

# Commercial Opportunities for Fruit in Malawi

Laronne Faulkner, Joe Harrington, Damon Levy, Koen The



# Commercial Opportunities for Fruit in Malawi

Laronne Faulkner, Joe Harrington, Damon Levy, Koen The

**Correct citation:** Faulkner L, Harrington J, Levy D, The K. 2009. Commercial Opportunities for Fruit in Malawi. ICRAF Working Paper no. 86. Nairobi, Kenya: World Agroforestry Centre.

Titles in the Working Paper Series aim to disseminate interim results on agroforestry research and practices and stimulate feedback from the scientific community. Other publication series from the World Agroforestry Centre include: Agroforestry Perspectives, Technical Manuals and Occasional Papers.

Published by the World Agroforestry Centre  
United Nations Avenue  
PO Box 30677, GPO 00100  
Nairobi, Kenya  
Tel: +254(0)20 7224000, via USA +1 650 833 6645  
Fax: +254(0)20 7224001, via USA +1 650 833 6646  
Email: [icraf@cgiar.org](mailto:icraf@cgiar.org)  
Internet: [www.worldagroforestry.org](http://www.worldagroforestry.org)

© World Agroforestry Centre 2009  
ICRAF Working Paper no. 86

The views expressed in this publication are those of the author(s) and not necessarily those of the World Agroforestry Centre or contributing organizations.

Articles appearing in this publication may be quoted or reproduced without charge, provided the source is acknowledged. No use of this publication may be made for resale or other commercial purposes.

All images remain the sole property of their source and may not be used for any purpose without written permission of the source.

The geographic designation employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of the World Agroforestry Centre concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

## **Contributors**

Laronne Faulkner	University of California-Berkeley Haas Team
Joe Harrington	University of California-Berkeley Haas Team
Damon Levy	University of California-Berkeley Haas Team
Koen The	University of California-Berkeley Haas Team

## **Acknowledgements**

The authors wish to thank the following institutions for financing the work reported in this paper: the Haas School of Business, University of California-Berkeley, the Government of Ireland, through funds from Irish Aid, and the Government of the United States of America, through funds from the US Agency for International Development. The authors also thank the World Agroforestry Centre, and particularly the ICRAF-Malawi team, for providing technical and logistics support.

## **Keywords**

Malawi, commercial opportunities, fruit, fruit products, smallholder farmers, indigenous fruit processing, microfinance

## TABLE OF CONTENTS

EXECUTIVE SUMMARY .....	5
INTRODUCTION .....	8
BACKGROUND AND STRUCTURAL ISSUES.....	8
Malawi: An Import State .....	10
The Malawian Marketplace: Major Areas for Improvement.....	10
Government Programs: Ministry of Agriculture .....	12
Research: The World Agroforestry Center and Other Organizations .....	13
FRUIT MARKET LANDSCAPE .....	13
IMPORT AND EXPORT OPPORTUNITIES.....	14
Fresh Fruit Value Chain .....	15
Processed Fruit Value Chain.....	16
FINANCING OPPORTUNITIES.....	20
NURSERY OPPORTUNITIES .....	22
MACADAMIA NUT OPPORTUNITIES .....	23
OPPORTUNITY BREAKDOWN .....	25
BUSINESS GUIDE .....	26
Creation of Farmer Cooperatives.....	27
Leadership Organization .....	29
Strategic Objectives .....	31
Business Plan Analysis .....	32
Opportunities for Training.....	32
Obtaining and Managing a Loan.....	33
Business Development.....	35
RECOMMENDATIONS.....	36
APPENDIX A .....	37
APPENDIX B .....	42
APPENDIX C.....	46
APPENDIX D .....	48
APPENDIX E .....	50
APPENDIX F .....	51

## EXECUTIVE SUMMARY

The objective of this project was to access commercial opportunities of Malawian fruit and fruit products domestically and internationally that can best benefit smallholder farmers. We identified major barriers to developing a successful fruit product industry in Malawi. ICRAF has many opportunities to leverage its core competencies to support niche fruit product opportunities. Our recommendations for ICRAF include pursuing new areas of research, leveraging its training expertise in innovative ways and taking an active approach with limited implementation activities.

ICRAF's main goals in Malawi align with its organizational vision to improve the lives of smallholder farmers through poverty reduction, assuring food security and promoting nutrition. ICRAF focuses its research on soil fertility improvement, commercializing indigenous fruit processing enterprises, increasing availability of fodder for livestock and sustainable land use.

Malawi is one of the world's poorest countries; 90% of the population is engaged in subsistence farming, with maize as the staple crop. Smallholder farmers are particularly vulnerable to threats of food insecurity due to the lack of crop diversification. There is an issue of landholding density: most families control less than .5 hectares of land.

Malawi possesses fertile land with which it could produce all the fruit it needs. However, broad structural issues are prohibiting the development and success of the fruit product industry. The infrastructure is plagued by poor transport (e.g. road conditions) and fresh fruit storage capability. There is lack of smallholder farmer expertise in sustainable propagation methods and business skills. Finally, smallholder farms have difficulty obtaining the capital they need to start-up, purchase inputs and equipment. While ICRAF may possess limited ability to help develop Malawi's infrastructure, there are targeted opportunities that exist to support initiatives to improve farmer education and expand access to capital.

Most smallholders have limited understanding of obtaining capital and do not have the required collateral. Microfinance institutions provide a possible solution to offer loans to groups of smallholders, and the largest institution (Malawi Rural Finance Company) is anxious to diversify its tobacco-heavy loan portfolio. ICRAF is in position to raise awareness among smallholders of MFI opportunities and train the MFI field workers on agricultural expertise.

Moreover, ICRAF should consider acting as a guarantor for MFI loans to cooperatives. ICRAF has a history of providing grants to specific smallholder initiatives, and this would be an opportunity to help more farmers obtain the same amount of capital at a lower expenditure for ICRAF. A simple example would be for ICRAF to substitute a grant of 100K MK to a cooperative, and instead provide upfront cash collateral of 15% and the first interest payment of 30%. Instead of providing one grant of 100K MK, the NGO can now serve three farmer groups with the same resources. Plus, there is still ample opportunity for ICRAF to provide the same technical training and expertise to the group.

There are niche rather than large commercial opportunities within processed fruit for smallholder farmers within processed fruit. Some smallholder farm cooperatives such as Village Hands are successful and have made it into local market retailers with their fruit juice. However, there is more smallholder farm opportunity within import substitution and exports. For example, local

commercial fruit juice processors import all of their concentrate from neighbouring countries like South Africa. Dairibord, a Malawi commercial fruit juice processor, wants to source its produced concentrate domestically within three years. From Dairibord's perspective, it appears prudent to invest in a centralized production facility and take advantage of its developing fruit procurement infrastructure. This provides smallholder farmers with the chance to supply Dairibord with all the fruit it needs to produce concentrate. ICRAF can partner with Dairibord to provide the technical training to farmers to increase yield and quality of the fruit.

Export opportunities are limited for many processed fruits, as most neighboring countries can grow or process the same exotic fresh fruits as Malawi. Opportunities exist with fruit extracts, bolstered by a growing worldwide demand for organic and natural products. Tree Crops, an exporter of fruit extracts, is focused on the potential for baobab fruit, whose seed oil and pulp can be used in cosmetics and food flavorings. Tree Crops works with an international organization called PhytoTrade who brings natural product entrepreneurs in developing countries in contact with interested businesses in first-world markets. ICRAF has an opportunity to work with PhytoTrade in providing training to entrepreneurs and smallholder farmers on proper agricultural technologies. Relationships with organizations like PhytoTrade are also important for ICRAF to maintain a pulse on future commercial fruit product opportunities.

Beyond fruit tree products, ICRAF should pursue opportunities to assist smallholder farmers who grow macadamia nuts. Malawi is among the top 10 producers worldwide of macadamia nuts, exporting mainly to Europe and Asia. Nuts are an attractive near-term focus for exporting because they can be handled and sold without significant processing. There is a stronger infrastructure in place for tree nuts over fruits, as the Tree Nut authority monitors the production of nuts in Malawi.

Nurseries represent a smaller opportunity for ICRAF support, given the shift from government run to private nurseries. Nurseries are establishing themselves across Malawi, although we have no way to accurately measure potential market saturation. There has been widespread concern over the quality of seedlings from private nurseries, and ICRAF can step in with support and training for these entrepreneurs in proper propagation.

This analysis has been primarily performed by looking at different players on the supply-side. Our findings and opportunities are primarily based on interviews with leaders in fruit research, NGOs and commercial enterprises. Because this represents a small group of qualitative interviews, it is potentially biased and we recommend a more in depth demand study be performed. Due to time constraints, it was infeasible to complete the demand analysis during our project, but a graduate student in Malawi could complete the study. Our recommendations include specific guidelines on how to conduct the study.

Our qualitative analysis suggests that local demand for fruit products is low. However, ICRAF should continue to push its research and support implementation of fruit propagation techniques to bolster food security and improve the nutrition of Malawi smallholder farmers. ICRAF Malawi has already taken a gradual approach to earning the trust of the smallholder farmers, through introducing soil fertility expertise before expanding promotion of growing fodder supply and indigenous fruits. The same go-slow approach is appropriate specific to growing fruits. By having farmers grow a small amount (5 to 10) of diversified fruit trees, it assists in food security and nutrition. From a long-term



commercial benefit perspective, farmers then may see the benefit of selling the fruit and expand farming of the fruit.

## INTRODUCTION

This report summarizes our research project on the commercial feasibility of fruit products in Malawi. The project has been carried out through the International Business Development program at Haas School of Business, University of California-Berkeley. The team consisted of four graduate students who pursue their Masters of Business Administration at Haas School of Business. We conducted research in coordination with the World Agroforestry Centre (ICRAF), where the objective was defined as follows.

### Objective

Assess commercial opportunities of Malawian-grown fruit and fruit products domestically and internationally.

