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Malawi Groundnut Seed Sector Case Study Report

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Executive Summary

Groundnut is an important commodity in Malawi with the potential to positively impact economic development, resilience and nutritional status, but has significant barriers to commercialization, including a non-optimal formal seed system. This dysfunction creates a bottleneck for innovations, such as scaling improved varieties, and investments in the sector if quality seed is unavailable. This report documents the findings of a limited case study of an emerging disruption in the sector in Malawi from tobacco diversification investments. These efforts have shed light on several challenges and potential direction for future activities learned over the past two years of collaboration with the Feed the Future Innovation Lab for Peanut and USAID Malawi Agriculture Diversification Activity. In this report , we attempt to summarize lessons learned that extend beyond the specific groundnut seed case for improving "research for development" activity linkages to scaling.

The key findings include:

- Special attention must be paid to the peculiarities of a commodity seed value chain, including the need of expert knowledge of the crop, including expertise from countries that are predominantly smallholder and industrialized systems, such as the US.
- Despite previous research acknowledging the particular challenges of groundnut seed, the previous models promoted follow the same track as other commodities, such as hybrid maize or other legumes, which focuses on seed companies and traditional distribution channels. The business case for this scenario is not sustainable.
- Following the model of industrialized production systems where the processors are also the seed companies, the tobacco aggregators have become their own seed suppliers. This streamlines variety development and scaling to match their market demand for seed volumes for producers and processing types for buyers.
- Additional streamlining and innovation of roles is needed between the public sector and private sectors to support new variety releases in a timely manner and then scaling those released varieties. This may create some challenges to policy around seed.
- The total impact of this contained contract farming system may seem small relative to the total demand for groundnut seed in the country, yet the focus on targeted production and innovation may lead to greater spillover in the long run compared to continuing with the current model.

- Additional critical research is needed to reduce potentially negative impacts of commercialization, such as gendered disenfranchisement, and increase positive spillover to the informal sector.

This report describes the emerging successful case of commercial groundnut seed in Malawi and attempts to synthesize useful lessons from the experience of the Feed the Future Innovation Lab for Peanut (Peanut Innovation Lab) collaborations with several partners engaged in this effort.

Although it is still early in this case to consider these commercialization efforts a success, there are many valuable lessons afforded by this partnership that can be critically applied in other contexts.

Introduction

Improving access to improved crop varieties has been a significant challenge across Africa. While newly developed varieties carry traits that reduce the impacts of disease and environmental constraints and, ultimately, help farmers' productivity, it is common for farmers to grow older cultivars with reduced genetic potential. One cause of this conflict is that each crop and country have a unique seed system. Modern formal seed systems have developed in a few regions and for a few commodities, primarily hybrid maize, but many others lag, especially in legume crops. Despite widespread cultivation and investment in groundnut, most countries have had limited success in sustainably scaling improved varieties.

This report describes the emerging successful case of commercial groundnut seed in Malawi and attempts to synthesize useful lessons from the experience of the Feed the Future Innovation Lab for Peanut (Peanut Innovation Lab) collaborations with several partners engaged in this effort. This brief case study is not meant to be an exhaustive review of all aspects of groundnut seed in the country, but a targeted documentation and analysis of the natural experiment that has come from the significant investment in crop diversification by the tobacco aggregation companies in collaboration with the USAID mission-funded Feed the Future Malawi Agricultural Diversification Activity (AgDiv).

The objectives of this study include:

- Identifying key challenges and opportunities in the groundnut seed system, especially as it may guide future research and investments;
- Documenting key innovations related to the groundnut seed system: what has worked well, what has not, and what is still needed;
- Synthesizing information that is specific to the groundnut seed system in a way that may be useful for similar initiatives in other countries; and
- Synthesizing general findings that may help other research for development initiatives, including other Innovation Labs, move innovations out of research and have deeper, positive impact.

The primary data for this effort was generated through a series of ten interviews (Appendix 1) with seed value chain actors and a review of available literature. The interviews (virtual) were conducted jointly by the authors between March 15th and 28th, 2021 and covered a range of questions (Appendix 2). While most of the information was gleaned from these interviews, the findings are the opinions of the authors' alone.

