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Analysis of the Value Chains for Root and Tuber Crops in Malawi: The Case of Sweet Potatoes

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Introduction

Sweet potato (*Ipomoea batatas*) is one of the most important food crops in Malawi. The crop currently occupies nearly 50 percent of the area under roots and tubers and 47% of the total production of roots and tubers according to Ministry of Agriculture Production Estimates for 2016/17 (MoAIWD APES 2016/17). Sweet potato stores well as a famine reserve crop, tolerates extreme weather conditions, and performs well in fringe soils, which makes it ideal for food security. Although commonly categorized as a subsistence crop, potential uses of sweet potato have considerably diversified in developing countries over the 1990s (Carey et al., 1997). Despite its important role in the Malawian food value chain, productivity at farm-level remains much lower than potential yields. A value chain study on sweet potato was conducted in 11 districts of Malawi across all the three regions to analyze and identify bottlenecks and inherent opportunities for possible investments for upgrading and development of the value chain.

The study was conducted against the backdrop of the Government of Malawi's approval in September 2016 of the National Agriculture Policy (NAP) and subsequent development of its implementation plan, the National Agriculture Investment Plan (NAIP). The NAP is the overarching policy for the agriculture sector of Malawi. The Policy aims 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. In order to achieve this, the sector will have to make strategic

Key Findings and Recommendations

- Sweet potato yields have increased over the past decade partly due to introduction of improved high yielding varieties but yields still fall short of the potential.
- Some of the factors constraining productivity growth include over-recycling of seed among farmers and poor agronomic practices due to limited extension services.
- The release of Orange Fleshed Sweet Potato (OFSP) varieties have contributed to the decline in Vitamin A deficiency in Malawi, contributing to improved nutrition status.
- Demand for sweet potato and associated products is increasing partly due to increased urbanization and vulnerability of maize to climate change impacts.
- To improve Malawi's sweet potato value chain, the following recommendations are made: significant investments in seed systems, irrigation, post-harvest, value addition and agro-processing technologies in response to identified market and industry needs; investments in research and extension on improved varieties, good agronomic practices, and pest and diseases prevention and control; and investments to link farmers, farmer organizations and processors through contract farming arrangements and scaling up of Orange-Fleshed Sweet Potato (OFSP) varieties to maintain sufficient Vitamin A intake.

investments in various value chains that have the potential for sustainable and inclusive economic growth. One of such value chains is sweet potatoes.



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Data and Methods

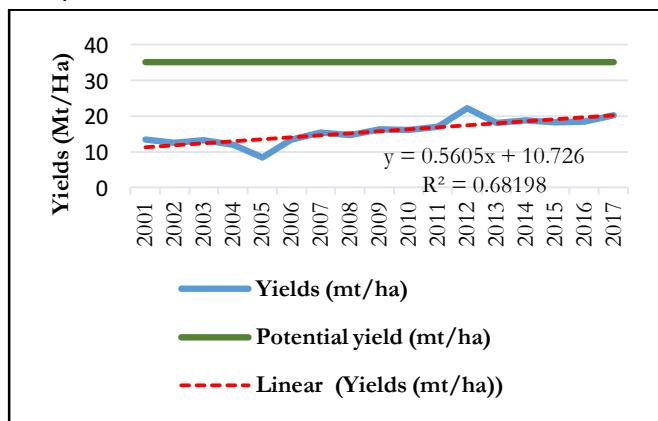
The study applied both quantitative and qualitative methods to collect primary data from 94 farmers belonging to 7 farmer groups using Focus Group Discussions (FGDs), 14 traders and 16 key informants comprising policy makers, NGO representatives and scientists from both local and international research institutions. The data was collected in 11 districts: Mzimba and Nkhata Bay, in the Northern Region; Nkhotakota, Ntchisi, Lilongwe, Dedza, and Ntcheu in the Central Region and Zomba, Blantyre and Mulanje in the Southern Region in February to March 2017. Applying the value chain approach, the study used several analytical techniques that include Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, profitability analysis at various stages along the chain and input (seed) demand analysis.