To narrow the scope we defined two focus areas:

- Identify major barriers to development of a thriving fruit/fruit product industry and propose practical solutions
- Recommend practical strategies to ICRAF on how it can leverage its core competencies to facilitate widespread fruit farming

In order to get a broad perspective we interviewed various experts from the fruit product industry, including horticultural researchers, academics, NGO administrators, government officials and commercial entrepreneurs. Our team also paid field visits to seed nurseries and farmer cooperatives. We combined this face to face research with relevant existing research from ICRAF studies, dissertations and the internet to form the basis of this report.

Our analysis presents ICRAF with a fresh perspective of the business dynamics of fruit product markets in Malawi. We hope that our findings encourage ICRAF to pursue opportunities where it can add value, such that their in-depth knowledge of fruit trees science is adopted by important constituents in the fruit product industry.

In the next section we elaborate on the structural issues that may hinder Malawi in growing a sustainable fruit product market. Then we lay out the fruit market landscape and suggest which fruits should have priority focus. The next section lists the opportunities we identified in the fruit product market. We then provide a detailed business guide for smallholder farmers that would like to use fruit trees beyond their own consumption. Finally we end with concluding remarks and case studies of successful micro-enterprises.

## BACKGROUND AND STRUCTURAL ISSUES

The Malawian economy is agriculturally based, with maize as the staple crop. Agriculture represents 38.6% of the GDP, accounts for over 80% of the labor force, contributes about 63.7% of total

income for the rural population, and represents about 80% of all exports.<sup>1</sup> Nearly 90% of the population engages in subsistence farming. Farms are organized along two major dimensions—estate farms and smallholder farms. Estate farms are larger and are generally used for tobacco, sugar, tree nuts, and tea. Smallholder farms range from .4-2+ hectares and produce a variety of crops, mostly maize, but also beans, rice, cassava, and groundnuts (peanuts).

By the late 1980s, over 56% of households farmed plots of less than 1 hectare, and a further 20% on 1.0-1.5 hectares.<sup>2</sup> The size of land holdings generally depends on the area within the country. The southern region is the most densely populated, and an average farming family controls about .4 hectares of land. In the central region, the average is 1 hectare of land. The northern region has the lowest population density in the country, with farming families in control of an average 1- 2 hectares of land.

Like many countries in sub-Saharan Africa, Malawi has historically suffered from the threat of food insecurity. Long-standing food insecurity due to droughts is fundamental to historic and current farming strategies, and is a key driver of farmers' concerns with crop diversification, or the expansion into crops outside maize, tobacco, tea, and sugar. In fact, Malawi has experienced drought in three of the past six years. Past experiences with drought have led to “defensive” farming, with a reluctance to begin cultivation of new crops (e.g. fruit trees), especially crops that farmers do not have substantive experience with.

Malawi's subtropical climate is ideal for a diverse array of fruit trees. The northern region is the coolest and rainiest. The central region is the warmest and driest. The southern region's climate falls between the northern and central regions. Over forty percent of the country's land area is suitable for agriculture.<sup>3</sup> Most of the arable land is under traditional/customary tenure system. The chief grants cultivation rights, rather than ownership, through village headmen. Matriarchal property rights are common in the central and southern regions while patriarchal property rights are most common in the north. In the matrilineal system, where the husband leaves his home to live with the wife, the wife inherits cultivation rights.

Malawi's economic reliance on the import of agricultural commodities renders it particularly vulnerable to external shocks such as declining terms of trade and drought. High transport costs, which can comprise over 30% of its total import bill, constitute a serious impediment to economic development and trade.<sup>4</sup> Paucity of skilled labor, difficulty in obtaining expatriate employment permits, bureaucracy, corruption, inadequate and deteriorating roads, electricity, water, and telecommunications infrastructure further hinder economic development in Malawi. However, recent government initiatives targeting improvements in the road infrastructure, together with private sector participation in railroad and telecommunications, have begun to make the investment environment more attractive.

---

1 <http://www.state.gov/r/pa/ei/bgn/7231.htm>

2 Ibid.

3 <http://www.fao.org/ag/AGP/AGPC/doc/Counprof/Malawi.htm>

4 Ibid.

The Malawian government, academics and researchers are aware of the potential positive effects of increased crop diversification on farmer income and food security. However, there is currently a disconnect between the knowledge that exists in the academic community and the dissemination of information to smallholder farmers. Effective communication of the business case for crop diversification is essential to overcoming widespread psychological barriers associated with food insecurity within Malawi.

### **Malawi: An Import State**

In terms of fruits and fruit products, Malawi has historically been an import state, with many fresh fruits and fruit products imported from neighboring southern African countries. In 1999, the most recent publicly available data, Malawi had a trade deficit of over 9.7 billion Malawian Kwacha (MK) with countries in the Southern Africa Development Community (SADC).<sup>5</sup> The large trade deficit has resulted in a low import cover ratio (total exports/imports) of only .28. Over 70% of its SADC trade deficit, or 6.7 billion MK, is with South Africa. South Africa is Malawi's largest trading partner in the SADC, followed by Zimbabwe at 3 billion MK in imports and a trade deficit of 2.5 billion MK, with an import cover ratio of .16.<sup>6</sup>

The issue of imbalanced trade with neighboring countries is an important one because it highlights fundamental and numerous shortcomings in the Malawian marketplace that preclude development of a competitive advantage against neighboring countries. The vast majority of fresh fruit and fruit products imported into Malawi can be produced locally. Many fruits sold in local and regional markets that are imported from South Africa grow well in Malawi, such as bananas and mangoes. Additionally, a substantial portion of fruit juices consumed locally is sourced from other countries, such as South Africa. Imported fruits reach every level of the Malawian marketplace, from roadside and local markets to major juice manufacturers like Dairibord.

### **The Malawian Marketplace: Major Areas for Improvement**

Improvement within Malawi can be categorized in three broad areas:

- 1) Infrastructure
- 2) Education
- 3) Capital.

#### **Infrastructure**

Infrastructure consists of three sub-areas:

- 1) Transportation
- 2) Production Capacity
- 3) Storage Capability.

*Transportation.* Each year, a significant portion of harvested fruit is wasted because of inadequate transportation due to poor road quality. In most areas, transport occurs via bicycles or on foot. Not only does this restrict the quantity of products that can reach markets, but also packing techniques

---

<sup>5</sup> The SADC includes Angola, Botswana, Lesotho, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania, Zaire, Zambia, and Zimbabwe.

<sup>6</sup> National Statistics Office of Malawi (1999 data).

can result in damage to the fruit. Malawi consumers are particular about the physical appearance of fruit when making purchasing decisions. Fruit quality issues remain even when large transport vehicles are available to transport fruit from farms to the marketplace. While most roadways between major regional areas (such as Lilongwe and Blantyre) are paved relatively well, the peripheral road network in rural and less urban areas is generally unpaved and mechanically unfriendly to vehicles. So, even fruit transported by vehicles suffer from wastage due to in-transport damage.

*Production Capacity.* The small acreage under control by an average farmer places significant agricultural pressure on the land. There is little opportunity for fallow and rotation to restore soil fertility, and smallholders have expanded their cultivation to marginal, less fertile soils often on hill slopes, which are not suitable for intensive cultivation, leading to woodland depletion, soil degradation, and erosion. This results in decreased fruit yield and quality. Rain-fed agriculture predominates, dependant on a single rainy season between November and April. Only 10,000 hectares of land is currently irrigated, 5% of the potential irrigated area, largely on sugar estates.<sup>7</sup> Increasing both production capacity and yield quality is critical to satisfying local demand with locally produced products.

*Storage Capacity.* The ability to store and protect products from spoilage is critical to the fresh fruit and fruit juice/juice concentrate market. Once fruit has been harvested, extreme heat or prolonged sun exposure can damage or destroy fruit. An analysis of uapaca fruit quality at harvest and after storage identified large variations in size and color at harvest and during storage due to inadequate post-harvest processes. Post-harvest damage to unripe fruit and exposure of ripe fruit to direct sun caused more fruit skin darkening, which uapaca consumers least desire.<sup>8</sup> There are also significant issues related to fruit over ripening before it reaches its final market destination. This mostly results from a lack of expertise on the optimal time to harvest fruit given its final output and distance from the final place of sale.

Refrigeration is critical for juices or juice concentrates that require temperature control to insure quality maintenance. The electricity network in Malawi is not widespread, which restricts locations in which refrigeration units can be installed. Even when electricity is available, the energy and maintenance costs of refrigeration are generally prohibitive to smallholder farmers.

## **Education**

Education consists of two sub-areas:

- 1) Technical
- 2) Business.

*Technical education.* Technical education for farmers includes a range of areas, including optimal spatial planting techniques, sustainable harvesting methods, and general care guidelines by tree type. With Uapaca fruit, for example, harvesting usually involves forcefully knocking the fruit down from a tree, which leads to cracking and other physical damage.<sup>9</sup> Education on proper harvesting techniques

---

<sup>7</sup> Ibid.

<sup>8</sup> Kadzere, Irene. Dissertation: Pre- and Post- Harvest Factors Influencing the Quality of Uapaca Kirkiana Fruit, 2006.

<sup>9</sup> Ibid.

would lead to immediate improvements in quality. The Malawi Department of Agriculture has historically offered technical advice to farmers through the use of extension workers. Extension workers are government employees with expertise in horticulture or another related field. The government recently changed its approach to offering extension worker expertise to farmers. Historically, extension worker services would “push” services, where extension workers had specific agendas for the farmers. In recent years, however, the government has shifted to an “on demand” approach, where extension workers address topics that farmers solicit.

*Business education.* Based on interviews with farmers and government representatives, very little business education and training has been provided to farmers. Most smallholder farmers do not have the basic accounting, marketing, or finance skills required to effectively run a business. Business education is particularly important if farmers expect to process fruits, as they will need to make an accurate assessment of their value add in the supply chain.

### **Capital and Equipment**

Capital was consistently cited as a barrier for farmers to diversify and increase fruit yield and quality. Anecdotal evidence from interviews with farmers and farmer groups (cooperatives) suggest that they would invest in new tree types to diversify product offerings if they could pay for the requisite inputs. Start-up financing, however, is needed to effectively diversify into new crop products and markets. Farmers need capital to purchase processing, storage, and transport equipment.