What's so special about groundnut?

Groundnut is one of the most important crops in Africa and yet it is often overlooked. It is the most widely grown legume on the continent, almost exclusively grown by smallholders and commonly noted as a "woman's crop." As a legume, it plays a critical role in soil fertility and needs little to no inputs to produce a crop even on marginal soils and where rainfall may be limited (although yields can be much higher with inputs). It is high in protein and healthy fat and is used in many ways by nearly every culinary tradition. It can be easily stored by the household and is often used as a savings account that is sold or consumed as needed, while generally increasing in value the longer farmers can wait after harvest. Groundnut is sold in local and regional markets where it is often one of the highest cash value crops that can be produced by smallholders. All these attributes make groundnut a critical candidate for investments to improve resilience and economic development.

In Malawi, groundnut has been a primary backbone of the economy and the case for investment in the sector seems clear, with a long history of regional trade and need for diversification from the current dependence on tobacco, which is experiencing declining demand. However, despite the potential of the crop and decades of investment from international donors and some private sector actors, little progress has been made on yields, quality, farmer income or dynamism in the value chain.

Many of the same positive attributes of groundnut noted above are also factors in constraining progress, both in Malawi and across the continent. The crop's ability to grow on marginal soils often means that it is relegated to marginal land. The fact that the plant grows without inputs often leads farmers to resist using any inputs at all, even if evidence shows that the investment can be cost effective through increased yields and quality. The potential to store groundnut at the household level leads to price volatility and quality control problems, especially aflatoxin contamination, which create challenges for aggregation and market formalization. For groundnut to reach its potential, these contradictions must be addressed.

The focus of this report is to examine lessons learned related to the challenges and opportunities posed by these contradictions within the groundnut seed system through a case study of the recent investments in the sector by the partnership between the USAID Feed the Future Innovation Lab for Peanut (Peanut Innovation Lab), USAID Malawi-funded AgDiv project, the Malawi Department of Agricultural Research Services, and tobacco companies in Malawi aiming to diversify crop options for their farmers. The initial experience of these companies can be considered as a natural experiment in the groundnut value chain that holds valuable lessons for Malawi and beyond.

It's widely recognized that African agricultural productivity suffers from a yield gap and groundnut is no exception. Whereas average yields in the state of Georgia in the US are over 4,000 kg/ha, the realistic yields for smallholders in Malawi are generally well under 1,000 kg/ha. Many factors play a role in this gap (soil fertility, agronomic practices, environment, etc.) but two important limitations are the genetic potential of existing cultivated varieties and the availability of quality seed of these varieties. The primary varieties grown in Malawi, CG7 and Chalimbana, were released in 1990 and 1968, respectively. While both varieties are popular with farmers and local and regional markets, neither are particularly high yielding nor have disease resistance. They also require a long growing season (~140-150 days), which presses up against the limit of the rainy season, even while climate change has been making the seasons shorter and less predictable. And, while a few new varieties have been released over the past 30 years, there is little evidence that they are available in the market or known by farmers. Likewise, the quality of seed sold as "certified" is often dubious with little or no distinction from edible grain, a high

likelihood of genetic impurity and frequent problems with germination. Tobacco companies faced a serious challenge during the first production season to find adequate volumes of certified seed; when the seed was planted, germination rates were usually below 50%, leading to poor stands, weed problems and, ultimately, low yields and financial losses. Tobacco company managers recited a phrase that they would have to pay their "school fees" in the early days, but these losses and the revelation that each company would need to become their own seed supplier was a steeper cost than they'd anticipated.

If groundnut is to evolve from a commodity that is traded informally with limited potential for development impact, the seed sector must change to support, in a sustainable manner, both the pipeline of improved varieties and a reliable seed sector to multiply and make these varieties available. Two years into the sustained collaboration between the Peanut Innovation Lab and the tobacco companies, signs of success are appearing. During this most recent (2019-2020) cropping season, the companies have managed to produce certified seed to meet their demand and had very high germination rates. Several varieties have been advanced from just a few kilograms of breeder's seed to several tons of high-quality certified seed. In addition, data on agronomic performance and market acceptability has started to narrow variety choices to the best bets for coming years. What can we learn from this transition? What challenges may lie ahead? How can we profit the most from these shared "school fees?"

