even though at a cost—they are charged a commission (2 of 12 groups) or offered a lower price (1 of the 12 farmers groups). This is another source of inefficiency in how the cooperatives are structured.

These findings suggest that farmers groups need to be trained on mechanisms and principles of collective marketing, business management, as well as on group dynamics to enhance gains from collective marketing and improve the effectiveness of trade.

Lack of Trust among Members: Lack of trust among members further increase the transaction cost of aggregating supplies from members. This is exacerbated by the fact that most farmers have not understood the functioning and advantages of collective marketing. Interviews with NFAM revealed that attempts at aggregating the product from members even after a buyer has been identified often end up in frustration. Farmers receive advance notice from NFAM staff to make their grain available for sell on a specific date. However, the absence of several warehouses, and issues of trust often challenge successful marketing of the grains—farmers are unwilling to release the grain before they are paid, and the buyer is unwilling to release the money before the inspecting the grain. This increases the transaction cost of doing business as the association can only aggregate the grain from

the farmers on the day the buyer has promised to come. This practice also often discourages buyers from coming due to uncertainties in the quantity and quality of the grain that will be available for purchase. Past cases of delays in payment when grain is sold on credit and the risk of embezzlement of funds by a group executive member after the grain is sold have also helped to reinforce the lack of trust in members.

Limited/Low Levels of Operational Funds: Most of the farmers' groups are very weak in terms of performance and are hardly able to deliver the full benefits of collective marketing to their members. The level of financial literacy and business management skills among the groups is low. In addition to this, most of the groups lack the operational funds required to make investments in soft infrastructures (e.g., training) or hard infrastructures (e.g., warehouses) that improve/maximize gains from their activities. Few of the farmers' groups have any avenue through which they generate income for group functions. For example, the NFAM deducts from each member two percent of the value of pigeon pea sold through the association. However, this is hardly a steady stream of income since members have a tendency to side-sell.

Access to storage (warehouse) is very vital to improve the gains from pigeon pea marketing. FGDs with the groups revealed that the lack of financial resources has limited their ability to construct their own warehouse for storing their grain in speculation of better prices; or purchase a truck to use in assembling grain from member farmers or transporting grain to points of sale.

Only one of the twelve farmer groups studied owns a warehouse. NFAM has a warehouse at its headquarter branch in the village of Mpemba (southern region). This lone warehouse is not able to serve all members of the association (6,600 in number) who are geographically dispersed. Further, use of it requires the members to incur the cost of transporting their grains to the warehouse for storage. Members around the Mpemba area deposit their grain in the NFAM warehouse after NFAM verifies the quality (free of any stones, sorted by color and dry (low moisture content)).²⁶ The grain sits in the warehouse while the NFAM actively engages in finding a good buyer. However, members of the association who are located far away from Mpemba cannot use this warehouse (distance and transportation cost). The absence of several warehouses, and issues of trust often increase the transaction cost of doing business as the association can only aggregate the grain from the farmers on the day of arrival of the buyer. As a result, buyers are often discouraged by the uncertainties in the quantity and quality of the grain that will be offered for sell. Even when member farmers are located close to warehouses owned by the commodity exchange or WHRS, interviews revealed that high cost of storage and handling fees charged by the CES and the high interest rates on the payment advanced by the bank on the warehouse receipt discourage use of these warehouses by some farmer groups.

These findings suggest the following:

- Farmer groups need to be trained on mechanisms to generate funds to support business activities (e.g., for the construction of their own storage facilities or warehouses) and reduce business related cost. Pigeon pea farmers and farmer cooperatives or associations can learn from the example of the tobacco industry where farmers associations organized the transportation of tobacco from their satellite depots to the auction markets through a centralized system in which the associations contract specific transporters (Chirwa 2011). The growers and growers' associations were vertically linked in the value chain with some of the transporters of tobacco. The GoM can also support these groups in the construction of

²⁶ White is sold at a higher price.

their own warehouses. Having warehouses in close proximity to the farmers will help the group aggregate their commodity and attract better prices.

- There is a need to develop/facilitate linkages between the farmers' groups and financial institutions. Financial inclusion is necessary if these groups are to function effectively and benefit smallholders. Formalization of these groups is the first step towards financial inclusion. There is need to engage financial institutions in developing/designing products that can serve the needs of these farmer groups, by making available the liquidity that they need to function in a way that maximizes gains from grain trade. For example, the group can open a group account with a financial institution, and work to build a credit history or establish a credit worthiness, thereby improving their eligibility for group loans that can be used in making advanced payments to members at harvest. Such practices can encourage members to sell through the group and will allow the group to postpone the bulk sales of the grains to when prices are more favorable. Group loans from financial institutions are also more likely to enjoy lower interest rates and higher repayment rates (due to peer pressure) than individual loans.
- Government should work with financial institutions to lower interest rates charged on warehouse receipts.

Unsustainable Farmers' Groups: Some of the farmers' groups are sustained by NGOs or other donor funded projects. That is, they depend on these organizations for training and help in organizing themselves. As a result, some of these groups are unable to function on their own and efficiently after the projects or NGOs phase out.

9.2.2. Retail Level Challenges

A major marketing challenge at the retail level of the value chain is poor/low grain quality. According to retailers, sellers sell to them wet pigeon peas that quickly decays. Retailers also observe that some sellers add sand in the bag of grain prior to selling in order to increase the weight. Other challenges identified by retailers of pigeon pea include: i) difficulty in sourcing sufficient quantities of the legume to satisfy local demand (both in the Southern and the Central regions); ii) inability to procure sufficient quantities of the variety (red in color²⁷) that is mostly demanded by consumers (Southern region); iii) huge price fluctuations; iv) high price of pigeon pea (expensive); v) dishonesty—use of distorted measuring scales when they are buying the grain from farmers or other suppliers; vi) theft and harassment from police officers while transporting the pigeon peas to the markets—officers demanding bribes. All these challenges increase the cost of doing business for the retailers. Poor transport infrastructure and the high cost of transportation were also identified as major factors limiting the profitability of pigeon peas for retailers in local markets.

²⁷ Please note that retailers sell to local consumers. Data suggests that consumers in the South prefer the red color grain because it is perceived to be sweeter. However, farmer groups selling to the export market channel observed that the white grain sells for a higher price than the red grain. Thus, there appears to be a difference between the quality (color) preferred by export trade and the quality preferred by domestic consumers.

9.2.3. Large Exporters/Processors

A. Difficulty Obtaining Sufficient Supply of the Volume and Quality Desired

Low Productivity: Key informant interviews with exporters reveal that low productivity of pigeon pea translates to shortages in the volume of grain required to satisfy the demand for export trade and domestic consumption. The low productivity was attributed to climate change and the low access to improved seeds (already discussed).

The Withholding Tax on Foodstuffs: In addition to a general low productivity, the government mandated withholding tax of 3% charged on foodstuffs supplied to traders and institutions was noted to be an impediment in procuring grains from farmers. Large buyers who demand this tax observed that the tax shuns farmers from selling to them, and increases the likelihood that farmers will sell to vendors since vendors do not deduct the withholding tax from the total value of pigeon pea sales made by the farmer. According to key informants, the government should abolish this tax.

Poor Organization amongst Farmers: Poor organization amongst farmers was also identified by large-scale exporters/processors as a factor limiting their ability to obtain sufficient quantity of the legume. According to the key informants, poor organization increases the transactions cost of doing business with farmers or farmers' groups.

Poor Quality Grain: Large-scale processors also raised concerns about the quality of the grain sold to them by farmers and vendors. There are gaps in knowledge of grain quality and standards for pigeon pea along the value chain. According to large-scale processors/exporters, there are official grades and standards for pigeon pea exports in the international market. However, farmers are not knowledgeable about these grades and standards. Two most common quality attributes are the color of the grain and the moisture content. Other minor grain quality requirements include free of impurity (grass, stones and metals). With respect to color, there appears to be preference for white pigeon pea in the export market. Notwithstanding, large buyers still buy both the red and the white pigeon peas. Data from smallholder farmers did not reveal any difference in price based on the color of the legume, meaning that smallholder farmers do not receive a premium for supplying white grain when they do so. However, interviews with NFAM revealed that white color grain fetches a price premium over the red or mixed color pigeon pea. To ensure that NFAM always sells good quality and fetches good prices for its grains, the association has been training its members on grain grading. Thus, while individual farmers do not get any price premium for selling white color pigeon pea to vendors or the branches of large-scale buyers, collective marketing of the grain has a potential to enhance farmer's ability to obtain a premium for the quality of the grain supplied for sell.