The cooperatives we interviewed said that they routinely sold out of their products each year and wanted to be able to produce more in the future. A growing domestic market in fruit juice concentrate production is raising demand for more advanced juicer equipment. However, the most significant barrier to entry for the juice concentrate market is the ability to purchase the necessary processing and storage equipment.

### **Government Programs: Ministry of Agriculture**

Malawian government policies targeting the agricultural industry are implemented via the Ministry of Agriculture. The mission of the Ministry is to promote sustainable agricultural productivity to increase food security and income derived from agricultural productivity. The Ministry has six pillars for the development of the agricultural sector:

1. Irrigation Development
2. Agricultural Research Services
3. Animal Health and Livestock Development
4. Crop Production
5. Agricultural Extension Services
6. Land Resources Conservation

The Ministry has a number of programs targeting improved smallholder farmer agricultural and economic productivity. Programs include the Outgrower Sugarcane Production Project, the Macadamia Irrigation Project, the Small Farms Irrigation Project, the Improving Agricultural Marketing Price Data Project, and the Farm Income Diversification Project. Though there are a number of programs targeted at economic development, our interviews hinted at a bias towards staple crops and cereals, with a small focus on horticulture and fruit crops. There is little focus on fruit tree

production. Extension workers generally have expertise in a specific crop types, such as maize and legumes, but few have or offer specific training on fruits.

## **Research: The World Agroforestry Centre and Other Organizations**

### **ICRAF's vision, mission & core research**

- Harness the science of agroforestry for development by focusing on poverty reduction, assuring food security, and maintaining a healthy environment for future generations
- Focus on smallholder farmers
- Core research focuses on generating knowledge on tree species

The World Agroforestry Centre (a.k.a. ICRAF) has produced and supported a substantial amount of valuable research on progressive and innovative agroforestry methods and technologies. ICRAF has focused on such research areas as:

- *Soil Fertility*, such as the identification and domestication of 'fertilizer trees' for various soil fertility replenishment practices
- *Domestication, Processing and Marketing of Indigenous Fruits and Products*, such as a publication on strategies for commercializing indigenous fruit processing enterprises
- *Fodder*, such as R&D work on developing agroforestry management principles to increase availability and use of a diverse range of fodder tree species for smallholder livestock
- *Land and Biodiversity Management*, such as research on carbon sequestration, mitigation against climate change, and management and sustainable land-use

A number of other organizations are active in Malawi and also dedicated to poverty alleviation and/or the economic empowerment of smallholder farmers. We spoke to some of these organizations in our research, including the National Smallholder Farmers' Association of Malawi (NASFAM), Wildlife and Environmental Society of Malawi, the Clinton Foundation, Small Enterprise Development Organization of Malawi (SEDOM), and Development of Malawi Enterprise Trust (DEMET).

## **FRUIT MARKET LANDSCAPE**

Malawi's fruit market landscape can be divided into opportunities for indigenous and exotic fruits. The majority of ICRAF's research in Malawi has concentrated on indigenous fruits. However, there has been a broadened focus to exotic fruits, primarily because of demand potential on the export market and burgeoning interest from the farmers.

Fruits overall have low demand within the country. Most Malawians do not perceive much value with fruits, and they consume fruits primarily as snacks. Awareness of nutritional benefits is low. Ability to pay for fruits is also low. Fruits also suffer from difficulty of storage and trade, as fruits in fresh form often have short life spans and are subject to damage in transport.

Overall, we did a basic analysis of fruits found in Malawi to prioritize them. We relied on the experts we spoke with, who provided insight on the supply side. However, the short timeframe of the project precluded collection of demand data. We recommend that ICRAF works with a graduate

student to complete demand-side research on specific fruits and fruit products. We prioritized the fruits below based on expert opinion, supply, and geography and seasonality.

We are therefore unable to present specific fruit-focused opportunities (e.g. mango jam versus dried bananas). After the demand research is complete, the next step is to identify specific opportunities based on consumer or partner demand (partners such as PhytoTrade or Dairibord). A marketing person can then draft a business plan for various fruits and apply the supply chain analysis and business assessment sections of this paper.

We narrowed the scope of our research by delineating which fruits have clear potential in the short and the long term and which do not. To make this distinction, we used input from experts on fruit products in Malawi. These experts came from colleges, NGOs, and research institutes. Mangos, citrus and bananas were consistently cited as high potential exotic fruits, while baobab, ziziphus and uapaca were cited among indigenous fruits. Fruits mentioned less frequently were temperate fruits (e.g. apples, pears, etc), guavas, avocados, papayas, and pineapples. The consensus is that there is less research on these fruits and they are not as widely available as the high potential fruits. We focus on the high potential fruits because they have a higher likelihood of inclusion in studies on new technologies and marketing efforts. They also have high sales potential, high value in terms of food security, and high nutritional benefits.<sup>10</sup>

Temperate fruits were excluded from our analysis because they can only grow in cool areas, which is limited in Malawi. Scale is therefore limited by supply. Furthermore, fruits like guavas, avocados, papayas and pineapples are not widely seen. People are unfamiliar with them and therefore prefer to buy other well-known fruits such as bananas. Familiarity was also a factor considered. For instance, bananas only need to be peeled while avocados usually need more preparation. It may take a while before people are more familiar with these fruits and consume them on a large scale. While these excluded fruits have long-term potential, we focused on the ‘low-hanging’ fruit with the greatest near-term potential. Please see Appendix A for a detailed background discussion on each prioritized fruit.

## IMPORT AND EXPORT OPPORTUNITIES

The Malawi government has a stated goal to “transform the country from being a predominantly importing and consuming nation to a predominantly manufacturing and exporting country”.<sup>11</sup> From a capacity perspective, Malawi has abundant fertile soil that can produce the agricultural crops it requires for domestic consumption and food security (excluding the drought factor). In our interviews we heard that fruit wastage is extremely high due to improper care and under utilization. For example, estimates for mango wastage ranged from 60-90%. This is evidence that there is significant supply potential for both domestic and international markets. Yet, while Malawi has made inroads into foreign markets with tobacco, maize, tea, nuts, and cotton, fruit product exports is underdeveloped. Fruit products may contribute to Malawi’s goal of becoming a net exporter, both as an import substitute and as an export.

---

<sup>10</sup> Ibid.

<sup>11</sup> Malawi Growth and Development Plan, 2006



To explore the opportunity for utilization of the fruit supply in Malawi, we will discuss the supply chains for both fresh fruit and processed fruit. Then we will discuss the import substitution and export opportunities. For the most part, import substitution takes the form of fresh and processed fruit, while the export opportunity is focused on processed fruit.

### **Fresh Fruit Value Chain**

*Fresh Fruit Transport.* Once harvested, fresh fruit must be taken to market for sale. An individual smallholder farmer's fruit is usually transported by manpower (carrying, wheelbarrows, bicycles) to the main road, where a consumer, vendor, or middleman can purchase the fruit. A vendor or middleman then transports the fruit to a market where he sells the fruit himself or sells to another vendor. The number of middlemen involved in transport to markets is related to a farmer's distance from markets. It is unlikely an individual farmer will travel far because of lack of transport vehicles, travel cost or competing farming priorities at home.

*Fresh Fruit Consumption.* Within Malawi, the majority of fresh fruit consumption occurs when fruits are in season. Eating fruits is not ingrained as part of the daily nutritional diet, which is dominated by daily consumption of maize (nsima). There are various possible reasons for this. First, there is low awareness of the nutritional value of fruits. Second, fruits are mainly consumed when it is abundant and free. Finally, from a Malawian's perspective, fruits do not complement maize well as part of a meal.

*Fresh Fruit Market Assessment.* Most markets are informal, ranging from individuals selling roadside to many sellers congregating to offer a variety of produce and other agricultural products. The markets in larger cities such as Lilongwe and Blantyre are similar to the markets in market towns like Balaka or Ncheu, but simply larger with more vendors for each product.

For greater detail on the value chain, please see Appendix B.

Given transport and handling inefficiencies in Malawi, the commercial opportunity for locally produced fruit is limited to local markets. Malawi cannot currently compete with the more mature transport and handling abilities of neighbouring countries, and is therefore disadvantaged in the regional and international marketplace. Larger supermarkets such as Shop Rite carry fruit that is a combination of local and imported. While there is a small import substitution opportunity associated with these supermarkets, it is not a large opportunity that many smallholder farmers would benefit from. We recommend that ICRAF follow up with Shop Rite to develop a relationship, as we were not able to arrange a meeting with their management in Malawi.

We believe that current domestic demand for fresh fruit is low, although we expect the demand to grow based on three major structural changes: 1) awareness of nutritional value; 2) increased income per capita; and 3) increased adoption of crop diversification strategies. Willingness-to-pay for fruits is also low, and we do not anticipate a rise in the near-term.

We recommend fruit tree planting for the moment for household consumption and preparation for demand growth over the next ten years. The benefits of nutrition and crop diversification currently

outweigh the benefits of potential market opportunities. We would recommend ICRAF use its expertise to recommend a fruit tree-planting plan, but that would most likely include a range of fruit trees suitable to the farming region with a total of 5-10 trees planted on the farmer's land. As we will discuss later, nut trees could also be integrated into this plan. Secondly, to accurately assess future demand, research should be performed on how demand for fresh fruits can be stimulated (e.g. lowering prices for fruit, increasing nutritional education, and increasing availability of specific fruits).

### **Processed Fruit Value Chain**

Processed fruit products include juices, jams, dried fruits, and wines. They are sold in supermarkets and to hotels. Processed fruits are rarely available in informal markets. In order for smallholder farmers to participate in the processed fruits market, they must either be provided the capital to build their own processing plant or they must be able to provide fresh fruit to commercial organizations that specialize in processing. Smaller juice processors generally struggle to remain commercially viable, though we will present a case study on Village Hands, a cooperative that is making consistent profits from the processing of baobab (malambe).