The findings in this report are based on interviews with key partners in the national program, public sector, and private sector (independent seed producers and the tobacco companies). While not extensive, most of the observations were consistent across interviewees and provides a good assessment of the progress made and challenges remaining in groundnut seed production in the country.

The uniqueness of groundnut

A very common theme across the interviews was that partners unexpectedly found groundnut different from other commodities, especially in relation to seed, and that groundnut requires specific considerations at each point of the value chain. One collaborator said that successful groundnut production is more akin to tobacco production than was expected, demanding precision management. Below is a list of attributes and their impact on seed scaling from interviews, literature reviews and experience of the authors:

- Groundnut seed is fragile. Mistakes in post-harvest handling can quickly degrade the seed's ability to germinate. The seed should be stored in-shell as long as possible and not subjected to high temperatures, which makes it bulky, expensive to transport and store, and with limited geographies for ideal storage (not along a hot lakeshore, for example).
- The fragility of the seed requires specialized equipment that often cannot be used for other commodities, such as expensive, multistage shellers that reduce damage, but are hard to financially justify if they only are used to shell seed.
- The same limitation is true for mechanized production. Planting, digging, and threshing equipment are generally specific to groundnut, making the equipment uncommon or even unavailable, expensive and unfamiliar to operators, which presents a challenge to larger scale production due to the high labor demands of the crop if most production processes are done manually.

- Groundnut is self-fertile. As with other legumes, farmers can save groundnut seed, unlike hybrid maize where they must buy seed each year. There is limited incentive to develop, license and produce new varieties if they may only be sold once and then maintained by farmers. If they are able, farmers often prefer to save their own seed which can be much less expensive.
- There is confusion about the difference in producing seed vs. edible grain. Quality seed production requires good agricultural practices (often with higher costs for inputs) to assure good germination and vigor when sold. These additional production costs may be hard to recover if low-input (low-cost) grain can be passed off as seed at much higher prices without proper traceability. This can lead to a "race to the bottom," even among knowledgeable seed producers.
- The multiplication rate is low. A common estimate for the seed multiplication ratio is 1:8-10 for groundnut whereas maize is 1:80-100. This means it can take several generations to scale seed once a variety is released. For example, a variety that was found to be acceptable to export markets in 2018 may only be available at a large scale in 2020, even with excellent production management resulting in high yields. It may also mean that groundnut seed may not fit into the regulated practices that require breeders seed to produce pre-basic seed; with a limited supply of breeder seed available each season, seed producers may need the flexibility to use pre-basic seed both to create basic seed and to increase the supply of pre-basic seed.
- Due to cool temperatures in the primary production region of Malawi, groundnut cannot be produced during the dry season even with irrigation, further limiting the scale of producing multiple generations per year.
- The seed itself is bulky, adding additional expenses for the farmer to purchase. Recommended seeding rates for groundnut in Malawi are 80-160 kg/ha depending on the size of the seed. By contrast, the recommended planting rates for maize in Malawi is 25 kg/ha.

These challenges make the business case for becoming a groundnut seed company particularly challenging. The limited potential for consistent sales reduces incentives to invest in licensing new varieties and the necessary infrastructure to reliably produce high quality seed.

Seed system models and groundnut

The seed system in Malawi is an amalgamation of public and private entities and functions along a spectrum of formal to informal, largely dependent on the commodity. Nearly all sources agreed that the maize seed system in the country functions reasonably well, with clear distinction of roles to optimize their resources in a sustainable balance. They also agreed that legume seed, and groundnut in particular, does not function nearly as well. The roles and responsibilities entities should play in different parts of seed production are not clearly delineated and far from optimal. These roles are in flux due to changes coming with tobacco company investments, but it helps to understand the system prior to these changes to capture these innovations and strategize about further improvements and lessons that can be shared.