According to key informants, smallholders find it difficult to satisfy the moisture content requirement. This is because their desperation for urgent cash after harvest usually triggers them to want to sell the pigeon pea even before it is dry enough for commercialization. It was observed that while the government often announces the start of the buying season, smallholder farmers still have a tendency to sell the legume before the buying season was declared to start. Furthermore, the scramble for the legume also makes vendors or intermediate traders to rush for the farmer's grain before the buying season, and sometimes even while the crop is still on the farm. Early buying of the legume and the desperation for income by farmers makes farmers even more vulnerable to opportunistic behaviors.

The above-mentioned difficulty faced by pigeon pea exporting companies in supplying sufficient amounts of the variety and quality demanded by the export market is not a new story. Jones,

Freeman, and Le Monaco (2002) observe that Malawian exporters continue to have difficulties meeting the quality standards for both the dried pigeon pea and the processed dhal because of limited supply of quality grain from the producers. Makoka (2009) also observed that one major challenge for pigeon pea exporters in Malawi is their inability to supply sufficient volumes of the variety demanded by India (the major destination for Malawi's pigeon pea exports). While there is high demand for the white-seeded pigeon pea varieties (e.g., ICEAP 00040) from the export market, Malawi is not producing enough of this variety (ibid). India is currently sourcing all this variety from Myanmar that is producing about ten times more than Malawi (Makoka 2009).

The high demand for specific varieties of pigeon peas like the ICEAP 00040 seem like an opportunity for pigeon pea growers in Malawi to expand production and increase income. However, farmers need to be empowered to take advantage of this opportunity. For example, by educating farmers on crop production techniques and the market potential for different varieties of pigeon peas, increasing availability of improved seed varieties, promoting farmers involvement in collective marketing groups, investing in existing cooperatives and associations (thereby empowering them to reap the benefits of growing the legume), and promoting access to reliable and profitable markets.

B. Poor Business Enabling Environment

Poor Transport Infrastructure and High Freight Cost: Poor transport infrastructure was identified as a major impediment to trade. Lack of roads linking areas of pigeon pea production to the markets (or points of exchange) increases the cost of doing business. Key informant interviews with large-scale exporters/processors of the legume, revealed that poor transport infrastructure and the associated high cost of transportation makes business unprofitable. According to the informants, investment in railways or railroad transportation (for example from Karonga to Nsanje) will significantly reduce the cost of transportation and overall the cost of doing business to the benefit of both farmers and business owners.

High freight cost also increases the cost of exportation. Malawi is an inland country (landlocked), and as a result, Malawi's freight cost is higher compared to exporters in neighboring countries (Makoka 2009). Pigeon pea shipments from Malawi take longer periods than shipments from other exporting countries, thus making Malawi's pigeon pea exports less competitive compared to its competition (Jones, Freeman, and Le Monaco 2002). As discussed earlier, Tanzania is emerging as a very strong competition to Malawi in the export market. The fact that Tanzania is not landlocked as Malawi gives the former a competitive edge over the latter. Malawi's transportation sector has been described as having anti-competitive practices and behaviors (collusive pricing and oligopolistic tendencies) (Chirwa 2011), a characteristic which coupled to it being landlocked increases the cost of transportation.²⁸

DTIS (2013) observed that reducing trade costs will enable all sectors of the economy to obtain imports at more competitive prices and increase the competitiveness of Malawian exports in both neighboring and international markets, opening up opportunities for Malawi to participate in both regional and global supply chains. Simtowe et al. (2010) and Makoka (2009) also suggest that a major way by which Malawi can increase its competitiveness in the export market will be to improve the quality of exported pigeon pea to be high enough to offset the higher freight cost that it faces. However, this will require efforts that promote the adoption of high yielding, market preferred

²⁸ http://unctad.org/en/PublicationsLibrary/ditccp2011d5_en.pdf

varieties of pigeon pea and incentivizing farmers (access to profitable markets and competitive prices) to adopt these varieties.

Harassment from Police Officers: Harassment by police officers was also identified as an impediment to trade in Malawi. Both large buyers and retailers identified the demand for bribery by police officers as a major impediment to trade. Police officers are more concerned about getting bribes from drivers instead of ensuring the safety of road users. There is therefore a need for government regulations against corruption, and with transparent procedures on how to enforce these regulations in the case of non-compliance. Other negative aspects of the enabling environment include an ineffective justice system. According to key informants, no justice is usually done when thieves steal grain from their warehouses/depots.

High Cost of Finance: Malawi has very few government-owned or private banks that support agricultural activities or related businesses. Me-Nsope and Larkins (2016) found that access to finance was a critical requirement for actors who are post-farm level in the pigeon pea value chain—e.g., private traders and retailers. These actors need financial resources to purchase inventory, as well as invest in market infrastructures (e.g., storage) that can help improve the performance and the profitability of their businesses. Large-scale exporters/processors also identified high cost of finance as a very prohibitive factor to businesses development and success in Malawi. One large processor cited using their own finances and own networks to sustain their businesses. Following reduced lending rate by the Reserve Bank of Malawi from about 25% to 16% has eased this problem somewhat as commercial lending rates have declined to about 25% in 2017/18 from about 40% before the Reserve Bank rate was reduced.

C. Government Policies, Laws, and Trade Regulations in Pigeon Pea Sector

Existing literature is sparse on any government policies or regulations, if any, that have implications for the pigeon pea value chain. Dzanja et al (2016) observe that a key fact in the market for pigeon pea in Malawi is that government does not consider it a strategic crop and therefore does not intervene with trade bans, tariffs, or any controls on local trade. According to the authors, a major dynamic in the market is that good pigeon pea harvests in India lead local companies to process their pigeon pea for export to both India (which remains deficit) and the United Arab Emirates, while a poor pigeon pea harvest in India makes it more profitable to export unprocessed pigeon pea. Unlike the case of Malawi's soybean market where trade policy both in Malawi and in its neighbors, is a major consideration, pigeon pea trade proceeds are unhindered by government policy (Dzanja et al. 2016). According to some key informant the pigeon pea industry should have been more regulated (as was the Tobacco industry) because companies that export pigeon do not disclose to the government the actual quantities of the legume traded and they also externalize the export earnings.

9.2.4. Additional Recommendations for Dealing with Pigeon Pea Marketing Challenges

Christian Aid and CISANET (2015) recommends the following actions/developments for addressing the marketing challenges faced by smallholder pigeon pea farmers so that the legume can contribute to the improvement in the socioeconomic conditions of smallholders:

- Government monitoring of pigeon pea prices at farm gate level. The government should take a deliberate effort to disseminate crop market information to farmers, as is the case with

tobacco. Further measures are needed by government to ensure that cross-border transactions on pigeon pea and other pulses are properly documented.

- Investments that will reduce marketing costs, improve pigeon pea trade and eventually improve livelihoods of the smallholder farmers in Malawi and the overall economy of the country.
- Promotion of contract farming to avert some of the market risks that farmers incur. Contract farming offers farmers with market access, increased incomes, reduction in the risk of price fluctuations, credit and financial intermediation, timely inputs and production markets, monitoring and labor incentives, facilitate product and quality standards and requirements.
- Market infrastructure must be developed to reduce the high transport costs incurred in areas with poor quality roads and increase farmers' interest in selling food and cash crops.
- Improved access to financial services. Insufficient financial services for smallholder farmers are a major barrier to purchasing and accessing equipment, seed, fertilizer and pesticides. There is a need to adopt innovative strategies to provide credit, savings and insurance for individual farmers; creating mobile cash transfer systems; developing new novel risk-mitigation instruments; and providing capital funding for small business;
- Organizing farmer cooperative societies/associations. As more farmers will be able to commercialize their produce, business will deal with producer organizations. This collective action enables smallholder farmers to sell quality grain at higher prices and in good quantities.
- Develop market linkages: moving from food crop to cash crop implies the need to develop market linkages for smallholder producers and processors/business.
- Competitiveness: improvements in economies of scale, reduction in transaction costs, quality enhancement and a more enabling environment present significant progress for the pigeon pea industry in Malawi.
- Market demand driven research. Some of the breeding objectives on pigeon pea should focus on regional and international market demand, especially grain quality standards.
- Government policy. The dissemination of improved cultivation techniques has been insufficient, and the development and dissemination of new varieties has been slow. This has not kept pace with the emerging markets for grain legumes including pigeon pea.