Most processed fruit products currently are imported, primarily from South Africa. Mulanje Peak Foods, a subsidiary of Dairibord Malawi, processes Malawian-grown fruits into jams and sauces. Dairibord also imports concentrate from South Africa to produce fruit juices.

For processed fruits, smallholder farmers do not currently have the capacity to process fruits on their own. We observed a few farmer cooperatives that process jams and juices, but they were only viable because of NGO support. Demand for processed fruits comes from import substitution and from export. The import substitution opportunity is the chance for local farmers to provide the fruit which processing companies are currently sourcing from South Africa. The export opportunity primarily focuses on processing indigenous fruits for export to countries that would use them for cosmetics and oils. There is also a small opportunity to export jams and juices to neighbour countries but this is best addressed by a company that is already providing processed fruits to supermarkets in Malawi.

#### *Import Substitution*

In our market assessment, we identified two import substitution opportunities – juices and jams. We learned that there are many juice producers, but the large commercial enterprises import their concentrate from primarily South Africa. Local fruit juice processors such as Dairibord, Suncrest Creameries and Golden Sun compete for shelf space with South African imported fruit juice. For fruit jams, Mulanje Peak is the only commercial domestic producer of jams and they are positioned as the low-priced brand in most supermarkets.

Based on our research, we believe juice processors such as Dairibord and Suncrest would be keen to switch to local production of concentrate if: 1) it could be purchased at costs equal or lower than imported concentrate, 2) the concentrate meets quality standards – (e.g. Malawi Bureau of Standards), and 3) supply is sufficient and consistent.

Malawi has the ample supply of domestic fruits from which to produce concentrate. Dairibord would like to locally procure more of its concentrate within 2 to 3 years, and is most interested in oranges, guava, pineapple, and mango.<sup>12</sup> It is establishing both credibility and a network with farmers, particularly in the southern regions through the Mulanje Peak initiative. They are also acquiring fruit in the rest of Malawi by purchasing fruit at specific locations when their delivery trucks return from delivering products. From a smallholder farmer perspective, this type of concentrate system has the potential to encourage crop diversification and to increase income.

ICRAF has the opportunity to proactively contact Dairibord and become a partner in its plans to produce local concentrate. ICRAF has the expertise to provide the knowledge and training to farmers to produce improved varieties and reduce wastage.

The second opportunity would be to establish a cooperative network for bulk concentrate production. This option is more difficult, but there would be benefits in increasing income for cooperatives through this specialization. As we mentioned earlier, capital is difficult for cooperatives to obtain unless it is granted by an NGO. Small juice processors also encounter challenges of achieving sufficient scale, developing business expertise, and meeting quality standards that are driven by hygiene.

To determine whether a cooperative should pursue one opportunity over another, ICRAF can leverage its 2005 research on the Magomero Women's group producing concentrate for Dairibord. It should also dedicate resources to compare the two alternatives. We would recommend comparing the value of selling fresh fruit to the value of selling concentrate. This would entail calculating the profits yielded from processing the fruit into concentrate, along with the investment required to reach scale and quality standards. On the surface, it appears that selling the fresh fruit to juice processors would be much more feasible based on the structural issues encountered by smallholder farmers.

We conclude that import substitution opportunities exist for locally produced juices and jams in the local market. Future research could investigate whether there is untapped local demand for processed fruit and whether smallholder farmers can deliver fruit to effectively fill demand.

### *Export Opportunities*

In considering export opportunities, we have noted through our interviews there may be a perceived stigma with Malawi fruit exports.<sup>13</sup> Fresh fruit is not an attractive option, as southern African nations are able to grow or obtain the same exotic fresh fruits from other neighboring countries. South Africa and Mozambique are also far ahead of Malawi in establishing trade relationships with Europe and other first world nations in fresh fruit. South Africa in particular holds huge advantages as one of the largest exporters of high-quality fresh and processed fruit in the world. It has a well-established infrastructure, and efficient modern processing technology, enabling it to produce high-quality fruit at a relatively low cost.

---

12 Interview with Innocent Mushava, Financial controller of Dairibord

13 Interview with Thomson Chilanga, Director of Bvumbwe Research Station

Export opportunities for fruit juices and concentrates are also limited. There are small opportunities for international market penetration; Dairibord will soon gain access to Shop Rite's stores in Mozambique (and eventually in South Africa) to sell its fruit juice (nectar) products. It may test Mulanje Peak jams there as well. Exporting fruit concentrate will be tough, especially because South Africa is already very established as the market leader.

Worldwide, the popularity of dried fruits continues to increase as market demands for nutritional snacks increase to battle the problem of obesity. The majority of dried fruits available on the local market are imported from neighboring countries like South Africa, which possesses a strong infrastructure for producing, processing and exporting dried fruits.

There is strong potential on the export market for indigenous fruit extracts, bolstered by trends favoring organic and natural products. Fruits that can be used as ingredients for food flavorings or cosmetics are beginning to attract more attention. We met with Chris Dohse, director of Tree Crops, a company that produces extracts from Malawian fruits, particularly the pulp and seeds. Lately, their focus has been on baobab fruit. Its pulp has a market in South Africa as a plant extract for food flavoring. Baobab seed oil is particularly suitable for cosmetic end uses such as body creams and milks because of its epidermis softening and restructuring properties. According to PhytoTrade, the total market for indigenous fruit products (in southern African countries) is \$3.4 billion. Baobab represents a market of \$961 million worldwide.

Fruit extracts present an intriguing export opportunity because smallholder handling of the fruit is not a large issue. Seed extraction is relatively straightforward, and the oil can be stored much longer than fresh fruit. Pulp extraction would depend on the fruit. However, if entities like Tree Crops can provide the capital to create facilities to produce the extracted pulp and seeds, smallholder farmers would only need to supply the raw fruit.

Currently, Tree Crops is procuring baobab from smallholder farmers who collect them from trees that often lie on common lands. Tribes or villages typically own these lands. While this is currently not an issue, a new dynamic could develop if baobab fruit becomes more valuable. A secondary concern is the environmental issue associated with indigenous trees. For example, baobab trees are not endangered but there must be a sustainable plan for how they will be propagated and new trees will be planted. Organizations already seem to be on the right track as Tree Crops is establishing Fair Trade standards for its farmers and Village Hands is training farmers on how to collect fruit sustainably, but this is a critical issue if the market for indigenous trees grows.

There is an issue with connecting entrepreneurs that invest in fruit extracts with the international market. There is an organization called PhytoTrade whose overall objective is to enable poor rural communities in southern Africa to generate income through natural product market opportunities.<sup>14</sup> They connect businesses in foreign countries interested in natural products with the production potential in a developing nation. PhytoTrade's approach is to identify and form close relationships with a very small number of potential market partners at the R&D stage.

---

14 PhytoTrade Africa 2004 Annual Report

PhytoTrade's challenge is to invest in products for which there is a demonstrable market demand, and which are suited to small-scale rural production in the region. To attract interest and investment from commercial R&D partners, PhytoTrade generates and analyzes samples from the developing nation's regions, tests them and works on product specifications and quality standards.

PhytoTrade grants memberships to burgeoning entrepreneurs in developing countries. Membership brings the following benefit to supply chain management:

- Identify, develop and disseminate appropriate technologies to members
- Link producers together to achieve required volumes for buyers
- Facilitate and pay for certifications (e.g. organic, fair trade)
- Business services manager to link members to private service providers for business skill development

Finally PhytoTrade links its members with interested foreign entities through a mutually optimal arrangement – exclusivity agreements where the buyers and sellers agree to only conduct business between each other.

Some examples of initiatives promoted by PhytoTrade include exporting baobab pulp to the EU, a baobab cereal bar in the UK, and a study for baobab fruit smoothies in the UK.

PhytoTrade works with businessmen and entrepreneurs, but not the farmer directly. Organizations like ICRAF can assist the entrepreneurs by providing smallholder farmers with the training and expertise for sustainable farming methods. PhytoTrade also hosts centralized training seminars and manuals for its members, presenting a clear opportunity for ICRAF to provide its knowledge competency.

Outside of fruit tree products, ICRAF should not ignore the value of tree nuts in the export market. Malawi exports mostly to Europe and Asia, specializing in macadamia nuts and cashews.<sup>15</sup> Nuts are an attractive near-term focus for exporting because they can be handled and sold without significant processing, thus avoiding the hygiene and storage issues. As mentioned previously, nuts can be consumed or used for household oil extraction and cosmetic manufacturing.

Malawi produces an average of 5 metric tones of macadamia nuts per year.<sup>16</sup> The total area under macadamia cultivation is 2,200 hectares. Macadamias can be produced successfully in areas where avocados, papayas, mangoes and bananas do well.

Moreover, there is a strong infrastructure in place. Nuts are a higher priority for government economic focus than fruit trees. The Tree Nut Authority monitors the production of nuts in Malawi. Bvumbwe Research station is investing in production of improved macadamia clones. SUNESMA is an NGO that is promoting macadamia farming for smallholder farmers in Neno. And perhaps most importantly, there are commercial macadamia nut processors.

---

15 Interview with Thomson Chilanga, Director of Bvumbwe Research Station

16 [http://www.mccci.org/highlights\\_export\\_products.asp](http://www.mccci.org/highlights_export_products.asp)

## FINANCING OPPORTUNITIES

A major issue for farmers is lack of capital. Most farmers do not formally own land that can be used as collateral for a loan from commercial banks. Farmers are therefore left with two sources of capital: a loan from a microfinance institution (MFI) or a grant from an NGO or research institute<sup>17</sup>. The former is subject to strict requirements while the number of grants is limited. We believe that there are opportunities to streamline capital acquisition for farmers.