To begin, it's important to describe the previous system and some of the dynamics. This has been useful in comparing models of groundnut seed systems in other contexts, including the US. For new varieties to be registered, they must be tested in multiple locations over multiple years. This is the responsibility of the National Agriculture Research System (NARS) breeder, and in Malawi, it is handled by the Department of Agricultural Research Services (DARS). Once the breeder releases a variety, it is also their

responsibility to supply the first generation of seed for scaling called, “breeders seed” to seed producers to then produce pre-basic seed (US equivalent of foundation seed). Pre-basic seed is then used to produce basic (US equivalent of registered seed), and basic to produce certified, which is then intended for widescale production for the edible market.

Due to the specific challenges of the crop, the incentives and supports to make this system work are not well aligned. The breeder has limited financial and material resources and should prioritize bringing new, improved cultivars into the pipeline and evaluating them, but is also responsible to produce large volumes of breeder’s seed to share with seed companies that would produce pre-basic seed. This appears to be a significant bottleneck and an option whereby well positioned seed producer(s) could maintain pre-basic seed for continual regeneration and leave the breeder’s seed in long-term storage to be drawn upon only if concerns about purity are raised.

In previous seed system improvement programs, smallholder farmers were involved in early generation seed multiplication and certified seed production, with limited oversight and investment by non-specialized seed companies. The high cost of inspection, aggregation and handling should steer efforts towards larger, better-capitalized private sector partnerships to multiply and maintain seed, beginning at the pre-basic level. The role of smallholder production for certified seed may also need to be reconsidered given the evidence of previous quality control steps.

Requiring a minimum field size and perhaps basic input package could streamline field inspections and assure better quality of produced seed. A different role for smallholder seed producers could be envisioned as scaling partners for local seed banks or distributed seed markets where new varieties could be trialed and scaled by well-trained lead farmers, with local reputation and norms replacing the added costs of formal certification.

During a trip to Georgia to participate in the annual Georgia Peanut Tour, facilitated by AgDiv and the Peanut Innovation Lab, the tobacco company leadership had an “aha” moment in realizing that there were no pure peanut seed companies in the US. Once the breeder has released a variety, there is a non-profit public foundation that manages the scaling of early generation seed and production of all foundation seed. In Georgia, this entity is Georgia Seed Development which is affiliated with the Georgia Crop Improvement Association of seed producers and the public land grant university. While this group is technically a public entity, it is financially independent and relies on the sale of seed and a portion of seed royalties to finance its operations. The foundation contracts seed production with highly skilled nearby farmers, but oversees all operations, maintains strict purity standards and operates a purpose-built seed shelling and treatment plant. After the foundation, all registered (basic) and certified seed is then managed by the shelling companies (the buyers) who contract the best growers for their required volumes in each region. This is important because these shelling companies have both the expertise and specialized equipment for shelling and seed preparation, but also because they have the best information on the required demand for total volumes and of which seed varieties based on their position in the market. Also, any excess seed produced is simply redirected to their normal shelling operation after planting, making predicting volumes much simpler and less costly.

This model is unlike any in Africa where seed companies generally handle many commodities and are not likely to invest in the specific requirements of groundnut, especially given the other challenges to the business case. New strategies will need to be adapted to each market environment.

Seed production, distribution and marketing innovations

Though tobacco companies are moving toward becoming their own seed producers, they claim to have limited interest in entering the wider seed business due to the challenges of the groundnut seed business case. Their priorities lie in accessing and evaluating pre-released varieties and being able to supply the internal demand for their contract growers. In doing so, they are investing in seed processing and distribution strategies scaled for their demands, with some marginal potential for outside sales of excess seed or as the demand may arise, such as through NGOs or other donor programs.

Stakeholders agreed that the traditional model of contracting with smallholder growers to produce "certified" seed that is shelled, bagged and sold through local distributors is not feasible due to several factors: the uncontrolled supply chains lead to poor germination, bulky seed is expensive to move through that supply chain, the market is volatile in price and demand, and seed producers struggle to compete with fraudulent seed. These factors create a challenge to scale quality seed and new varieties beyond the contract farming network of the tobacco companies to the bulk of Malawian farmers. However, the high level of management and capitalization of these companies can be used to jump start the variety pipeline while other strategies are developed to enhance the spillover of this system.