The authors conclude that no single policy is a panacea for addressing all the challenges that smallholder farmers and entrepreneurs face in accessing domestic and global markets for pigeon pea. Rather, different policies—e.g., technology adoption, microfinance, social protection, export and import regulations, farmers' rights—should be integrated appropriately.

10. OPPORTUNITIES IN MALAWI'S PIGEON PEA SECTOR

10.1. Growing Demand for Pigeon Pea in the Global Market

Export markets have been identified as the key outlets for Africa's pigeon pea (Mula and Saxena 2010), and India is the principal destination for global pigeon pea exports. In spite of being the largest producer of the legume, India is also the heaviest consumer of pigeon pea in the globe. Growing domestic consumption needs in India due to population increases and shortfalls in domestic production of the legume continues to create an opportunity for trade in pigeon pea between India and the southern and eastern African countries (Jones, Freeman, and Le Monaco 2002; Simtowe et al. 2010).

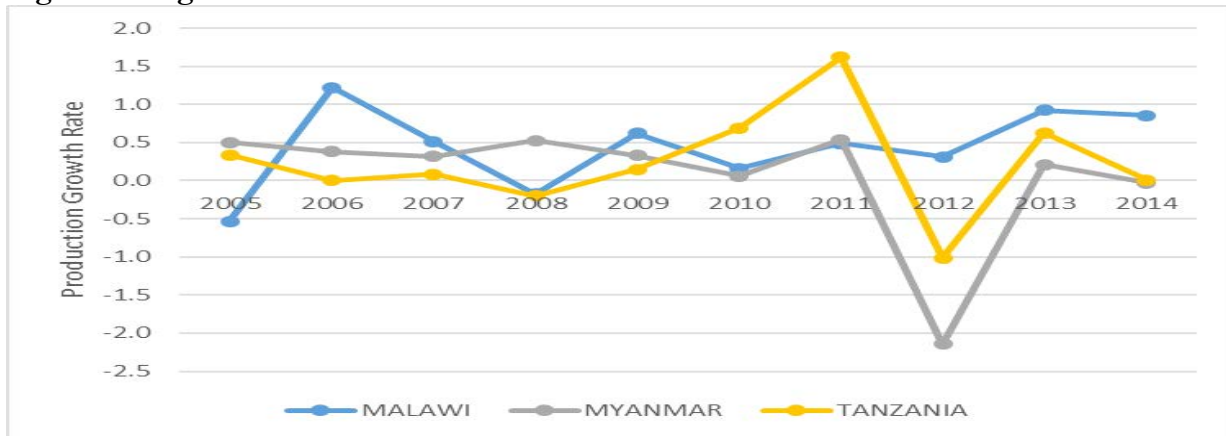
According to Mula and Saxena (2010) while a considerable potential exists for export of pigeon pea to people of Indian descent, Africa supplies only less than 5% of this requirement.²⁹ Interviews held with key informants from the exporting and processing companies in 2014 and this year (2017) revealed that the volume of pigeon pea produced in Malawi is insufficient to meet the total demand for the legume (local consumption as well as for the export market). Furthermore, the interviews revealed not only a high demand for Malawi's pigeon pea (unprocessed dried grains and dhal) in India, but also a high preference for dhal made from Malawi's pigeon pea (due to its high protein content, an attribute that makes it great for vegetarians) by Indians. Mula and Saxena (2010) further observes that in addition to India, there are similar high value niche markets for exporting pigeon pea to European and American markets. Unfortunately, prior to India's 2017 import ban, the quantity produced in the Malawi remained insufficient to satisfy this growing market demand.

As shown in Figure 2, pigeon pea production in Malawi has been on a rise in the past decade. Since 2009, Tanzania has also experienced significant growth in production. However, the increase in Malawi's production is relatively small when one considers the growing global pigeon pea market. Malawi experienced growth in production in the period 2005-2014 (Figure 5), with her world production share increasing from 1.9% in 2005 to 6.8% in 2014. Meanwhile in Tanzania, total production and share in total world production has also been increasing—from 3.5% in world production share in 2005 to 5.1% in 2014. Albeit a decline from 21% in world pigeon pea production share in 2009 to 12% in 2014 (Figure 6), Myanmar remains second to India in terms of global pigeon pea production and shares. The analysis of export volumes and values (Table 4) shows that although Malawi produces more pigeon pea than Tanzania, the volume and value of pigeon pea imported to India were higher for Tanzania than Malawi—almost double in volume. Thus, while growing global demand for pigeon pea represents an opportunity for Malawi, several factors limit Malawi's ability to compete with its competitors. As shown in Figure 21, production growth rates have been higher for Malawi compared to Myanmar and Tanzania since 2012. However, yield growth rates have been slower compared to its competition (Tanzania and Myanmar) (see Figure 22). Comparing Malawi's yield growth rate to the growth rate in area harvested for pigeon peas, it appears that the growth in total production observed during the period has been due more to productivity gains, and less to expansion in area harvested for pigeon peas.

Land is a limiting factor in the Southern region where most of Malawi's pigeon pea is currently cultivated, and most of the smallholders growing pigeon pea do so on very small land (on average 0.5 acres).

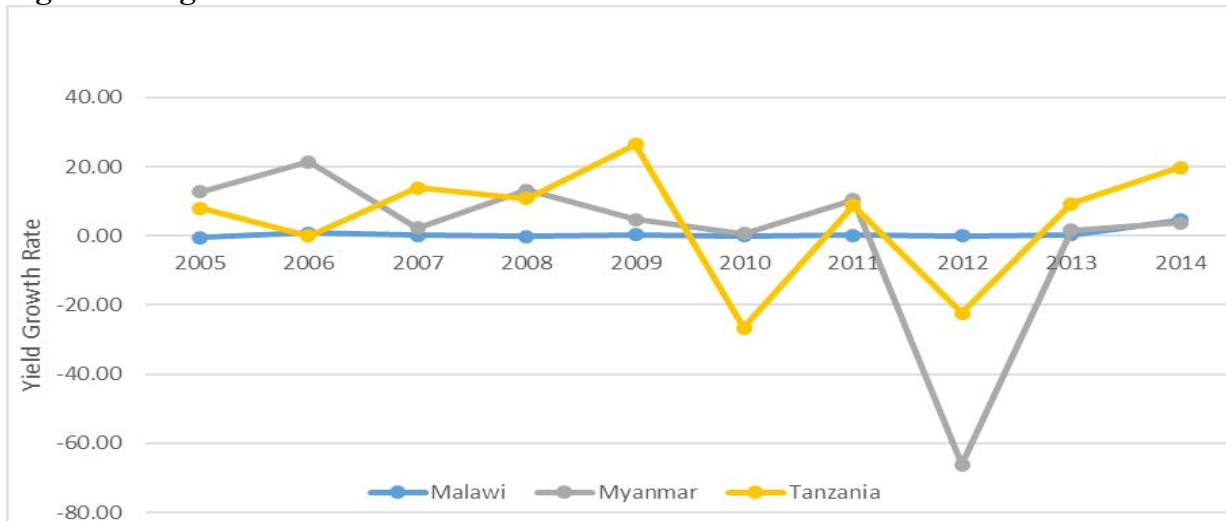
²⁹ Need up-to-date data on the share of Indian's pigeon pea imports originating from Africa and Malawi specifically.

Figure 21. Pigeon Pea Production Growth Rate 2005-2014



Source: Author's computation using FAOSTAT data.

Figure 22. Pigeon Pea Yield Growth Rate 2005-2014



Source: Author's computation using FAOSTAT data.

Unlike in the south, informal discussions with farmers in the North region indicate that land is not much of a constraint in pigeon pea production, they also noted that expansion in the area cultivated for the legume is unlikely to happen in the absence of remunerative markets. This finding suggests that expansion in pigeon pea production in Malawi to take advantage of existing opportunities in the global export market is most likely to come from an increased adoption of high yielding technologies (especially in the south) and innovative models of improving smallholder farmers' access to remunerative markets (especially in the north).