There are several for-profit MFIs active in Malawi, such as Malawi Rural Finance Company (MRFC), FINCA, FITSE, and Pride Malawi. MRFC is the largest MFI, with total outstanding loans of 2.2B MK. The government supports MFIs by providing them with loans with favourable terms. Under the Poverty Reduction Program, the government lends money to MFIs at 40% of the prevailing bank interest rate. Currently, 1-year interest rates are about 30% for prime and repeat customers and 33% for first-time borrowers. Although MFIs provide loans to individual farmers, they prefer providing loans to farmer groups. Loans to farmer groups better distributes risk because members are usually jointly liable for the group's loan repayment. A farmer must at least satisfy the following conditions to be eligible for a loan:

1. Has not defaulted in the past.
2. Grows a crop with proven commercial viability.
3. Has received pertinent regulatory standards. For processed fruits, for example, a farmer has satisfied Malawi Bureau of Standards.
4. Has access to alternative sources to generate positive cash flows in case of a multiple period loan.
5. Exemplifies the right entrepreneurial spirit.
6. Provides evidence of technical and business skills, or proves that partners have these skills.

After a loan has been approved, the MFI trains and monitors the farmers. Its network of 120 field offices facilitates training across Malawi. Bookkeeping, selection of new members, and guidelines to farming methods are areas covered during training. MRFC's loan recovery rates have been historically tied directly to the success of each year's tobacco harvest. At a certain point the loan recovery rate for MRFC was 83%. Although they are open to fruit farmers as clients, MRFC has not yet done business with these farmers, mostly because none of them have yet requested a loan.<sup>18</sup> Smallholder farmers interested in producing fruit may be unaware of the possibility to take a loan from an MFI. NGOs and research institutes, on the other hand, provide grants to some of the farmer cooperatives they work with. ICRAF, for instance, provided a grant to the School Leavers Association to fund the set up of a fruit processing business. Although there are many NGOs and research institutes active in Malawi, the number of grants is limited.

---

<sup>17</sup> An alternative to MFIs are agricultural seedbanks where NGOs and research institutes fund the setup of seedbanks, which provide farmers with seedlings. The farmers pay off their 'loan' by providing the seedbank with new seedlings.

<sup>18</sup> In our interview, W. Kusani, Director of Operations at MRFC, stated that currently 90% of their portfolio is in tobacco and they would like to reduce that to 50% in the next five years.

Closer cooperation between MFIs and NGOs/research institutes can lead to a lower barrier to capital under better terms for farmers. First, NGOs and research institutes should increase farmers' awareness of MFI loans. Awareness begins with identifying MFIs that offer the best conditions on their loan. Interest rate is just one of the factors that should be considered. Attention should also be focused on other terms of the loan such as collateral requirements. MFIs prefer larger loans to smaller ones (the average loan at MRFC is 50-100 MK), which means that a group of farmers is more likely to obtain a loan than an individual farmer. NGOs and research institutes regularly work with farmer cooperatives and associations; they can thus start discussions with farmers about MFI loans from a business perspective.

Secondly, NGOs and research institutes can train MFI field staff on best practices in growing different fruit tree types. NGOs and research institutes have more in-depth agricultural knowledge while MFIs have an extensive training network in place. Combining these resources should lead to a higher fruit quality and quantity yield and ultimately to a higher loan recovery rate for MFIs (and thus a lower interest rate for farmers). The MFI field staff should be provided with information on best practices and the latest technologies next to training materials that they could use to train the farmers.

Lastly, NGOs and research institutes can act as a guarantor for farmers to get a loan. They can also agree to provide the upfront cash collateral and pay the first interest payment to relieve the farmers from short-term obligations. This is a more effective use of capital than handing out grants. To illustrate this point, suppose that, instead of providing a 100,000 MK grant, an NGO decides to act as a guarantor for a 100,000 MK loan and provides the upfront cash collateral of 15% and the first interest payment of 30%. That means that the NGO foregoes interest on its cash collateral of 15K MK (although these usually bear some interest) and it pays 30,000 MK of interest payment after one year. Instead of providing one grant of 100,000 MK, the NGO now needs fewer resources to help the farmer group<sup>19</sup>. Since the farmers get a loan (with their land as collateral next to the upfront cash) instead of a grant they have more incentives to perform well. This way the farmers are encouraged to act more like entrepreneurs. The NGO should impose strict selection criteria when it assesses for which farmer group it will act as a guarantor. Furthermore the farmers should get extensive training as mentioned before. A well-written study on the pros and cons of an NGO acting as a guarantor is done by Bastiaenen and van Rooij<sup>20</sup>.

If MFIs and NGOs/research institutes work more closely together, the capital infrastructure can be improved. Combining the expertise and funds of NGOs and research institutes with the capital and infrastructure of MFIs leads to a lower cost of capital for farmers. And, more farmers have access to capital. Moreover, a close relationship with MFIs entails a business perspective that can be useful for a research institute such as ICRAF. This approach requires NGOs and research institutes to take a hands-on approach of their research and funds.

---

<sup>19</sup> Note that a reservation should be made.

<sup>20</sup> Guarantee Funds and NGOs: Promise and Pitfalls, Enterprise and Cooperative Development Department International Labour Office Geneva Working Paper, M. Bastiaenen and P. van Rooij.

## NURSERY OPPORTUNITIES

Government nurseries are usually research stations that also provide farmers the opportunity to purchase seedlings. The government typically funds the overhead for the nursery and researchers propagate the seedlings. Farmers can purchase the seedlings at prices of 100-150 MK, arbitrary pricing but targeted to be very affordable. However, most seedlings (~70%) are purchased by NGOs who gave the seedlings to farmers.<sup>21</sup>

Private nurseries are not abundant in Malawi. Based on our interviews, we identified the following reasons:

- 1) Lack of capital. Capital is difficult to acquire in Malawi, which deters small business creation
- 2) Significant government support. In the past, the government had the sole responsibility for dissemination of seeds and other farming materials
- 3) Lack of training. In order to operate a nursery, the person must have agricultural expertise to properly select and propagate seedlings

Private nurseries are beginning to form throughout Malawi, reducing the distances farmers must travel to get seedlings. Nurseries that have little to no competition in respective districts tend to sell out of the seedlings they propagate and their business spreads via word-of-mouth, as well as through government extension workers. It is unclear from our research how much market saturation is a threat. As with government nurseries, NGOs tend to represent most of buying power. Examples of NGOs that purchase significant seedling quantities are Oxfam, World Vision, Concern, Catholic Relief Services, and Catacomb. Smallholder farmers will typically purchase 1-10 fruit tree seedlings while NGOs usually place orders of 10+ seedlings.

We believe that nurseries continue to represent a business opportunity for entrepreneurial Malawians. The capital requirements are high to purchase land, to install water pumps, and to purchase the first year's materials. However, as shown in Table I below, even in conservative scenarios, a nursery can breakeven in 1.5 years. This assumes a significant capital loan, but it also assumes that the nursery has to start from scratch. If access to water already exists, the initial sunk costs drop dramatically. The takeaway: land and labour are relatively inexpensive, so a well-capitalized nursery can succeed in any decently sized market.

Entrepreneurs should seek locations where NGOs are operating and fruit trees will grow. ICRAF has an opportunity to seek out these nursery entrepreneurs and assist them or a supporting NGO in proper propagation techniques.

---

<sup>21</sup> Interview with Professor Shawa at Bvumbwe Research Station.



**Table I:** Conservative Breakeven Scenario for Nurseries**Cost inputs**

Land	13,333	MK/hectare (in Salima)
Fertilizer	50,000	MK/hectare
Seeds	10	MK/seed
Seed viability	50%	
Water	700,000	Per pump and borehole
Materials	10	MK/seedling
Bank loan payments	550,000	Based on 30% interest, 3 years, 1MM MK loan
Labor	350,000	Assumes 5 men/ha at 70000 MK/year

**Revenue inputs**

Price	250	MK/seedling
Capacity	10,000	Seedlings/year using 1 ha

**Based on a 1 hectare nursery**

Revenue	5,000,000	MK/year
Variable Costs	300,000	MK/year
Fixed Costs	950,000	MK/year
Sunk Costs	713,333	MK/year
Profits	230	MK/seedling

Breakeven	7,232	Seedlings
Annual breakeven <sup>22</sup>	4,130	Seedlings
Time to breakeven	1.45	Years, based on farming .5 ha

**MACADAMIA NUT OPPORTUNITIES**

Macadamia nuts are an important cash crop in Malawi. The kernels can be eaten raw or roasted, and the oil can be extracted for cooking and cosmetics. Currently, estates are the primary producers of macadamia nuts in Malawi but smallholder farmers also have an opportunity to earn income from this tree crop. There are two processing plants in Malawi and a vibrant export market that they are already connected to.

The total area in Malawi under macadamia cultivation is 2,200 hectares, which produces an average of 5 metric tons of macadamia nuts per year. Currently the nuts are exported to South Africa and Europe.<sup>23</sup>

<sup>22</sup> Refers to the sales necessary to breakeven in a year considering only variable costs.

<sup>23</sup> [http://www.mccci.org/highlights\\_export\\_products.asp](http://www.mccci.org/highlights_export_products.asp)

The cost per hectare in Malawi is very low. The primary issue in macadamia nut production is the long lead-time from planting to the point when a viable crop is produced. Macadamia nut trees can start bearing a small crop in the fifth year after planting, and full production is reached in 12 to 15 years.<sup>24</sup> Farmers must also maintain quality, but the market exists for the product. The market prospects look bright given the level of potential value added in the production of this commodity.

Due to increasing demand for the product, more foreign investment is being sought to boost the production and processing of the nuts into various marketable products.<sup>25</sup> Foreign investments may lead to harvesting, handling, and processing facilities for smallholder farmers of Kasungu and Mzuzu as well as the development of commercial macadamia estates.<sup>26</sup>

If water is readily available, the investment in macadamia nut trees is very low. As a result, while the long time to payoff may be a difficult sell to farmers, it is a strong opportunity due to the low handling requirements and the known market demand. ICRAF has an opportunity to provide its expertise and training to assist these farmers. We recommend that ICRAF contact SUNESMA to explore opportunities to work together to help smallholder farmers produce improved macadamia trees.