Linking private partners to the national program to become validated seed producers has marked a significant achievement. First, these companies are operating on a much larger scale, with complete input packages to assure maximum yield and quality, whereas even the national program struggles to operate at scale and uses very few inputs. Second, the quality of agronomic and market feedback towards variety prioritization is much simpler with the companies having a direct linkage between the wider market and production. The approval process and shift in mentality of the national program to allow the private partners access to the early stages of the process has been a challenge but is showing early success, leading to faster scaling and positive feedback from the industry and donor partners.

One additional innovation that was suggested by the Peanut Innovation Lab is the potential to distribute unshelled certified seed. This presents a regulatory challenge since there are currently no accepted grading standards for in-shell seed (% shell out rate, % immature or damaged seed, etc.). However, it is well documented that the best way to store seed to prevent germination loss is to leave it in the shell until immediately prior to planting. Most farmers know this well, and in fact have pushed back on receiving shelled seed, which is often known to germinate poorly. Since most contracted farmers are producing on roughly ½ ha, they only need ~70 kg of seed, which can easily be provided as ~115 kg of in-shell (assume 40% loss of shells and sorting) and then hand-shelled and sorted by the farmer, which is the gentlest way of shelling and preserving the integrity of the seed. This may have limitation of scale due to the added transport weight and volume and may provide some challenge as farm size grows. An additional challenge would be the safe and effective use of any seed treatments, such as pesticides or biological inoculants.

Summary of the Malawi seed case

- Groundnut has unique characteristics that require additional considerations throughout the value chain. Expert knowledge gathered from across the African continent and by creative adoption of basic principles learned from US system has been valuable to avoid retreading the same unsuccessful principles from previous efforts.

- The rebalancing of the roles of public and private actors in the seed chain are leading to more optimal outcomes.
- The Malawi case of tobacco diversification may be unique and thus application of lessons learned in other contexts should be considered. The financial, technical and human resources of these companies is incomparable to other potential partners on the continent. The remark that groundnut was considered a high management crop more akin to tobacco was a revelation and confirmation to the Peanut Innovation Lab. The companies' ability to pay high "school fees" in the form of setbacks and even foreseen challenges has allowed them to recover and learn.
- The impact of these investments may feel small relative to the much larger population of groundnut farmers outside the limited scope of the contracted tobacco networks, but these initial successes predict that the previous moribund state of the seed system may be shaken up enough to make positive changes. Success begets success. If the tobacco companies are successful, the market will grow, and further investment will follow.

General lessons learned for scaling Research for Development

To synthesize broader lessons from this case, we have compiled a few take-aways that may be valuable for other Innovation Labs or others to consider as they engage in research for development.

- Specialized knowledge should be respected. Historically, donor funded projects hire consultants with shallow understanding of the technical or in-country specific knowledge required for the work but AgDiv recognized the opportunity to bring in leading experts from US land grant universities that utilized existing USAID investment through the Innovation Labs. While a consultant may be contractually and temporally simpler than engaging a US academic institution, the particular knowledge of the groundnut value chain that is embedded within the Peanut Innovation Lab and its broader network, and the respect that it garners from all partners has made a great difference in adjusting the seed strategy based on the US model and experience from other African countries.
- Assumptions around how seed systems "should" work needs to be scrutinized. The model of hybrid maize or even other legumes should not be instinctually followed, especially when considering crop specific constraints. With some commodities, such as vegetatively propagated crops, this is quickly apparent, but groundnut continues to be lumped in with all other legumes to the detriment of progress.
- The roles of all entities in the seed system should be considered based on their strengths and weaknesses. In this case we could plot the entities along the continuum of public and private and formal and informal and quickly determine and clarify who should do what and why to optimize the pipeline. There may be regulatory hurdles that limit immediate action but documenting the pitfalls may help reshape the practice on the ground and eventually the policies themselves through evidence and experience.
- Coordination is always a challenge, but Innovation Labs can play a critical role. Although most Innovation Labs do not have the continuous presence on the ground required to coordinate all the players, serving as outside experts provides a dynamic that should be considered and used prudently. In the groundnut case, by aligning ourselves with the NARS we were able to assist in creating openings with private sector that were not considered previously and make the case to increase support for the particular public entity that was considered a primary bottleneck. The