Specifically, there is need for research to breed and release short-duration and climate resistant improved varieties of pigeon pea. Developing these productivity-enhancing varieties should be accompanied by efforts to promote the availability of these varieties. Specifically, this will require exploring the best models for further seed production and multiplication as well as investments in seed quality assurance—training for seed certification; putting in place strict procedures for the

development of quality declared seeds; training of farmers to ensure that they understand the difference between seeds of different quality; developing regulations to protect farmers from untruthfully labelled seeds; as well as putting in place measures to monitor and enforce violations in seed production and distribution regulations.

There is also a need to make these improved seed varieties readily accessible to farmers and at affordable prices. This requires working with pigeon pea farmers' groups to build their capacity in the area of seed multiplication. Having local farmers' groups involved in seed multiplication will result in seeds that are locally adapted to their agro-ecological zones, as well as help to ensure a steady supply of seeds available to group members. This will also increase the likelihood of adoption and could be a source of revenue for the farmers' groups. Affordability of seeds to farmers requires making available seeds at prices that farmers can afford or are willing to pay. Affordability is usually determined by profitability—farmers' decision to purchase an improved seed variety is influenced by the perceived gains from growing the legume, and the perceived gains in turn depend on the price received by the farmer for the harvested product. Thus, a lucrative output market is essential to boost the effective demand for improved or quality seeds. Mula and Saxena (2010) observes that promoting pigeon pea will not happen unless outstanding yield performance can be demonstrated and a market at remunerative prices is available.

Per Simtowe et al. (2010), India imports about 90% of total pigeon pea exports from Malawi, and pigeon pea export prices are largely determined by India and the price offered by India is based on supplies received from other countries such as Myanmar. This leaves Malawian exporters and farmers as price takers. Thus, Myanmar's increasing share in pigeon pea imports to India could put Malawi at risk of lower prices if Malawi cannot compete by increasing its share of pigeon pea imports in India.

Furthermore, according to key informants, pigeon pea from Malawi could be made to fetch better prices in the Indian market by taking advantage of market forces in India. Specifically, it was observed that India and Malawi harvest pigeon pea at the same time. Thus, for grain from Malawi to get the best prices in the export market, the grain will have to be stored in warehouses and sold in times of scarcity in India (i.e., when demand is greater than supply). As attractive as this may be as an option, its profitability depends on the cost of storage—i.e., how does the price differential between times of scarcity and abundance compare to the additional cost of storage.

According to key informants, government regulation/formalization of pigeon pea trade as it was done for crops like tobacco will be very useful in protecting smallholder farmers, thereby creating the incentives for these farmers to expand cultivation of the legume. They observed that there is a lot of informal trade going on which limits farmers' ability to benefit from their production. According to these informants, the government can work with local village heads to limit informal trade. The informants noted that Malawi should follow in the footsteps of Tanzania that has already formalized pigeon pea trade. Formalization of trade is expected to help protect farmers from unscrupulous buyers and increase the gain from producing the legume.

Investment in irrigation could help increase pigeon pea production in Malawi. According to the large-scale exporters/processors, a major challenge in Malawi's agricultural sector is the lack of irrigation—although one-third of Malawi is made up of water, the country's water resources are untapped and not currently utilized to their full potential, and most of what is there as irrigation is concentrated around the lakeshore. This lack of irrigation was argued to limit pigeon pea

production. Investments in irrigation and dams may be necessary for any significant positive effect on pigeon pea yields and production in Malawi. For example, irrigation will allow farmers to grow multiple crop seasons instead of a single crop season as it currently is for most crops. Greenhouses could also help smallholder farmers diversify into high value crops, and this was based on the logic that one acre per family is insufficient to help a farmer increase production and income.

10.2. Highly Efficient Decorticators

A distinguishing characteristic of Malawi's dhal industry is its efficient decorticators, cleaning, and drying machines, capable of meeting the quality standards required by the international markets (Lo Monaco 2003). This very well-developed processing sector gives Malawi a competitive edge in the supply of processed products of good quality. However, sufficient supplies of raw material are required for these plants not to operate below processing capacity. Interviews with large-scale processors revealed their concerns about the risk of not achieving their minimum efficiency scale.

10.3. Regional Demand for Malawi's Pigeon Pea

Informal cross-border trade between Malawi and other countries signal an opportunity for Malawi to export pigeon pea to other countries in the region (Simtowe et al. 2010). Interviews with large-scale buyers and farmers associations reveal that large buyers come from neighboring countries such as Tanzania and Mozambique. However, there is no data on the frequency and accuracy of this trade. According to BIF, Malawi's pigeon peas goes to Tanzania before going to India so there is a recording issue—in terms of actual pigeon pea exports from Malawi.

Furthermore, as observed by large-scale exporters/processors, pigeon pea is increasingly emerging as a food aid commodity. World Food Program (WFP) for instance, has been purchasing large amounts of pigeon pea to give out as food aid in times of food shortages in other countries in the region. While this creates an opportunity (market) for smallholders to sell their pigeon peas, it does so by creating disruptions in the local market for pigeon pea—the grain is supplied as cheap food usually not preferred by farmers for consumption.

The smuggling of pigeon pea or the large amount of unrecorded pigeon pea trade could be an aftermath of the high trade costs involved in trading officially. As observed by DTIS (2013), opportunities for Malawi to supply neighboring countries with agricultural and agro-food products are currently held back by restrictions on trade. These include licensing limitations on agricultural inputs (which restricts choice), protection of local transport providers which increase costs, import and export licensing and minimum prices. Policies that restrict trade in basic commodities with the aim of promoting food security serve to destabilize growth, encourage illegal trade, increase price variation, discourage production for sale by smallholders and ultimately reduce the living standards of the most vulnerable groups in society. Such policies are inconsistent with the objectives set out in the NAP, NAIP, NES and MDGS III.

Regional Integration can play a key role in reducing trade costs as long as commitments are implemented and the regional agenda is premised on a vision of creating an open, internationally competitive market in goods and services. As a landlocked economy Malawi is dependent on transport corridors and ports in neighboring countries for all their trade. Unreliable and unpredictable delivery times prevent producers from competing in regional and international

markets and serve to highlight the importance of the GOM actively engaging in regional cooperation initiatives (COMESA, SADC, TFTA) to harmonize regulations and fast-track the reduction in non-tariff measures where possible (such as through Accelerated Program for Economic Integration, APEI).

10.4. Declining Tobacco and Cotton Prices

As earlier mentioned, discussions with farmers in the Central region, input suppliers, NGOs and pigeon pea buyers suggest that the declining/failing tobacco market is pushing tobacco farmers to look for alternative cash crops. Pigeon pea cultivation is a strong candidate in farmers' attempts to diversify their sources of revenue. Focus group discussions with farmers in Kasungu, for example, recorded high interest from farmers to cultivate pigeon pea as a cash crop.

10.5. Potential for Pigeon Pea as a Feed Ingredient

According to large-scale buyers and processors of pigeon peas (Transglobe and ADMARC), growth in the consumption of animal protein in Malawi is causing increases in the demand for the outer coat of pigeon pea grains for use as a feed ingredient. They note that this outer coat is very rich in protein content and therefore preferred by feed manufacturers as feed ingredient. In Malawi, the processing of dried pigeon pea into Toor Dhal is mostly done by large-scale processors. As a result, feed manufacturers in Malawi such as CP Feed buy the skin (or outer coat) from large-scale processing companies for the manufacturing of animal feed.

Overall, to take advantage of the opportunities discussed above, the production and marketing challenges discussed in sections 9.1 and 9.2 must be addressed. Furthermore, the Diagnostic Trade Integration Study (DTIS) Update prepared for the Enhanced Integrated Framework in 2013 identified the trade related constraints holding back Malawi from diversifying and deepening its production base, and increasing trade.³⁰ The document outlines that reducing trade costs will be essential to improve competitiveness, stimulate inclusive economic growth and encourage economic diversification. Specifically, reducing trade costs will especially benefit smaller producers and farmers, who often face difficulties in overcoming (fixed) trade costs. DTIS (2013) outlines a number of policy reforms that are critical to reducing trade costs and thereby permitting Malawian enterprises and farmers to more successfully compete in regional and global markets and achieving the government's stated policy objectives of expanding and diversifying exports for increased economic and inclusive growth. These include a) reviewing the trade policy framework to make it more transparent and neutral, and increase transparency in its implementation; b) reviewing existing Non-Tariff Barriers resulting from outdated technical regulations and the way these are applied at borders; c) improving trade logistics by improving border and transit procedures and increasing competition in the transport sector with a view to shorten delivery, increase reliability and reduce costs; d) address a number of binding constraints facing the expansion of agricultural trade and trade in agro-industrial products; and e) addressing key regulatory constraints increasing the cost (and reducing availability) of professional services.