---

<sup>24</sup> [http://www.extento.hawaii.edu/Kbase/crop/crops/i\\_macada.htm](http://www.extento.hawaii.edu/Kbase/crop/crops/i_macada.htm)

<sup>25</sup> [http://www.mccci.org/agricultural\\_sector.asp](http://www.mccci.org/agricultural_sector.asp)

<sup>26</sup> [http://www.mccci.org/agricultural\\_sector.asp](http://www.mccci.org/agricultural_sector.asp)

## OPPORTUNITY BREAKDOWN

In Table II we prioritized the recommendations we give to ICRAF and partner organizations to capture the opportunities we identified.

**Table II:** Prioritization of Recommendations

	ICRAF	NGO's
<b>Smallholder Income Generation and Access to Capital</b>	<p><b>High priority</b></p> <ul style="list-style-type: none"> <li>• Integrate fruit trees into more farming systems – recommend farmers plant a few fruit seeds and diversify their crops - while establishing benchmarks and goals for success</li> <li>• Partner with commercial fruit product enterprises like Dairibord, who may have a pulse on demand for processed fruits</li> <li>• Partner with organizations like PhytoTrade to get a pulse of international demand</li> <li>• Partner with finance institutions to help with agricultural training of their clients</li> </ul> <p><b>Medium priority</b></p> <ul style="list-style-type: none"> <li>• Connect implementers with new technologies and the entrepreneurs who market them (e.g. Kazembe)</li> <li>• After benchmarking consumer demand for fruit and fruit products, keep a pulse on fruit products sold in markets (informal, stores, superstores)</li> <li>• Form relationship with MFIs to keep abreast of what farmers are investing in</li> </ul> <p><b>Low priority</b></p> <ul style="list-style-type: none"> <li>• Monitor technology developments for storage (off the grid cooling systems), drying (solar), and other processing innovations</li> <li>• Act as a guarantor for loans to help support multiple cooperatives</li> </ul>	<p><b>High priority</b></p> <ul style="list-style-type: none"> <li>• Provide seedlings to farmers to plant on their farms</li> <li>• Raise awareness with smallholders of opportunities to supply commercial entities</li> </ul> <p><b>Medium priority</b></p> <ul style="list-style-type: none"> <li>• Connect international businesses with entrepreneurs developing niche fruit product industries</li> <li>• Provide capital to purchase processing equipment <u>along with</u> business expertise to run the processing business</li> <li>• Connect cooperatives with MFI's</li> </ul> <p><b>Low priority</b></p> <ul style="list-style-type: none"> <li>• Build storage facilities</li> <li>• Financial training for cooperatives (how to take a loan)</li> </ul>

	ICRAF	NGO's
<b>Research and Training</b>	<p><b>High priority</b></p> <ul style="list-style-type: none"> <li>• Invest in demand-side analysis to establish benchmarks on current Malawian demand for fruit</li> <li>• Continue to provide research on best species to clone. Maintain relationships with Bvumbwe and nurseries</li> <li>• Investigate tree nut crops, with an emphasis on macadamia nuts – determine how smallholder farmer can produce more easily</li> </ul> <p><b>Medium priority</b></p> <ul style="list-style-type: none"> <li>• Seek out partners with marketing and business expertise (e.g. DEMAT)</li> <li>• Provide best practices for seedling propagation practices to nurseries</li> </ul> <p><b>Low priority</b></p> <ul style="list-style-type: none"> <li>• Establish consistent relationships with government and UN representatives to take advantage of new policies regarding fruit nutrition</li> <li>• Provide government with research on importance of fruit nutrition. Find better ways to provide information to extension workers. Find ways to participate and provide support at government nursery “field days”.</li> <li>• Perform more research on ways to utilize “wasted fruit”</li> </ul>	<p><b>High priority</b></p> <ul style="list-style-type: none"> <li>• Provide business expertise (PhytoTrade, Technoserve, DEMAT)</li> <li>• Actively promote and assist in the formation of cooperatives</li> </ul>

## BUSINESS GUIDE

In this section we provide a guide that details which actions farmers should undertake if they want to take the growing of fruit trees beyond their own consumption. Note that the guide is written with the purpose of giving ICRAF and partner organizations a better understanding of the business aspects and forces that farmers face. Based on this guide ICRAF and partner organizations are able to assist entrepreneurial farmers.

## Creation of Farmer Cooperatives

Farmer cooperatives are membership-based organizations in which individual farmers come together to pool products and resources. The following guidelines for how to form a cooperative assume that organizations such as ICRAF will lead the organization of such cooperatives or work closely with organizing leaders from the farming community. While the formation of cooperatives should be the initiative of the farming community, we believe entities that bring “business” expertise to the group are key to the formation of a self-sustaining entity. Some of the recommendations are admittedly from the perspective of a more advanced economy, but can nonetheless be adapted to the Malawian marketplace. It is also important to note that the guidelines represent ideal scenarios.

The greatest benefit of membership in a cooperative is the gain from leveraging economies of scale in production, buyer negotiation, and information dissemination and education. As mentioned previously, capital requirements are important barriers to entry for many individual farmers interested in crop diversification and fruit processing. Cooperatives, on the other hand, can pool resources and purchase equipment that members can access. For example, a cooperative with 20 farming members could purchase one or two juice processing machines and allocate utilization to each member. Each member therefore has access to the juice and juice concentrate market, which would have been unlikely on an individual basis.

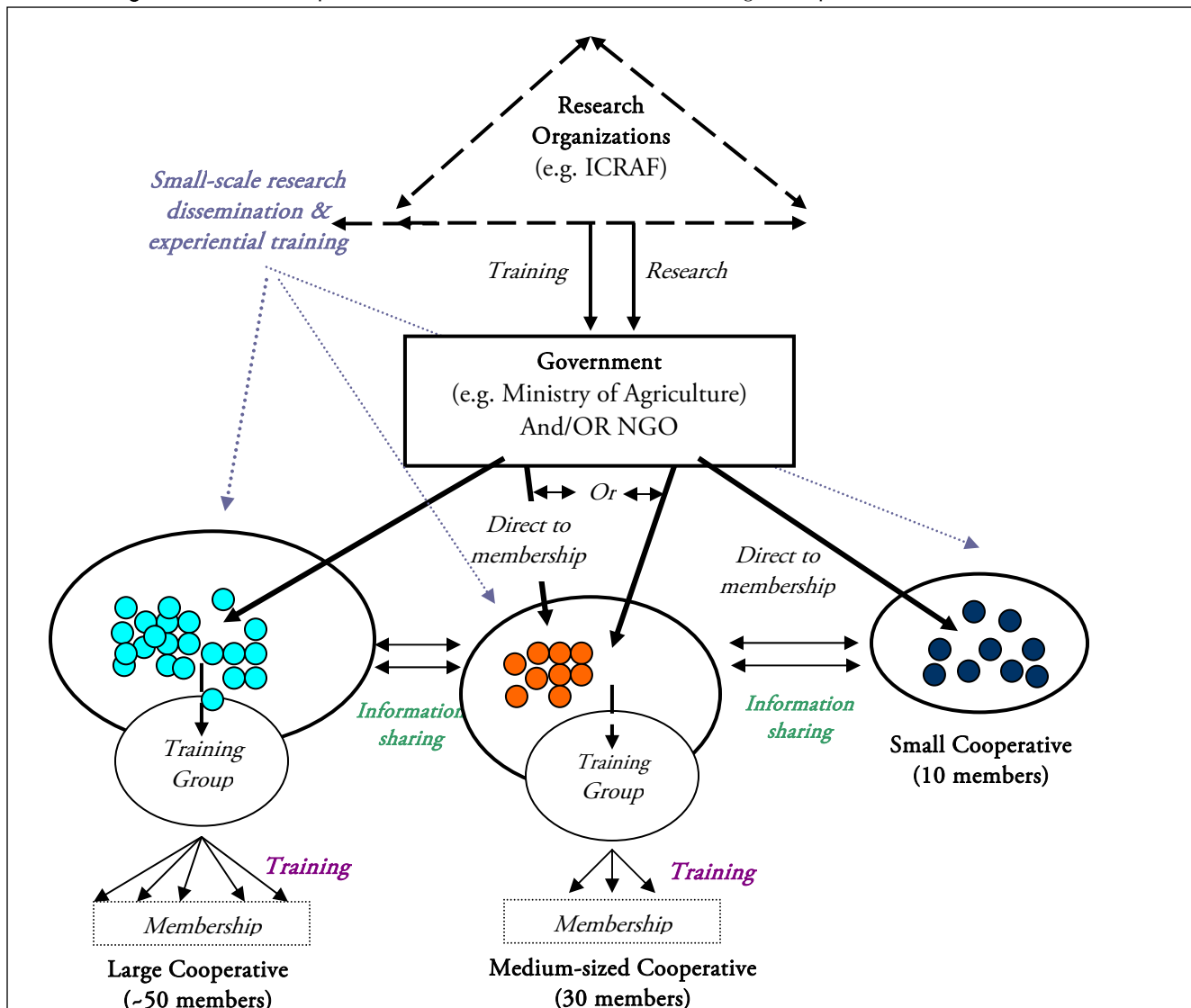
Another benefit of cooperative membership is access to progressive, innovative farming technologies and techniques. Given resource constraints of organizations like ICRAF or the Malawian government, it is more practical and effective to work through larger farmer associations than seeking to assist individual farmers. Land fertility and sustainable farming are important issues in Malawi, and much research has been performed by organizations like ICRAF on sustainable farming practices and techniques to improve soil fertility. It is difficult to disseminate research to individual farmers, particularly those that live in rural areas of the country (most smallholder farmers are located in rural areas).<sup>27</sup> Cooperatives therefore can offer even greater value to rural smallholder farmers.

Access to training and education is another significant value of cooperative membership. As more valuable research is generated and greater focus is placed on farmer education and training, it will become more difficult to reach out and “touch” individual farmers. With larger cooperatives, the concept of “train the trainer” can be maximally leveraged to reach a greater number of farmers. Entities such as ICRAF or the Malawian Ministry of Agriculture can educate and train the appropriate group at cooperatives, who would then be responsible for training and educating individual farmers. The pictogram below (Diagram I) gives one example of how the information flow to cooperatives could be organized. The intent of the pictogram is to describe one particular option and not to suggest the perfect situation.