risk of taking "the easy route" and bypassing these entities is likely not the long-term solution, but rather ILs should be looking at how the current model can evolve, including using the US model as a touchstone. The US land grant model has been a strong reference point in how to better align and coordinate between university research and training, public research and regulation, private sector investment and donor agencies. Likewise, the rapport of Innovation Lab researchers to the interview subjects for this project was fundamentally different than that of a consultant seeking the same information due to the respect, trust and collective efforts established during the previous research efforts.

- There is a balance of pushing research outputs versus creating pull for research outputs. Although there is a concern of bypassing the poorest farmers who are less able to take risks and make investments, the outcome of the larger private sector demand for technologies and knowledge has resulted in more accountability, better feedback and more innovation. Donor agencies and implementing partners should strategize about how to best magnify positive spillover effects while also critically evaluating and minimizing negative ripple effects. For example, new seed varieties and high-quality seed is now available in Malawi, but the scale may not meet the demands of the entire sector. Perhaps 30,000 farmers will have access to this seed pipeline through contract growing and NGOs, but easily 20 times that number still will rely on the marginally functional informal system. However, the potential to leverage a highly functional system is much greater than "pushing" the moribund old system to evolve. Conversely, ILs should be accountable to potential negative impacts, such as gendered exclusion of contracting mechanisms or the undermining of functional informal seed trade.
- The focus on rigorous research in areas that may normally wind up as programmatic "box-checking" for Monitoring, Evaluation and Learning (ME&L) is an opportunity for ILs. For example, impact evaluations related to gender dynamics in the groundnut system led by the Peanut Innovation Lab continue to form new opportunities and inform implementing partners and private entities.
- Researchers need to have timely and robust feedback and flexibility to respond to research demands. The primary example is that this shift towards the tobacco companies came after the establishment of the Peanut Innovation Lab's research portfolio and the initiation of AgDiv, and yet both projects were able to shift their priorities with the changes happening in the country. A challenge on this front was that recommendations were needed often before adequate data was available to support it.
- The challenges related to the COVID19 pandemic have made all parties more aware of ways that successful collaborations can be assisted through virtual communications and distance learning technologies, with less need for in-country presence. Though nothing can replace face to face interactions and field visits, these tools can open the door to more regular interactions and fewer trips, which can save resources and more easily fit into busy academic schedules.

Future investments required for success

During our discussions with different interviewees, a number of topics for future research investments were raised. The topics were suggested based on the interviewee's experience in groundnut production, including seed production.

Varieties & Traits

There was general agreement that there are a number of new varieties available for farmers and these have good levels of resistance to the major diseases and perform well under the water-limited

conditions in Malawi. At the same time, it was considered critical to maintain an active breeding pipeline with new varieties being released on a regular basis. This was felt to be a major role that the national program and other public sector institutions should play. The private sector is interested in partnering in varietal development, especially in the evaluation of pre-release varieties and in helping to set target traits of interest.

The establishment of a groundnut breeder network among many of the major national groundnut breeders is a good step in the right direction and is already allowing the breeders access to a wide array of diverse germplasm for evaluation and use. Since these efforts are being led by the national programs, it is hoped that the network will continue leading to significant improvements in varietal releases.

One of the recognized concerns was that some varieties performed well under high input management but were not as well-suited for low input smallholder production. Likewise, some varieties were very appreciated by export markets and processors, but less so by farmers. More feedback related to processing characteristics, such as ease of mechanical shelling and the resulting grades and sizes, will likely be forthcoming as more advanced processing becomes more common. As more formal exports and local value addition emerge, certain varieties are likely to be preferred or rejected based on quality parameters such as taste, protein and oil composition, and even association with aflatoxin contamination.

Among the traits mentioned by the interviewees included the following.