According to Christian AID and CISANET (2015), export of pigeon pea could take a positive twist if the country is able to fully utilize Export Enablers outlined in the National Export Strategy (2012) based on the needs of exporters and potential exporters to develop the capacity to export.

³⁰ <https://info.undp.org/docs/pdc/Documents/MWI/Malawi%20DTIS%20Update%20FINAL.PDF>

These include:

- Access to Skills - exporters and potential exporters, as well as public institutions, require access to a pool of skills necessary to allow for the required capacity to be able to compete on external markets;
- Institutional Capacity - exporters and potential exporters require effective institutions that can address market failures in an appropriate manner and provide the necessary institutional service of trade facilitation;
- Access to Markets - this includes the facilitation of trade, favorable trade policy, affordable transportation to markets, affordable cost of meeting standard requirements, affordable cost of required packaging;
- Access to Inputs - this includes affordable access to water, energy, fertilizer and seed;
- Access to Finance and Contract Law - this includes the affordable ability to finance capital, inputs and the ability to secure the returns from assets;
- Access to Business Development Services - this includes affordable access to legal, accountancy, technical specialized services, marketing, extension services, entrepreneur and start-up support;
- Ease of Meeting Tax and Regulatory Obligations - every exporter and potential exporter has to meet their tax and regulatory obligations. This therefore includes identifying the minimum obligations and facilitating the ease of meeting these obligations;
- Macroeconomic Prudence and Stability - price stability, affordable access to foreign exchange, affordable access to debt;
- Access to Information - this includes access to key information on consumer preferences, on accountability, to policy coherence and constructive stakeholder dialogue; and
- Fair Competition - exporters and potential exports require a level playing field to maximize output.

11. DYNAMIC TRENDS –THREATS TO THE COMPETITIVENESS OF MALAWI'S PIGEON PEAS

11.1. Global Market

Global demand for pigeon pea, particularly from India, continues to increase. Legume imports are part of national food policy in India; a large share of imports targets low-income Indian consumers, who constitute the largest group. As observed by Lo Monaco (2006), in the medium term, the Indian market will continue, and even increase its reliance on imports of pigeon pea and yellow pea which are used to make up for the shortfalls in the domestic market, and provide a cheaper substitute for processed products for low-income, price-sensitive consumers. These opportunities in the Indian market are not without threats or challenges. The two major threats are discussed below.

11.1.1. Intense Competition from Myanmar, Tanzania and Mozambique

India, as the largest consumer of pigeon pea, remains the only market to absorb any significant increase in African exports (Mula and Saxena 2010). According to Lo Monaco (2006), pigeon pea trading opportunities have changed significantly, as Myanmar has emerged as the major pigeon pea supplier to India. Pigeon pea is the major export grain of Myanmar and the government is keen on expanding the pigeon pea area to achieve significant increase in the export of this commodity (Lo Monaco 2006). Myanmar is not only supplying the largest quantity of low quality pigeon pea, but she is also doing so at a cost lower than countries in eastern and southern Africa. Myanmar is also able to supply imports to India all-year round, thereby reducing the competitive edge of seasonal exports in Africa (ibid). In the period 1961-2005, Myanmar experienced significant increases in its area and production compared to other major producers of pigeon pea. The increases in production was attributed to farmers' income derived from exports, given that the grain is not widely consumed by the local people of Myanmar. The surge in exports from Myanmar during this period led to falling pigeon pea prices in the export market, thereby posing a major threat to the competitiveness of African exports (Simtowe et al. 2010). An analysis of export parity prices for pigeon pea by Lo Monaco (2006) confirmed that falling prices reached parity for Malawi and Kenya during this period, thereby compromising their export competitiveness.

More recent production figures show a decline in the volumes of pigeon pea produced by Myanmar (Figure 2)—there was a huge drop from 2011 to 2012. Since 2012, production has been gradually increasing. Also, as shown in Figure 3, the share of Myanmar in total world pigeon pea exports has been on a decline since 2011. The area harvested for pigeon pea has also been declining since 2011. Notwithstanding, as shown in Table 4, Myanmar accounts for close to 40% of the total volume and value of pigeon pea imports into India. The dominant position of Myanmar as the major pigeon pea supplier to India is a great threat to pigeon pea exports from Africa.

In addition to having Myanmar as the strongest competition in India's pigeon pea market, Malawi is also increasingly facing competition from other countries in the region. Total production of pigeon pea in Malawi in the period 2011-2014 increased faster than that of its major African competition – Tanzania and Kenya.³¹ Since 2011, Malawi's share in world pigeon pea production has been on the rise and is still the largest in Africa; though in very close competition with Tanzania (Figure 3). Although Malawi produces more pigeon pea than Tanzania, Tanzania has a larger share in volume and value of pigeon peas imported in India. Thus, although the volume of pigeon pea produced by

³¹ FAOSTAT does not report data on pigeon pea production in Mozambique.

Malawi is increasing, it is still slower than the growth in export volume experienced by its competition.

Continuous growth in pigeon pea area in Myanmar as observed prior to 2005 was therefore projected to imply that structural surpluses in major production areas are likely to persist, thereby increasing the likelihood that pigeon pea prices in India would trend downward, at least in the medium term—a trend that will further erode the competitiveness of African exports (Lo Monaco 2006). However, while recent data does not support a continuous upward trend in pigeon pea production and areas harvested in Myanmar, the fact that Myanmar's total production more than triples total production from Malawi (Table 4), its proximity to India (reduced transportation cost), and the growing area and production from Tanzania and Mozambique are still valid threats to the competitiveness of pigeon peas from Malawi.

While some authors have argued that Malawi can take advantage of the existing opportunity in the global market by supplying pigeon pea of better quality, Lo Monaco argues that generally, there is little or no difference in wholesale prices between African and Myanmar varieties (Table 4). Regional patterns of market differentiation exist, based on the uses of processed pigeon pea grain, which lead to a preference (and a higher border price) for some African varieties (Lo Monaco 2006).³² However, these are exceptions – the market is largely neutral amongst imported varieties. Per Lo Monaco, the major implication is that exporters must compete based on price rather than quality.

11.1.2. Surging Demand for Substitutes

Another threat to the competitiveness of Africa's pigeon pea exports to India is the availability of substitutes. Competitive pressure from imports of yellow pea from Canada (also France) pose a threat to Africa's pigeon pea exports (Lo Monaco 2006; Simtowe et al. 2010). According to Lo Monaco (2006), higher pigeon pea yields in Myanmar and expansion of yellow pea area in Canada (and France) are creating large surpluses in both countries. The export orientation in all three countries leads to persistent gluts in international markets, implying sustained exports to India (ibid).

Simtowe et al. (2010) observes that these threats facing Malawi and Africa's pigeon pea export can be addressed through the development of existing value chains and alternative pigeon pea export markets, especially within the region. A detailed analysis of comparative advantage of pigeon pea within African countries has to be carried out to provide insights on the potential for regional trade and other export markets (e.g., communities in the UK). Lo Monaco (2006) also agrees that market opportunities exist within Africa, where pigeon pea is widely (but often informally) traded, between Mozambique and Malawi, and between Tanzania and Kenya; but argues that alternative non-African markets offer only a limited potential for increasing African exports. According to Lo Monaco (2006), while food consumption patterns among the sizeable communities of non-resident Indians remain largely unexplored, in general, the ethnic market in the traditional high-value markets, such as the UK, is saturated and not expanding.

³² Tanzanian varieties sold above the price of Myanmar pigeon pea, indicating a marginal preference, presumably due to the sweet taste and large grains, which are appreciated in some regional markets. African producers could explore the possibility of performing operations to add value to exported grain, provided these lead to a price advantage in the Indian market. In the lower-quality segment, African exporters could obtain adequate returns to investments in cleaning and sorting to improve size homogeneity and reduce foreign matter and weevilled grains. A shift in consumer preferences could improve the price premium for pigeon pea from Tanzanian over that from Myanmar. However, consistency of supply must be improved if preferences and prices are to change.