Study Findings

Production

Figure 1 presents national yield trend for sweet potato in Malawi. Sweet potato yields have generally been increasing from about 13 mt/ha in 2001 to about 18 mt/ha in 2017/18. However, they remain below the potential of 35 mt/ha.

Figure 1: Sweet potato yields trend in Malawi, 2001 to 2017/18



Data source: Agricultural Production Estimates Survey (APES), MoAIWD.

In areas where the International Potato Center (CIP) has introduced new potato varieties, adoption rates are high (about 70 percent). Some of the improved varieties that have been adopted include *Kenya*, *Semusa* and several

promising clones, such as 440131, 420240, and 440077. Most recently released improved sweet potato varieties include *Kaphulira*, *Anaakwanire*, *Mathuthu* and *Kadyaubwerere*, just to mention a few (Table 1). Several of the new varieties are orange-fleshed and contain pro-vitamin A. These varieties were approved for production by the government of Malawi in 2011 (CIP 2016). Interviews conducted with *sweet potato* producers revealed that *Kadyaubwerere*, *Zondeni*, *Kaphulira*, *Anaakwanire* and *Kenya* are some of the most popular varieties grown in Malawi. This indicates increased acceptability and consumption of OFSP varieties (in areas where they are introduced) which enhances nutrition as it contributes to reduction of vitamin A deficiency. Farmers that were interviewed for this study also mentioned preferring varieties that are high yielding, produce big roots, have high dry matter, and have low fibre content.

Figure 2: Kadyaubwelere OFSP variety in Malawi



Source: Authors

Figures 3 and 4 are maps showing sweet potato production areas and the crop's suitability under traditional management in Malawi. The figures indicate that sweet potato is generally grown in areas where it is mostly suited.

Figure 3: Estimated Sweet Potato Production in Malawi by District, 2016/17 Cropping Season (mt)