- **Short duration –** While there are a number of new varieties released in Malawi and providing quality seed of these is important, it was mentioned by several partners that new varieties with key traits and adapted to different regions of Malawi remains critical. In particular, short duration, Spanish varieties are required. The rainfall has been dramatically reduced in several regions and in some cases growing Virginia type varieties such as Chalimbana is no longer feasible as the amount of rainfall is much less and the rainy seasons are shorter.
- **Drought tolerance** – Similarly, varieties with better drought tolerance are needed to boost yields and quality given the less reliable rains. Water stress not only reduces yield, but also increases the likelihood of aflatoxin contamination.
- **High-oleic –** High oleic groundnut demand is growing in Malawi (and globally) and several interviewees suggested the desire to provide seed of such varieties. Varieties with high oleic acid content contain higher levels of mono-unsaturated fat that improves the healthiness of groundnut and increases the shelf-life of stored nuts and peanut products. At the moment, such varieties are limited in Africa although there is some breeding effort to introduce the trait into local varieties and one variety has been recently released in Ghana.
- **Seed dormancy –** Several partners complained about germination prior to harvest in the field. This is particularly severe for Spanish type varieties. Developing Spanish varieties with better pre-harvest sprouting resistance would increase the window for harvesting such varieties.

Pre- and Post-harvest Technologies

While a lot is already known about best practices for growing groundnut, there remain a number of areas needing further research to both optimize current practices and to evaluate new ones. The recent release of the Guide to Groundnut Production in Malawi by the Peanut Innovation Lab has helped assemble many of the best recommendations but will need to be continually updated and enhanced based on the latest results. Ownership of this iteration by the public sector (national program and universities) will be important for sustainability. Specific technologies are particularly required for seed production.

A few areas were raised by the interviewees that required specific attention.

- **Seed treatment –** The use of biological inoculants and pesticide seed treatments are not commonly used, and recommendations based on economic impact for smallholder farmers is lacking in many cases. Research to determine the best options is needed, especially for quality seed production. Innovative materials and ways of physically treating the seed that are feasible effective and safe may be needed based on the context of hand planting, in-shell seed distribution and scale.
- **Soil fertility management** – The composition, rate and timing of fertilizers to assure an economic response is still largely unknown. As mentioned in the report, it is common for farmers to believe that groundnut does not require fertilizer; however, it is obvious that if groundnut is grown in very poor soils, the yields will remain very low. In order to achieve higher yield, it is important that appropriate nutrient management strategies be developed and recommended. This starts with better understanding of existing soil properties and management strategies, especially inputs to adjust soil pH and the application of calcium and possibly micronutrients such as boron, required for good seed development.
- **Aflasafe** – Minimizing aflatoxin contamination is critical to achieve a safe and high quality crop. The use of Aflasafe is being promoted in several countries, although research on the long-term impacts and the interaction of Aflasafe with other production practices, especially for groundnut, is not known and should be investigated.
- **Mechanization –** Some partners suggested that obtaining appropriately sized shellers and other equipment needed for growing, harvesting and processing good quality groundnut is a challenge. As the industry becomes mechanized, it will be important for the breeding programs to use mechanization to screen new varieties as part of the evaluation program.

Policies and Regulations

Several of the interviewees commented on the progress made in the regulation of seed systems in Malawi, but also pointed out a few areas that need attention. Research into the impacts of these areas and possible improvements would help stimulate change. Many of these would be important for the commercial seed sector to thrive, especially in a crop like groundnut.

- **Seed policy** – The seed system in Malawi is quite complex and needs supporting government policy based on scientific information, including:
    - A review of existing policies on seed (both at the regional and local levels);
    - Addressing the important issues of regulatory changes, including seed certification; and
    - Considering regulations on pre-basic and basic seed production to allow seed companies to be an active partner in producing, maintaining and commercializing these categories of seed.
- **Market research –** Market information system needs to be developed and made available to groundnut producers. There may be several market niches and opportunities that Malawian farmers, NGOs and private sectors could target. Understanding the trends nationally, regionally and globally would be important to enhance the recent interest in groundnut production by the commercial sector.
- **Certified seed labeling –** The current seed system in Malawi provides for certified seed labels; however, it was mentioned that these are easily counterfeited and thus it is difficult for farmers

to rely on the label on a bag of seed. Developing a reliable labeling system would be critical to attract and retain quality commercial seed producers.