11.2. Domestic Market

Projected domestic demand for pigeon pea. Their findings suggest considerable growth in domestic demand for pigeon pea over time (Simtowe et al. 2010). Total demand for pigeon pea in Malawi was estimated at 120 thousand tons in 2020, up from 75 thousand tons in 2008, representing an increase of 63%. Dzanja et al. (2016) also analyzed future growth prospects for legumes in Malawi using expenditure elasticities from the 2010/11 Integrated Household Survey (IHS) together with population (current and projected) data from the United Nations (UN) and scenarios on per capita income growth. They found that total demand for legumes in Malawi is likely to grow overtime due to: i) the country's rapid population growth, which is projected to remain near 3% per year for the near future; and ii) paradoxically, its very low average incomes, which lead consumers to devote a large share of additional income to food expenditures.

According to Dzanja et al. (2016) while there is a strong export market for pigeon pea, which can absorb far more product than Malawi can produce, this market is, however, both competitive and potentially unstable, depending on policy and production trends in India. Lo Monaco (2006) and Simtowe et al. (2010) also observed that the shrinking opportunity for Malawi's pigeon pea exports in the Indian market due to tough competition signals a need to identify alternative markets for the legume. Thus, while prospects for other international markets (e.g., the UK) are also likely to be stationary (Lo Monaco 2006) regional and domestic markets look promising.

Studies conducted recently have also provided some insights into the availability of local demand for pigeon pea in Malawi. For example, White et al (2016) interviewed urban retailers of legumes in Lilongwe city markets and found that urban retailers face serious challenges accessing sufficient quantities of pigeon pea to satisfy the growing demand for consumption in the city markets. Unfortunately, the magnitude and spatial distribution of the domestic demand for local consumption in Malawi is yet to be understood. Fieldwork for the current study also revealed some diet diversification in the Central and Northern regions because of climate change—pigeon peas and cowpeas are increasingly consumed in non-traditional zones.

Furthermore, interviews with large buyers suggests that there are strong opportunities for value addition in pigeon peas just like there was with other legumes (e.g.,) soybeans. Exploring such opportunities to create alternative markets for the legume locally would increase local consumption/demand of the legume and improve the contribution of the legume to household nutrition security. For example, Me-Nsope and Larkins (2016) observed strong demand for split and decorticated pigeon pea from time-poor urban consumers in Malawi. This demand is currently met by last grade split and decorticated pigeon peas from large-scale exporters of processed pigeon peas—i.e., processed pigeon peas that did not make it to the export market. This finding suggests an opportunity for small-scale processing of dried pigeon peas into split and decorticated pigeon peas. Small-scale processing of dried pigeon pea has potential to stimulate local consumption of the legume since time required in preparation of the dried grain was also identified as a major factor limiting consumption of pigeon pea. Achieving demand growth in other regions of the country, (especially the Central due to its population) could fuel strong overall growth in local demand (Dzanja et al. 2016).

Thus, there appears to be a potential to expand domestic demand for pigeon peas in Malawi. Promoting demand for the legume will not only increase income for producers (reduce poverty) but also value addition is likely to increase the consumption of the legume, thereby contributing to the food and nutrition security of households in Malawi. Notwithstanding, research is needed for a

more qualitative and quantitative characterization of this demand by income group and across the three regions. Such an analysis will provide evidence necessary in the identification of investments and policies geared towards strengthening of local/domestic marketing systems for pigeon pea in Malawi with the goals to deliver the outcomes of improved livelihoods, food and nutrition security and poverty reduction for poor households.

12. CONCLUSION

The purpose of this value chain study was to generate evidence that will inform the Government of Malawi in developing a National Agriculture Investment Plan (NAIP) for achieving the human development outcomes spelled out in the new National Agriculture Policy (NAP). These outcomes include improved food and nutrition security, empowerment of women, youth and other vulnerable groups, enhanced institutional capacity, better coordination in the agricultural sector, amongst others. The analyses in this report makes use of primary data collected from value chain actors in February 2017 as well as secondary data/information on the pigeon pea subsector in Malawi. The report examines the challenges in the sector and their implications for: a) the performance and competitiveness of Malawi in global and regional pigeon pea trade; and b) the potential for this value chain to contribute to the outcomes of improved food and nutrition security and poverty reduction in Malawi. The study also examined the opportunities for Malawi's pigeon pea in global and regional pigeon pea trade. The report makes recommendations for investments and policies needed at various levels to improve the performance of the value chain and enhance the potential of pigeon peas to contribute towards improvements in livelihoods, food and nutrition security for poor households in Malawi.

The growing demand for pigeon peas in the global, regional and domestic markets and the high preference for Malawi's dhal in India (due to its high protein content, an attribute that makes it great for vegetarians) represent an opportunity for Malawi to gain some foreign exchange while at the same time improving the food, nutrition and income security of smallholder farmers and other actors in Malawi's pigeon pea value chain. Notwithstanding, several factors threaten the competitiveness of the pigeon pea sector, its potential to take advantage of these opportunities, and the extent to which the sector can contribute towards the outcomes of improved food, nutrition and income security of households in Malawi—especially for poor smallholder farmers who are responsible for over 90% of total pigeon pea production.

Prior to 2005, Malawi was a major player in the global pigeon pea market, a major supplier of pigeon pea imports into India, and she accounted for almost all of Africa's entire share in total pigeon pea exports to India. In spite of the growth in total production experienced since 2005, Malawi has lost the dominant position that it occupied in global pigeon pea trade prior to the 2000s. Since 2005, Myanmar has emerged as a major supplier of pigeon pea to the Indian market. Today, Myanmar is the second largest producer and exporter of pigeon pea to India in the world.

In Africa, Malawi continues to lead in terms of total volume of pigeon pea produced (FAOSTAT production statistics). However, other countries in the region, for example Tanzania, Kenya and Mozambique, are increasingly occupying a stronger position in the global pigeon pea market. Although Malawi produces more pigeon peas than Tanzania, Tanzania's share in total pigeon pea imports to India is about double that of Malawi. Production continues to increase in Malawi, until recently (2017/18 season) when dry spells are estimated to cause a 10.8% reduction in volume produced, and production growth rates for Malawi have been higher than that of Myanmar and Tanzania. Notwithstanding, yield growth rates have been slower for Malawi compared to some of its competition indicating a need for promotion and adoption of better yielding varieties.

12.1. Issues in the Production of Pigeon Peas

Limited availability of improved seed varieties affects crop productivity. Seed production in Malawi is one hundred percent rainfed. DARS/ICRISAT's ability to supply enough seeds for further production and multiplication is therefore limited by variations in rainfall or insufficient rains. DARS, the government entity responsible for seed certification, does not have the capacity and resources required to carry out this role. The legume component of the FISP program has stirred up private seed companies' interest in further production of legume seeds. However, the effectiveness of the FISP program in improving smallholder access to improved seeds has been limited by the difficulty faced by the seed certification unit in certifying all seeds produced under the FISP, which in turn limits how much seed is available to smallholder farmers. Demand side factors, such as heavy use of recycled seeds, low output prices (lack of incentives) and unreliable markets have also limited farmers' use of high quality seeds.

Various models of seed multiplication have emerged in the last few years to increase the availability of quality seeds (e.g., ICRISAT's SRF, contract growers and private seed companies). However, the effectiveness of these different models at increasing seed availability has been limited by the lack of sufficient capacity for seed certification, amongst other factors. Furthermore, the incorporation of legumes into the FISP has had its good and bad sides—increased private sector engagement in legume seed production/multiplication, but has also led to a rise in the supply of untruthfully labelled pigeon pea seeds in the market. Farmers' experience with these dishonestly labelled seeds is discouraging their investments in seeds, and this creates negative spillovers for companies that are producing good quality seeds. Research (DARS/ICRISAT) has produced a number of improved seed varieties for pigeon pea. Yet, many farmers continue to grow unknown pigeon pea varieties. Even when improved seed varieties are available, the lack of remunerative markets for dried grains further discourage the adoption of these seeds.

These challenges underscore the need to strengthen the seed system (production, certification, distribution and delivery) for pigeon pea in Malawi to reach farmers who continue to rely on low-yielding and disease-susceptible local varieties. Like previous studies on Malawi's pigeon pea sector, the findings of this study highlight the causal relationship between the structural weaknesses in seed and technology delivery and grain marketing system on one hand, and the challenges in the diffusion and adoption of improved technologies and consequently the on-farm productivity and profitability of pigeon pea on the other hand. There is need for investments and interventions to increase the availability of good quality seeds and improve on the diffusion of good quality improved seed varieties that are resistant to climate change and suitable for the various agricultural zones in the country. Adoption of these improved seeds by smallholder farmers must be supported if smallholder farmers must increase yields and enjoy food and income increases from pigeon pea cultivation. Improving seed availability, affordability and utilization will require coordinated and collaborative efforts from the public as well as the private sector. Recommendations on how to accomplish this with some specific examples have been discussed above (Section 9:1.8).