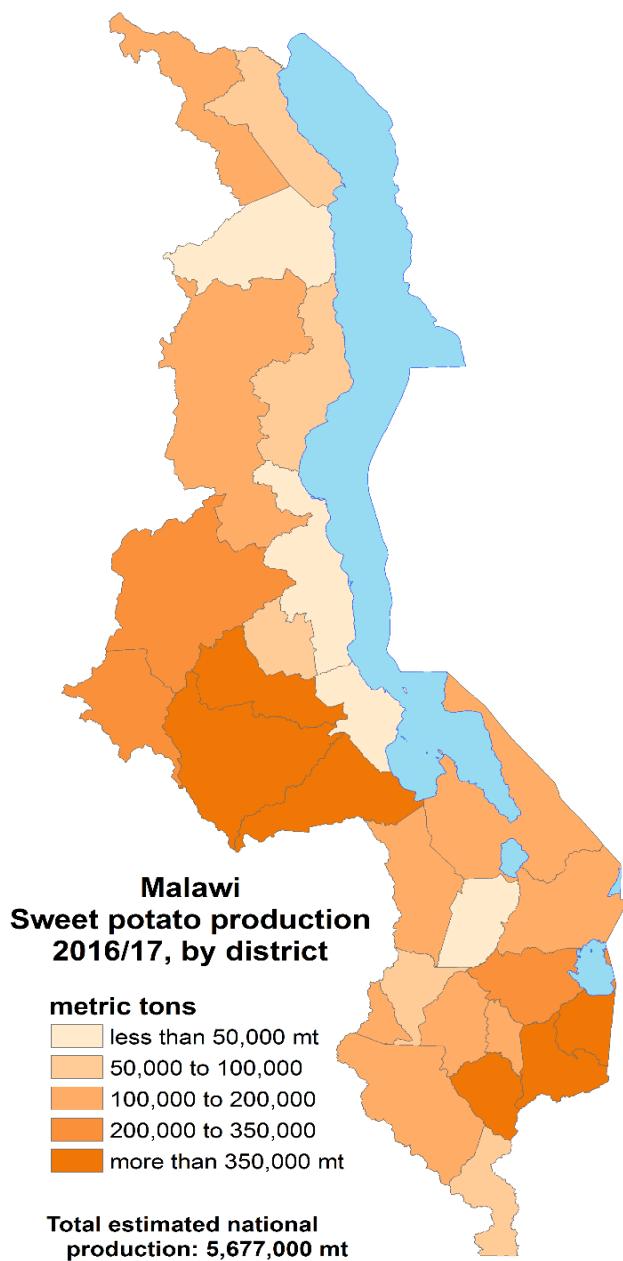
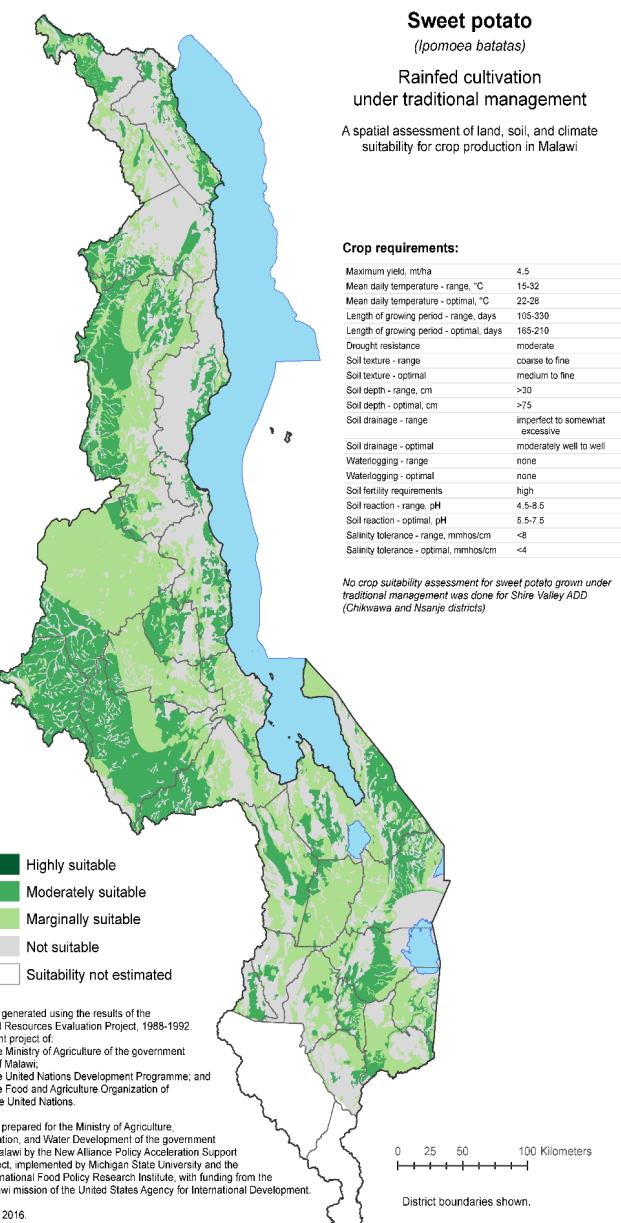


Figure 4: Suitability Map for Sweet Potato Grown under Traditional Management in Malawi



Sources: MoAIWD APES data, Department of Land Resource Conservation data, and Todd et al. 2016

Table 1: Recently Released Improved Sweet Potato Varieties in Malawi

Code	Proposed name	Flesh color	Yield, mt/ha	Special attributes	Maturity period (Months)	Dry matter, %
BV07/008	Nyamoyo	Cream	35	Smooth roots for commercial processing	5	33
BV07/016	Sungani	Cream	35	High yielding	5	32
BV07/028	Anaakwanire	Deep orange	25	More roots per plant	6	30
LU06/0146	Mathuthu	Orange	25	Soft, good for children	5	29
LU06/0128	Kuphulira	Orange	35	Early maturing, allows piece-meal harvesting during lean times	3.5	30
LU06/0527	Chipika	Orange	35	High yielding	5	30
LU06/0252	Kadyaubwere	Orange	30	Sweet taste	5	31
-	Zondeni	Deep orange	8-16	Late maturing	5-6	-
-	Kadyaubwerere	Pale orange	25	Tasty/sweet,	-	-

Source: Chipungu (2011); Malawi Government (2012); CIP (2016)

Value Chain Mapping

The sweet potato value chain in Malawi is characterized by small-scale producers, research institutions and scientists, government (mostly Ministry of Agriculture, Irrigation and Water Development), input suppliers, traders and other middlemen and transporters. Sweet potatoes move from producers to traders and to consumers with transporters facilitating this movement. It is through this channel that price transmission takes place.