---

<sup>27</sup> Akinnifesi, Festus. World Agroforestry Centre.

**Diagram I:** Idealized depiction of information dissemination & training to cooperatives



Another potential value of cooperatives is the ability to more effectively negotiate pricing and contract terms with buyers such as supermarkets and juice manufacturers. However, most farmers in Malawi currently do not participate in cooperatives and so fresh fruit and juice concentrate buyers hold the power in the marketplace. Therefore the benefit of increased negotiation power escapes most farmers. Currently, even farmers that belong to cooperatives do not have much market power because so few cooperatives exist and those that do are smaller and do not produce high enough quantities of the products buyers seek most. As more and larger cooperatives are formed, decreased numbers of producers with higher productivity will lead to increased farmer/cooperative power and leverage. This benefit is not currently realized, however, and will take some years to come to fruition.

There are several important areas to consider when forming a farmer cooperative, including:

- Leadership organization
- Strategic objectives (near- and long-term)
- Business plan analysis

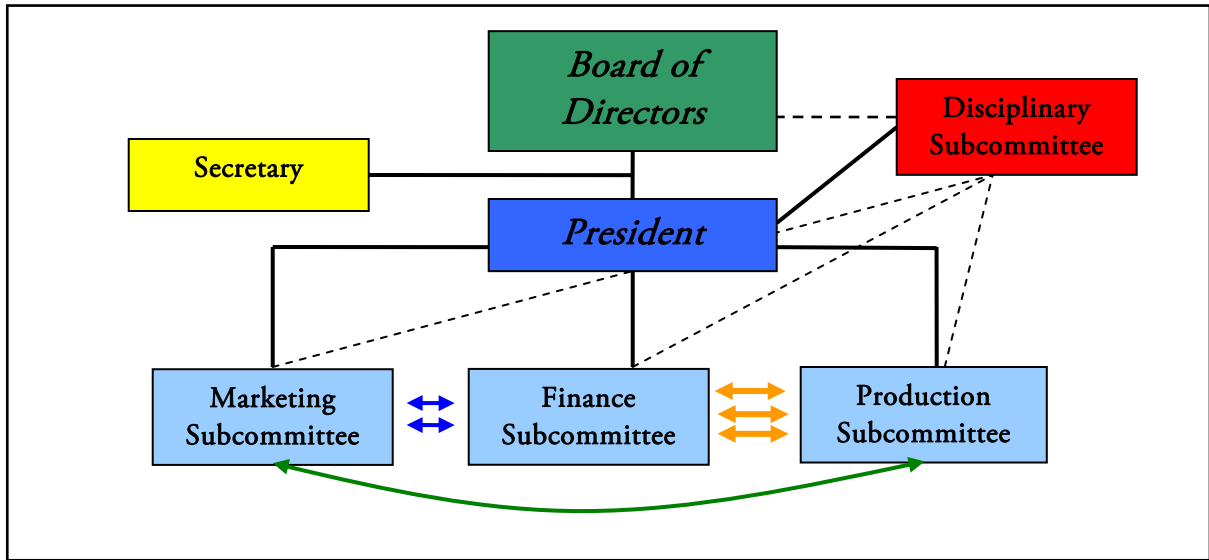
## Leadership Organization

Given the structure, capital, and educational barriers to achieving financial success in farming, selection of a capable, experienced, and visionary leadership team is crucial to the long-term success of a cooperative. At the highest management level is the board of directors, the group that establishes short and long-term strategic objectives and oversees production, marketing, financial operations, and interacts closely with external stakeholders. Some selected as board members would ideally be farmers that have experienced some degree of success in their personal farming operations. They would also be literate and have some awareness or knowledge of basic business concepts such as marketing, accounting, finance, and operations. Private sector entrepreneurs who have an interest in sustainable farming would be extremely valuable to the board. Since a business skill set will be very difficult to find among Malawian smallholder farmers, private sector members could be instrumental in establishing basic business concepts. The board members should also be visionary leaders who can work in teams and think strategically about the direction of the cooperative.

It is also worthwhile to examine what stakeholders should be included on the board of directors. Membership should be influenced by the near and long-term objectives of the organization. For example, if the cooperative intends to supply products to juice manufactures (such as Dairibord), leadership might consider whether to add a Dairibord representative to the board. If the cooperative intends to work closely with NGOs or research organizations such as ICRAF, it might also consider whether to add an ICRAF representative to the board.

The leadership team should also be broken into areas of expertise to more effectively deal with various aspects of the group's operations. These groups are commonly termed "subcommittees" and generally include members that have experience, expertise, or interest in a specific function within the organization. Common subcommittees include marketing, production/operations, and finance. Subcommittees report directly to the president of the cooperative and the board of directors. Diagram II below depicts an idealized management structure, and Table III describes sample major responsibilities of and relationships between subcommittees.

**Diagram II:** Idealized structure of farming cooperative management team



**Table III:** Sample description of management team value and responsibilities

<u><b>Board of Directors</b></u>	<u><b>President</b></u>	<u><b>Disciplinary Subcommittee</b></u>
<p>Value</p> <ul style="list-style-type: none"> <li>• Strategic thinking</li> <li>• Expertise in accounting, finance, marketing</li> <li>• Experience in successful farming operations</li> </ul>	<p>Value</p> <ul style="list-style-type: none"> <li>• Strategic thinking</li> <li>• Leadership ability</li> <li>• Experience in successful farming operations</li> <li>• Business acumen</li> </ul>	<p>Value</p> <ul style="list-style-type: none"> <li>• Includes chairs of each subcommittee and President</li> <li>• Enforcement of processes and protocol</li> </ul>
<p>Roles</p> <ul style="list-style-type: none"> <li>• Strategic guidance</li> <li>• Oversees President's performance</li> <li>• Goal-setting</li> <li>• Business development</li> <li>• Market assessment</li> </ul>	<p>Roles</p> <ul style="list-style-type: none"> <li>• Interface with external stakeholders</li> <li>• Fundraising</li> <li>• Sustainable &amp; profitable business activities</li> <li>• Increasing market power and market share</li> </ul>	<p>Roles</p> <ul style="list-style-type: none"> <li>• Ensure ethical business practices</li> <li>• Ensure member compliance with organization goals</li> <li>• Enforce quality and production standards</li> </ul>
<p>Works directly with</p> <ul style="list-style-type: none"> <li>• President</li> </ul>	<p>Works directly with</p> <ul style="list-style-type: none"> <li>• Board and subcommittees</li> </ul>	<p>Works closely with</p> <ul style="list-style-type: none"> <li>• President and chairs of subcommittees</li> </ul>



<u>Marketing Subcommittee</u>	<u>Finance Subcommittee</u>	<u>Production Subcommittee</u>
Value <ul style="list-style-type: none"> <li>• Creative and innovative mindset</li> </ul>	Value <ul style="list-style-type: none"> <li>• Accounting and financing expertise</li> </ul>	Value <ul style="list-style-type: none"> <li>• Operations &amp; production expertise</li> </ul>
Roles <ul style="list-style-type: none"> <li>• Differentiate product from competition</li> <li>• Determine what products marketplace wants</li> <li>• Determine product packing and labeling</li> </ul>	Roles <ul style="list-style-type: none"> <li>• Leads pro-forma budget estimations</li> <li>• Allocates financial resources</li> <li>• Closely monitors financial health of organization</li> <li>• Suggests solutions to financial problems</li> </ul>	Roles <ul style="list-style-type: none"> <li>• Continuous quality improvement in production chain</li> <li>• Seeks more efficient production methods and technologies</li> <li>• Monitors capacity and quality and suggests solutions to operational problems</li> </ul>
Works closely with <ul style="list-style-type: none"> <li>• Finance to assess marketing resources</li> <li>• President to create effectively marketing strategies</li> </ul>	Works closely with <ul style="list-style-type: none"> <li>• Marketing to assess marketing strategies</li> <li>• President to communicate financial status</li> <li>• President to create financial goals</li> </ul>	Works closely with <ul style="list-style-type: none"> <li>• President to communicate production updates &amp; issues</li> <li>• Finance to assess resources required to meet production goals</li> <li>• Finance to ensure projects stay within budget</li> </ul>

### Strategic Objectives

As the cooperative is formed, leadership should make clear the organization's short and long-term goals. The strategic plan should include what products the cooperative intends to produce as well as estimated production levels. The strategic plan should also include which markets the organization intends to enter, be it local, regional, or international markets. An important section to include is one that focuses on short-term goals (1- 3 years) and longer-term goals (3- 5 years). The strategic plan is the basis of the business plan, so care should be taken to develop a robust and compelling set of organizational goals and objectives.

Importantly, leadership should have a plan that lays out the steps it will take to meet any regulatory issues applicable to its growth objectives, such as how it will meet production standards of the Malawi Bureau of Standards. A plan to meet these standards is particularly important if the cooperative intends to sell products to supermarkets or if it plans to sell to markets in the international marketplace. Clear and supported strategic objectives are critical if the cooperative intends to seek either loans from banks or microfinance institutions or seed funding from the government or NGOs.

## **Business Plan Analysis**

A compelling business plan is one that provides sufficient evidence that, given the cooperative's strategic plan, it can be profitable in the near term. This is particularly important if the cooperative will seek external sources of financing in the form of either grants or loans. A proper business case will include projected costs and revenues by product line. The ideal business case will also include a break-even analysis and net present value (NPV) calculation. The ultimate goal of the business case is to provide evidence of profitability or, at least, evidence of self-sustainability without continuous external financial support dependence.

## **Opportunities for Training**

Our recommendations on where to focus education and training for farmers are based on areas we believe will have the greatest impact on farmers' ability to increase fruit yield and quality. We focus on three areas for the most opportunistic training options:

- 1) Basic business skills
- 2) Technical knowledge
- 3) Innovative soil maintenance technologies.