Pest and insect damage pose a major threat in pigeon pea production, and the need to make investments in crop protection has become even more relevant with the introduction of improved varieties of pigeon pea. Unfortunately, the use of pesticides is still very low amongst smallholders. Farmers are yet to understand that unlike traditional varieties that do not require any pesticides/insecticides, improved varieties of pigeon pea require investments in crop protection. The lack of remunerative markets also discourages investments in pesticides, particularly for farmers who have not yet perceived the economic gains associated with growing such varieties. Furthermore, the

presence of fake/expired pesticides in the market threatens farmers' demand for pesticides. There is therefore a need for farmer education programs, regulations, and the monitoring and enforcement of existing regulations governing the distribution of pesticides, and a restructuring of the output marketing systems to improve pricing and gains for farmers, thereby, stimulating demand for improved seed varieties and investments in crop protection (particularly pesticides).

Farmers' lack of knowledge of best farm management practices and an under-equipped and weak extension system that is incapable of playing its role in the transfer of technology and knowledge to farmers also hinder pigeon pea production in Malawi. The challenges facing the extension system are not only specific to one crop but are relevant to the entire agricultural system and range of crops produced in Malawi. Investments are needed to strengthen and build capacity for extension agents to provide training on crop-specific production and pest management techniques, group functioning, and agribusiness. Collaborative efforts between public and private institutions are needed to invest enough in extension services. For example, the GoM can collaborate with private sector organizations in the delivery of training on pest management as well as on raising farmers' awareness on the importance using pesticides when cultivating the improved varieties of pigeon peas.

Poor organization amongst farmers, poor group dynamics and limited understanding of the concept of collective marketing, and lack of resources hinder group performance and the ability of the group to generate gains from engagement in pigeon pea cultivation and trade. Membership in farmer groups was found to help improve access to crop production inputs, especially seeds or planting materials. Various models of promoting access to seeds were observed across the groups investigated. However, many of the groups continue to face challenges in their efforts to support member's access to crop inputs. These findings suggest a need to strengthen the role of farmers' groups in improving members access to farm inputs needed to increase yields; to support financial inclusion for groups thereby empowering them to invest in storage and marketing infrastructure necessary to improve business performance; and to build capacity of farmers' groups to function effectively (training in collective marketing, group dynamics and business management). The GoM should capitalize on the reduced transactions cost associated with directly targeting farmers' groups with investments or interventions to increase crop productivity.

12.2. Issues in the Marketing of Pigeon Peas

Major marketing challenges limit the performance, competitiveness and gains to smallholder actors from pigeon pea in Malawi. At the farm-level and retail level, poor access to storage increases the susceptibility of the grain to insect pest damage even after harvest, reduces the quality of the grain with consequences for the price that the grain fetches in the market. Insufficient financial services for smallholder farmers are a major barrier to purchasing and accessing equipment, seed, fertilizer and pesticides. Poor access to reliable markets also limit gains derived by smallholders from the cultivation of the legume. High transportation cost and distance away from the market leaves smallholder farmers at risk of opportunistic behaviors from the vendors. There is need to improve access to financial services for smallholder farmers. For example, adopting innovative strategies to: provide credit, savings and insurance for individual farmers; creating mobile cash transfer systems; and providing capital funding for small business. Market linkages also need to be developed between smallholder farmers and processors.

While the WHRSs were established to facilitate the marketing of pigeon pea and to increase gains from trade (by providing storage and empowering the farmer to wait for better prices), the utilization of the WHRS is still very low amongst smallholder farmers. Most farmers and farmers' groups are yet to sell their grains through these exchange systems. Key informant interviews reveal that the WHRS is not working for smallholder farmers. According to the key informant affiliated with ACE, ninety-nine percent (99%) of the users of the ACE WHRS are aggregators who use the WHRS to get financing. The WHRS appears to be working for aggregators by enabling them to access finance and increase their liquidity, which in turn allows them to purchase larger volumes of grains from farmers. The handling fee of 2% of the total value of the grain and the storage fee discourage farmers' groups from utilizing the warehouse system. Distance to the closest warehouse also limit use of the warehouses by individual farmers as well as farmers' groups who may even have an important quantity to sell through the WHRS. To improve the use of these WHRS by smallholder farmers, some measures are necessary.

First, smallholder farmers need to be organized. Aggregators are able to obtain finances from banks through the WHRS because they aggregate large quantities. Aggregators also have a stronger bargaining power and are more likely to fetch higher prices because they bring in larger tonnage. Farmer groups, if properly organized can also enjoy all the benefits that aggregators are getting.

Second, the GoM can subsidize the storage cost for smallholder farmers who are in groups, as it appears to be a major factor discouraging the use of the WHRS.

Third, to increase profits for smallholder pigeon pea producers when they sell through the WHRS, the GoM will need to work with financial institutions to lower the interest rate that is charged on warehouse receipts.

Major factors hindering the competitiveness of Malawi's pigeon pea in the export market include the inability of exporters to supply sufficient quantities of the variety and quality of grain desired by the export market, particularly India. While there is high demand for the white-seeded pigeon pea varieties (e.g., ICEAP 00040) from the export market, Malawi is not producing enough of this variety (Makoka 2009). India is currently sourcing all this variety from Myanmar that is producing about ten times more than Malawi (ibid). The high demand for specific varieties of pigeon peas like the ICEAP 00040 seem like an opportunity for pigeon pea growers in Malawi to expand production and increase income. However, farmers need to be empowered to take advantage of this opportunity. Specifically, this finding suggests a need for the following interventions:

Educate farmers on crop production techniques and the market potential for different varieties of pigeon peas, increase availability and accessibility to improved seed varieties for farmers, promote farmers involvement in collective marketing groups, invest in existing cooperatives and associations, and promote access to reliable and profitable markets.

A poor business environment, characterized by poor transportation infrastructure, high freight cost, high cost of finance, harassment from police officers, and the absence of good regulations and laws to support business further limits the competitiveness of Malawi's pigeon pea sector. To improve the competitiveness of the sector and enhance gains for value chain actors, there is need for policies, regulations and investments to: improve the business environment, reduce marketing cost (e.g., market infrastructure such as roads and railways), improve grain quality (development and adoption of high yielding varieties adapted to the needs of different markets, educating farmers on grain grades and standards in the export market), and government monitoring and dissemination of

prices. There is a need for government regulations against corruption, and with transparent procedures on how to enforce these regulations in the case of non-compliance.

As observed by Christian Aid and CISANET (2015) no single policy is a panacea for addressing all the challenges that smallholder farmers and entrepreneurs face in accessing domestic and global markets for pigeon pea. Rather, different policies—e.g., technology adoption, microfinance, social protection, export and import regulations, farmers’ rights—should be integrated appropriately. Furthermore, several of the issues plaguing the pigeon pea sector are also relevant to other crop sectors. This implies that priority should be given to investments and/or interventions that have a strong potential to solve the issues that cut across multiple sectors while contributing to the outcomes of the NAP.