Marketing of Sweet Potatoes

Producers market about 74 percent of their production in the informal fresh root markets located in home stands, community markets, and along roadsides (Vugt 2016). Only one percent of the sweet potatoes finds its way into commercial or industrial processors due to the underdeveloped product base and unclear markets for sweet potato products. Roadside markets along the main roads of Malawi and urban outlets provide premium prices for fresh roots for traders and retailers. The data collected for this study shows that primary producers received an average price of MK160 (USD 0.22)¹ per kg from traders while aggregators who sell to final consumers (mostly households) received an average price of MK270 (USD 0.37) per kg. This implies that the trader's price is 69 percent higher than that of the producer (**Error! Reference source not found.**).

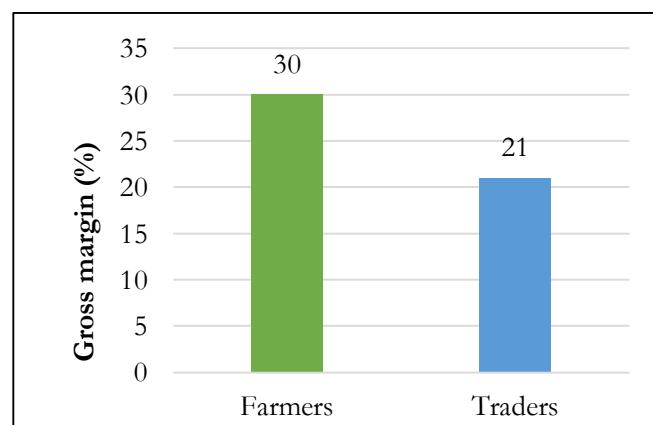
Table 2: Price transmission across the sweet potato value chain

	Farmer	Trader
prices(MK/kg)	160.0	270.3
Price value change	Base	69 %

Profitability Analysis

In terms of profitability, producers took the lead with their gross margins estimated at 30 percent of gross income and traders at 21 percent.

Figure 5: Gross Margins along the sweet potato value chain (%)



Source: Computed by authors

¹ 1 USD=725MK

This means that most of the price advantage that traders have over the producers is eaten up in the costs (mostly transportation costs). This result also indicates that the perception that vendors/traders exploit farmers, is debunked, as the traders have to incur transportation costs that the producers may not be willing/able to incur.

Although no sweet potato processors were contacted during the study period, processing of sweet potato is actively taking place in some districts – promoted by the International Potato Centre (CIP). CIP implemented a project called “Rooting Out Hunger in Malawi with Nutritious Orange-Fleshed Sweet Potato” between 2009 and 2014 in Dedza, Mulanje, Phalombe, Zomba and Chikwawa districts, with further provision of vines to other projects in an additional 10 districts. The project aimed at improving vitamin A and energy intake for at least 70,000 households with young children. The project’s value-addition component trained farmers to produce sweet potato cakes, juice, sweet beer, scones, chips, and meatballs. The project also connected farmers to Universal Industries Limited, which among other commodities, uses sweet potato for production of various value added products at industrial level. Scaling up of such initiatives would be critical to promoting the sweet potato value chain in Malawi.

Demand for Early Generation Seed for Sweet Potatoes
While Malawi has a wide spectrum of improved sweet potato varieties, an analysis of the seed requirements for sweet potato vines has not been conducted. This study analyzed and quantified the demand for early generation seed (EGS), i.e., commercial, basic and breeder seed for sweet potato. The analysis was based on key model variables that include: adoption and non-adoption rates of improved varieties, seed rate, seed replacement rates and