- **In-shell seed certification –** As mentioned earlier in the report there are advantages and disadvantage for in-shell seed certification. There is a need to research how this could work so that in-shell seed certification could be proposed based on scientific information.

Training and capacity building

Several interviewees mentioned a lack of qualified staff in various department involved in the seed system. This is particularly true for the seed certification system and maintaining genetic purity. The offering of training visits in other countries, in-person and virtual training workshops in seed production and seed certification will be important.

Appendix 1. Persons Interviewed

Name	Organization	Title/Role
John Gait	Pyxus	Commercial farm manager
Tadala Rambiki	Pyxus	Groundnut program manager
Lloyd Barker	Retired from Limbe Leaf (LLTC)	Commercial farm manager
Nuno Oliveira	Canon Garth (LLTC)	Agronomist
Nicole Schauer	Canon Garth (LLTC)	Groundnut program manager
Carl Jensen	Good Nature Agro (GNA)	CEO
Jeremy Venable	AgDiv	Agricultural development specialist
Elizabeth Sibale	AgDiv	Deputy CoP
Justus Chintu	DARS	Legume/Groundnut breeder
Andrew Goodman	Horizon Farm	Owner/Seed producer

Appendix 2. Interview Questions

1. Tell us about your job and your/your institutes role within the groundnut seed system in Malawi?
2. From your perspective, what are the biggest challenges in general and relative to your role for the groundnut seed system in Malawi? *Perhaps it helps to differentiate challenges on the supply/production side and demand/market side?*
    a. Are there enough improved varieties, are new varieties being released in a timely manner (are things improving, why/why not)?
    b. Is there enough seed of the various classes (breeder, basic/foundation, certified)?
    c. Who *should* oversee nucleus seed, breeder seed, foundation/pre-basic seed, and registered/basic and certified seed production and maintenance?
    d. What is the role of the private sector, national program, NGO/not-for-profit (includes CGIAR) and smallholder farmers in the groundnut seed system? How do you expect that to change over the next 5-10 years?
    e. With the recent new investments in groundnut production in Malawi by the leaf growers, what are the main lessons learned related to seed?
3. Can you tell us about some innovations your institute/company has done to improve the seed system over the past few years? What seems to be working? What hasn't worked?
    a. How the seed multiplied by your company (eg, contract farmers, do anything different for seed vs grain)? How many hectares? What is the amount of seed sold annually/projected for the next few years?
    b. How do you determine what varieties to grow, how much seed of each to produce?
    c. Have you seen any uniqueness with groundnut seed production (eg, inputs, isolation, handling)?
4. What is the business case for groundnut seed in Malawi? How can it be sustainable?
    a. What are realistic margins for certified vs. non-certified seed?
    b. Who pays for breeder and basic/foundation seed production?
    c. Most smallholder Malawian groundnut farmers either save their seed, or possibly buy it from neighbors or the market, but with no quality declaration even though saved seed can sometimes be better quality than commercial/certified seed. Can you make the case why farmers should invest in certified seed?
    d. What proportion of farmers can afford to buy certified seed of improved varieties?
    e. Are tobacco farmers different from other Malawian farmers in terms of technology adoption and risk taking, etc.?
5. Any additional suggestions for how the groundnut seed system can be improved, or areas that need further research?
    a. Do you have any suggestions to make the seed certification process easier and cost effective?
    b. How can the cost of seed be reduced so that more farmers can have access to quality/certified seed?
6. Conclusion
    a. Are you willing for us to re-connect with you if needed as we progress with our analysis?
    b. Do you have any final thoughts? Is there anything that we forgot? Is there anyone in particular that you feel that we should connect with relative to our topic? Or, any documents that we should review?

Appendix 3. Reference Materials

The authors of this report have not made attempt to comprehensively evaluate the groundnut seed sector in Malawi but focused efforts to a specific seed sector where they describe the emerging successful case of commercial groundnut seed in Malawi. Nonetheless, we have surveyed a number of articles as background material and are providing the following as reference materials to the report.

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