REFERENCES

- African Centre for Biodiversity (ACB). 2016. Green Revolution Dead-End in Malawi: Two Case Studies—AGRA’s Pigeon Pea Project and Malawi’s Agro-Dealer Strengthening Programme. Johannesburg, South Africa: ACB.
- African Institute of Corporate Citizenship (AICC). 2017. Malawi Pigeon Pea Outlook, July-September 2017. Report produced by the Legume Unit. Lilongwe, Malawi. AICC.
- Bie, S.W. 2008. Agriculture in the Time of HIV/AIDS. *A Report on the Situation in Sub-Saharan Africa Prepared for NORAD*. Noragric Report No. 42. Aas, Norway: Norwegian University of Life Sciences.
- CHRISTIAN AID and CISANET. 2015. *Policy and Structural Arrangements Affecting the Global Market Opportunities for Malawi’s Pigeon Peas and Pigeon Peas Products*. Policy Brief No. 10.1. Lilongwe, Malawi: CISANET.
- De Schutter, O. 2010. Food Commodities Speculation and Food Price Crises: Regulation to Reduce the Risks of Price Volatility. United Nations Special Rapporteur on the Right to Food. Briefing Note No. 2: 1-14. New York: United Nations.
- Diagnostic Trade Integration Study (DTIS) Update. 2013. Reducing Trade Costs to Promote Competitiveness and Inclusive Growth. Prepared for Enhanced Integrated Framework. Lilongwe, Malawi: Government of Malawi.
<https://info.undp.org/docs/pdc/Documents/MWI/Malawi%20DTIS%20Update%20FINAL.PDF>
- Dzanja, J., M. Matita, H. Kankwamba, M. Dolislager, and D. Tschirley. 2016. *Mapping Market Prospects for Grain Legumes in Malawi*. GCFSI Publication Series. Malawi Report No. 005. E. Lansing, MI: GCFSI.
- Chirwa, Ephraim. 2011. Analysis of the Tobacco Industry in Malawi. United Nations Conference on Trade and Development. Geneva: United Nations.
- FAOSTAT. 2008. Online agricultural statistics. Rome: FAOSTAT. www.faostat.org.
- FAOSTAT. 2012. Online agricultural statistics. Rome: FAOSTAT. www.faostat.org.
- FAOSTAT. 2017. Online agricultural statistics. Rome: FAOSTAT. www.faostat.org.
- Farm Input Subsidy Programme (FISP). Several Years 2009-2015. Final Report on the Implementation of the Agricultural Inputs Subsidy Programme. Lilongwe, Malawi: Government of Malawi, Logistics Unit.
- Gondwe, Anderson. 2017. *The Case For Structured Markets in Malawi*. Policy Note No. 29. Lilongwe, Malawi: IFPRI Malawi.
- ICRISAT. 2014, 2015. 2015. Annual Report 2014. International Crops Research Institute for the Semi-Arid Tropics. Telangana, India: ICRISAT.
- Jadhav, Rajendra. “India Puts Curbs on Pigeon Peas Import to Support Local Prices.” *Reuters India*. <https://in.reuters.com/article/india-pulses-imports/india-puts-curbs-on-pigeon-peas-import-to-support-local-prices-idINKBN1AL0G3>.

- Jones, R., H.A. Freeman, and G. Le Monaco. 2002. *Improving the Access of Small Farmers in Eastern and Southern Africa to Global Pigeon Pea Markets*. AgrenNetwork Paper No. 120. London: United Kingdom: UK Department for International Development.
- Jones R., A. Likoswe, and H.A Freeman. 2000. Improving Farmer's Access to Technology and Market for Pigeon Pea in Malawi. In *Integrated Crop Management Research in Malawi. Developing Technologies with Farmers. Proceedings of the Final Workshop of the Farming Systems Integrated Pest Management Project*, ed. J.M. Ritchie. Chatham, United Kingdom: Natural Resources Institute.
- Kadale Consultants. 2013. Malawi Vulnerability Assessment Value Chain Analysis. Pigeon Pea Value-Chain Analysis, Draft Report v1.0. Burlington, VT: Tetra Tech ARD.
- Kananji, G.A.D, P.J.Z. Mviha, M.Siambi, and S.N. Silim. 2009. *A Manual for Pigeonpea Production in Malawi*. Lilongwe, Malawi: Ministry of Agriculture, Department of Agricultural Research Services. <https://www.cabi.org/gara/FullTextPDF/2009/20093200517.pdf>
- Kelly, J.D., P. Gepts, P.N. Miklas, and D.P. Coyne. 2003. Tagging and Mapping of Genes and QTL and Molecular Marker-Assisted Selection for Traits of Economic Importance in Bean and Cowpea. *Field Crops Research* 82.2–3: 135-154.
- Kenya Horticulture Competitiveness Project (KHCP). 2012. The Indian Market for Pigeonpea. Market Survey No. 09. Nyayo Stadium, Nairobi: USAID-KHCP.
- Lo Monaco, G. 2003. *Competitiveness of African Pigeon Pea Exports in International Markets*. Socio-Economics and Policy Working Paper Series No. 15. Bulawayo, Zimbabwe: International Crops Research Institute for the Semi-Arid Tropics.
- Lo Monaco, G. 2006. Competitiveness of African Pigeon Pea Exports in International Markets. SAT e-journal 2.1. ICRISAT. <http://ejournal.icrisat.org/mpii/v2i1/v2i1competitiveness.pdf>.
- Makoka, D. 2009. Small Farmers' Access to High-Value Markets: What Can We Learn from the Malawi Pigeon Pea Value Chain? Lilongwe, Malawi: Bunda College Centre for Agricultural Research and Development.
- Me-Nsope, N. and M. Larkins. 2016. Beyond Crop Production: Gender Relations along the Pigeon Pea Value Chain and Implications for Income and Food Security in Malawi. *Journal of Gender, Agriculture and Food Security* 1.3: 1-22. <http://agrigender.net/uploads/JGAFS-132016-1-Paper.pdf>.
- Mhango, W.G., S.S. Snapp, and G.Y. Phiri. 2013. Opportunities and Constraints to Legume Diversification for Sustainable Maize Production on Smallholder Farms in Malawi. *Renewable Agriculture and Food Systems* 28.03: 234-244.
- Mula, M.G. and K.B. Saxena. 2010. Lifting the Level of Awareness on Pigeon Pea – A Global Perspective. Telangana, India: ICRISAT.
- Orr, A., B. Kambombo, C. Roth, et al. 2014. Adoption of Integrated Food-Energy Systems: Improved Cookstoves and Pigeonpea in Southern Malawi. *Experimental Agriculture* 51.2: 191-209.

- Rao, NVPRG, S.N. Silim, F. Simtowe, et al. 2012. Enhancing Pigeon Pea Productivity and Production in Eastern and Southern Africa. Project Report. Ibadan, Oyo State, Nigeria: CGIAR. http://oar.icrisat.org/6617/1/EngagingSmallholders_205-216_2012.pdf
- Sichali, F., S. McLean, and B. Botha. 2013. Seeds for Change: A Certified Seed Project in Malawi Is Boosting Local Incomes and Supporting Emerging National Agricultural Policy. Presented at Hunger, Nutrition, Climate Justice • 2013 | A New Dialogue: Putting People at the Heart of Global Development. Dublin, Ireland.
- Simtowe, F. 2011. Pigeonpea Reduces Poverty: Evidence From Malawi. *Acta Horticulture* 911: 285-293. DOI:10.17660/ActaHortic.2011.911.32
- Simtowe, F., B. Shiferaw, M. Kassie, T. Abate ... and G. Kananji. 2010 Assessment of the Current Situation and Future Outlooks for the Pigeon Pea Sub-Sector in Malawi. Nairobi, Kenya: ICRISAT. https://www.researchgate.net/publication/228602228_Assessment_of_the_Current_Situation_and_Future_Outlooks_for_the_Pigeon_pea_Sub-sector_in_Malawi
- Snapp, S.S., D.D. Rohrbach, F. Simtowe, and H.A. Freeman. 2002. Sustainable Soil Management Options for Malawi: Can Smallholder Farmers Grow More Legumes? *Agriculture, Ecosystems and Environment* 91.1-3: 159-174.
- Snapp, S.S., R.B. Jones, E.M. Minja, J. Rusike, and S.N. Silim. 2003. Pigeon Pea for Africa: A Versatile Vegetable—and More. *Hortscience* 38.6: 1073-1078.
- SOKO, H.N. 2001. Pigeon Pea Production in Malawi and Opportunities for the Future in Pigeon Pea Production Technology Training Course, 10-12 July 2001. ICRISAT/DARTS/USAID Training Manual. Lilongwe: ICRISAT.
- Waldman, K.B., D.L. Ortega, R.B. Richardson, and S.S. Snapp. 2017. Estimating Demand for Perennial Pigeon Pea in Malawi Using Choice Experiments. *Ecological Economics* 131; 222–230. <http://doi.org/10.1016/j.ecolecon.2016.09.006>
- Walker, T., S. Silim, B. Cunguara, C. Donovan, and M. Siambi. 2015. Pigeon Pea in Mozambique: An Emerging Success Story of Crop Expansion in Smallholder Agriculture. A MEAS Discussion Paper for the USAID project, Modernizing Extension and Advisory Services (MEAS). Urbana, IL: MEAS. <http://meas.illinois.edu/wp-content/uploads/2015/04/MEAS-EVAL-2016-Mozambique-Pigeon-Pea-Walker-Nov-2016.pdf>