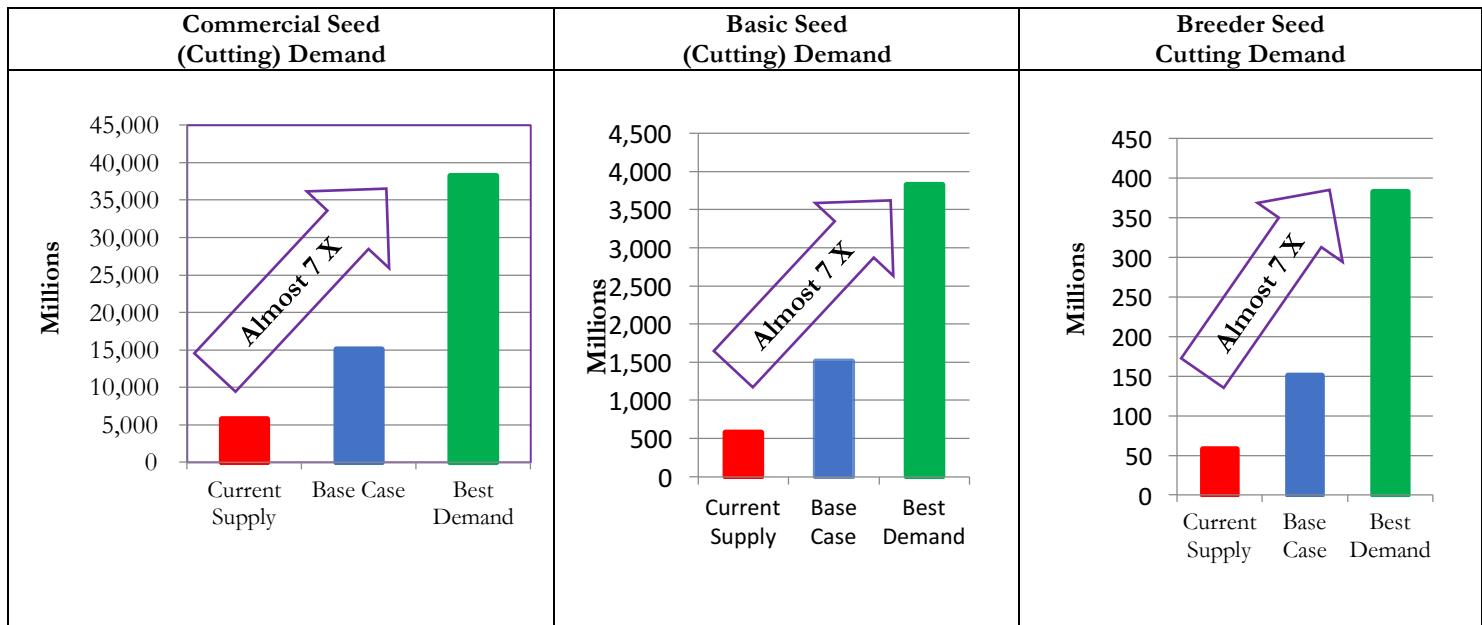
seed yield, among others. These were modeled and developed as follows:

- Current EGS supply: Current level of supply in the market, based on current adoption rate of improved varieties of 70% and current market conditions. Seed replacement rate of 4 years is assumed.
- Potential EGS demand - base case: Assumed that adoption rate of improved varieties is 80% and all EGS specific recommendations are implemented, with other market impediments assumed to remain in place. Seed replacement rate of 2 years is assumed.
- Potential EGS demand - best case: Assumed 90% adoption rate for improved varieties, all EGS specific recommendations are implemented, market impediments removed and other value chain and policy constraints are addressed (e.g., downstream value chain improvements and best agronomic practices followed). In this scenario, the seed replacement rate is reduced to 1 year.

Using the amount of land allocated to sweet potatoes in the 2016/17 growing season of 290,000 ha (MoAIWD APES 2016/17) and a seed rate of 162,600 cuttings per ha, the current demand for sweet potato cuttings (commercial seed) was estimated at 5.78 Billion² (**Error! Reference source not found.**). The base case and best demand case for breeder, basic and commercial improved sweet potato seed (cuttings) were also computed, with demand under the best case rising to almost 38 billion, representing a seven-fold rise above the current supply. For foundation seed, the current supply was estimated at 578 million cuttings, with demand under the best demand rising to 3.823 Billion cuttings. For breeder seed, the current demand was estimated at 57.8 million cuttings, with the best demand rising to 382.4 million cuttings. The analysis shows that if the country is to have sufficient supply of EGS for sweet potato, production of the seed needs to be increased seven times. This requires significant investments into the seed system.

²The cuttings are usually 30 cm in length. For vine multiplication, seed rate is 1,626 bundles (100 cuttings of 30 cm each) per hectare planted on 325 standards beds (1.5 m * 20.5 m).

Figure 6: Demand for early generation seed (cuttings) for sweet potato in Malawi



Source: Computed by the authors

Constraints and Challenges along the Cassava Value Chain

The study identified several constraints and challenges at various stages along the cassava value chain. These are presented in Table 3.

Table 3: Challenges and constraints along the sweet potato value chain

Production level (producers)	Traders (marketing)	Processors	Policy level
<ul style="list-style-type: none"> Limited availability and accessibility to clean planting materials (vines) that results in seed recycling and contributes to spread of pests and diseases. Lack of reliable and established markets. Limited research and extension that results in poor agronomic practices and post-harvest losses. Poor organized functional farming associations. Low farm gate prices. 	<ul style="list-style-type: none"> Limited access to financial services, limiting business expansion. Lack of appropriate storage facilities. Inconsistent supply of sweet potato, due to reliance on rain-fed production. Perishability of the product. 	<ul style="list-style-type: none"> Limited investment in value addition technologies due to low capital levels and limited access to financial services. Unreliable and intermittent power and water supply. Low and inconsistent supply of sweet potato as raw materials. Lack of good marketing strategies, poor packaging, etc. 	<ul style="list-style-type: none"> Lack of emphasis on development of the sweet potato value chain (e.g. its omission in the National Export Strategy). Weak regulation of product standards on the market. Lack of commodity specific policies/strategies (until recently, when a roots and tubers development strategy has been developed) Limited government support characterised by adhoc programmes and interventions (roots and tubers being promoted when drought, floods and pests attack the maize crop)

Conclusions and Recommendations

Sweet potato is an important food crop with increasing cash generation potential for farmers in Malawi. However, the crop faces major challenges including: limited availability and accessibility of clean planting materials, forcing farmers to recycle seed thereby contributing to low production and productivity; limited opportunities for value-addition; and non-availability of well-structured markets. Sweet potato demand has been rising, partly driven by growth of demand for food as human population is increasing and the crop's increasing role as a resilience strategy in times of maize shortage due to climate change impacts. In view of the various constraints and opportunities identified, a number of policy recommendations have been drawn as follows:

- Significant investments in the seed system to ensure availability and accessibility of quality planting materials to farmers. Promoting decentralized vines multiplication is one way of ensuring timely access to and affordability of planting materials among farmers.
- Investments in research and extension to promote adoption of improved sweet potato varieties, best agronomic practices and enhanced farm management.
- Investments in irrigation technologies to increase productivity and address inconsistent supply of sweet potato. Subsidies could be introduced for imported irrigation equipment to facilitate access to and use of such technologies.
- Organizing farmers in groups/associations and linking them to reliable markets where they can satisfy demand for large-scale buyers.

The authors would like to thank all stakeholders who were consulted and provided information that helped with the production of the study report.

This research 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 study authors and do not necessarily reflect the views of USAID or the United States Government

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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

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This brief summarizes the results of **Sweet Potato value chain under the Roots and Tubers Value Chain study in:** Dzanja, J.K., Kanyamuka, J S., and Nankhuni F.J (2018), "Analysis of the Value Chains for Cassava, Irish Potato, Sweet Potato, and Cocoyam in Malawi". **Joseph S. Kanyamuka** is a Research and Policy Analyst, New Alliance Policy Acceleration Support: Malawi Project (NAPAS: Malawi) and **Joseph K. Dzanja** is Associate Professor in the Agribusiness Department at the Lilongwe University of Agriculture and Natural Resources (LUANAR), Lilongwe, Malawi. **Flora J. Nankhuni** is Associate Professor, International Development, Department of Agricultural, Food and Resource Economics, Michigan State University and Chief of Party, NAPAS: Malawi.