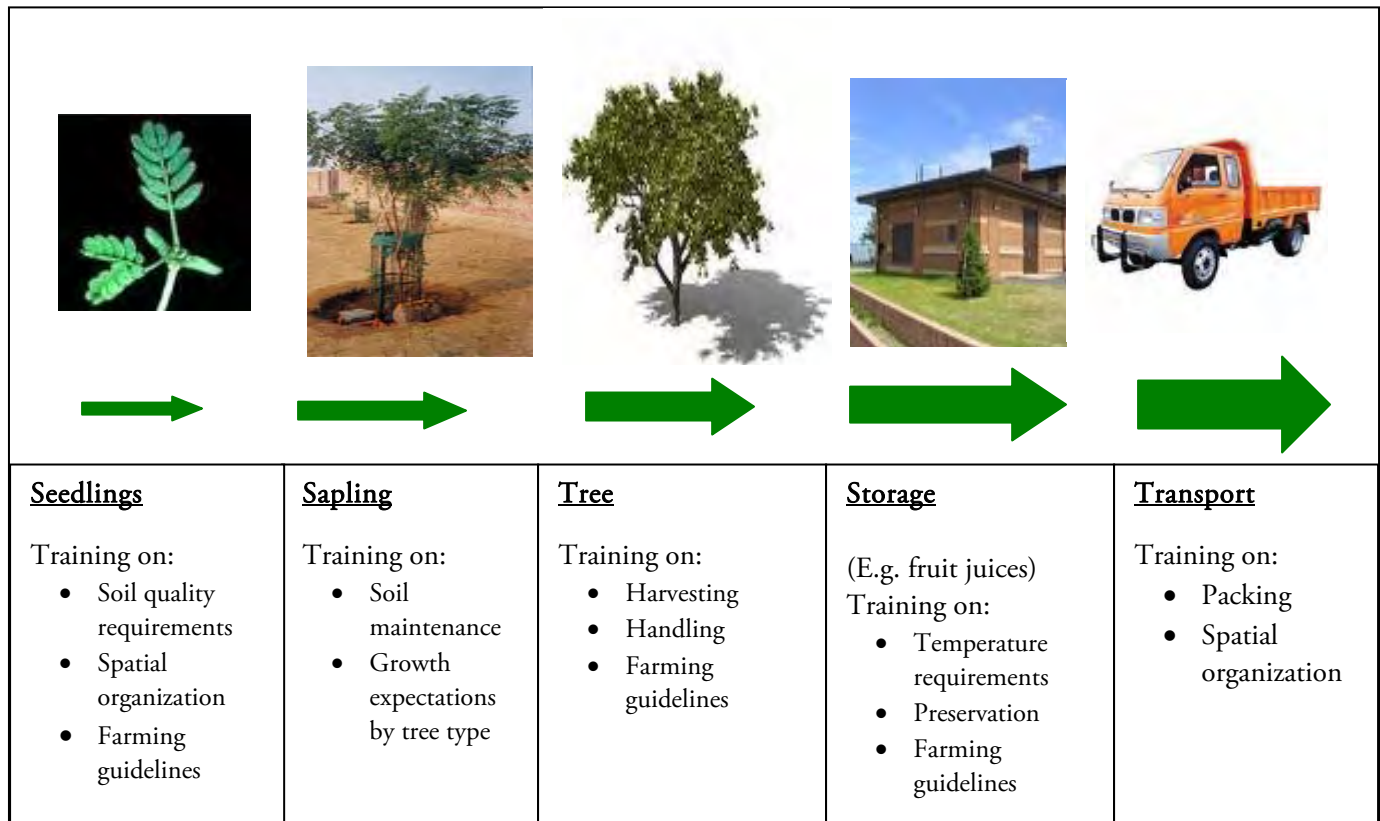
### *Basic business skills*

A fundamental knowledge of basic accounting, finance, and marketing concepts can significantly increase farmers' ability to competitively and profitably compete in the marketplace. The ability to estimate and measure costs and revenues is a simple skill that farmers can leverage to assess the profitability of their farming practices. Marketing skills will facilitate farmers' ability to think strategically about the products they offer and how to differentiate their products from competition. Basic business skills training will likely be most effective and far-reaching when done at the cooperative level. This way the "train the trainer" method can be a powerful information dissemination mechanism. Training for sole proprietorship farmers who are not members of cooperatives should also be done when feasible. Given resource constraints, an "on demand" policy could be implemented where a farmer must actively seek training to receive it. This would be the most fruitful use of teaching resources, as farmers that actively seek education will likely be those most likely to use the knowledge and thus benefit most from the education.

### *Technical knowledge*

Technical training could include proper planting techniques, optimal farming practice guidelines, sustainable harvesting methods, and effective storage and transport protocols. The goal of technical training is to provide farmers with sufficient knowledge to care for a diversified set of crops, from planting of seedlings to harvesting to transporting products to buyers or the marketplace. Diagram III below depicts technical knowledge training options for different stages of a fruit's lifecycle.

**Diagram III:** Training options for different stages of fruit product lifecycle



### *Innovative soil maintenance technologies*

Closely related to technical training is information dissemination of innovative methods to improve soil fertility. Soil fertility issues are particularly important in Malawi, where many smallholders have expanded their cultivation to marginal, less fertile soils, often on hill slopes that are not suitable for intensive cultivation, leading to woodland depletion, soil degradation, and erosion. Use of fertilizer trees, legumes, etc. increases soil fertility over time and results in higher yielding fruit trees with higher quality fruit. Basic business skills education, combined with technical and innovative soil maintenance technologies education, can significantly increase farming prosperity.

### **Obtaining and Managing a Loan**

In order for fruit production to add significantly to farmer incomes, farmers must be willing and able to increase fruit production beyond their own consumption. They may need to buy seeds, processing tools, and transportation vehicles, among other things. There are few farmers that have successfully increased production enough to significantly raise personal income. A major obstacle is the high start-up capital required to begin the enterprise. Instead, farmers may prefer to grow more fruit trees on a more gradual basis. We discussed before how NGOs, research institutes and MFIs could work together to improve the capital acquisition environment that currently exists in Malawi. From a farmer's perspective, it is important to know when to obtain new capital, how much is needed, and how to manage associated obligations. On the surface, it is reasonable to assume that there is no reason for an organization such as ICRAF to be involved at this stage. However, ICRAF can indeed

provide valuable input at this stage of the process. ICRAF would obviously need to understand the range of issues involved with assuming a loan.

In the following recommendations, we focus on financing through loans, and not on financing through grants. As a first step, the farmer group could attempt to self-finance. For most growth strategies, however, this will not be sufficient and a loan will be required. The next step, therefore, is to assess how much capital is required.

There are two major steps the cooperative should go through to obtain a loan. The first step is to perform, a simple return on investment analysis. The analysis should determine what the current income of the group is and how much it will grow if an investment is made (e.g. investing in a processing tool). That means the group will need to make earnings projections. This is where NGOs with a focus on business training like DEMAT could assist farmers. Together, DEMAT and the farmers can estimate future earnings based on variables such as the number of trees and current prices. The second step would be to understand worst-case scenarios. One question could be: can interest payments still be made when the country experiences two years of drought? Eventually the group should have an understanding of how much it should borrow and what the risks are. This analysis is important as it could lead to the conclusion that the group should not or cannot pursue a loan after all.

When the loan is in place, the group should have a centralized location for recording all financial activity. One person should be appointed as bookkeeper and, ideally, a separate person would be appointed as auditor. They should at all times be aware of income generated, accumulative costs, and loan outstanding. Any excess profit after interest payment and distribution to members should either be reinvested, used to accelerate loan repayment, or put into a savings account as a buffer.

In order to reduce default risk, the cooperative should diversify the crops they grow. For example, one farmer can grow mangos while another farmer grows Ziziphus, which is known to be drought-resistant. Diversifying spreads risks across tree types and reduces output and income volatility<sup>28</sup>. One role for ICRAF is to do further research in areas such as the Family Tree Enterprise Portfolio. Information from this research could better inform farmers which tree types to grow to maximize income stability throughout the year. The optimal portfolio of crops can be different for different farmer groups based on local climate, type of soil, etc.

Taking on a loan is not something we recommend all farmer groups to do. Farmer groups should first gain basic business knowledge and understand how to manage risks well. That means there is an important role for NGOs that focus on business training like DEMAT, but also for research institutes such as ICRAF.

---

<sup>28</sup> It also helps reducing the effect of deceases.

## Business Development

Once a farmer group is operational, it should seek further business development. It is important for the farmer group to understand what constrains the throughput. Once this constraint is identified, it should undertake actions to increase throughput.

### *Throughput constrained by supply*

When supply needs to be increased, one solution is to accept new farmers into the cooperative. These new members should already grow the same crop. Another solution is to increase production efficiency, although this requires more time and likely more resources. Improved operational efficiency could be obtained through use of improved trees, which grow more fruits in a shorter time period or through the use of new harvesting techniques. Most importantly, the farmer group should understand its options when capacity is supply-constrained.

### *Throughput constrained by demand*

If demand is lagging production, the farmer group could decide to produce less. However, the marginal costs (costs incurred per unit produced) are usually relatively small so the group should attempt to seek new demand channels, such as initiating communications with large buyers such as Dairibord. It could also look for markets further away from the home village to see if there is unmet demand elsewhere. Alternatively the group can start processing the fruits so that it taps into a different market altogether, although there could be significant costs associated with this. The farmers should realize surplus product is not wastage, and should proactively seek for other ways to sell.

## RECOMMENDATIONS

We believe niche opportunities exist to process indigenous fruits and that there is potential for import substitution of fruit juice concentrates. Our findings are primarily based on interviews with fruit experts based in Malawi. Because we conducted a small group of qualitative interviews, it is potentially biased and we recommend a more in depth demand study be performed. This study may also uncover latent demand for fresh fruits in Malawi, but we did not observe this demand through our interviews. In the remainder of this section we have grouped are recommendations.

### *New research on:*

- Selection of the best species and clones for processing – e.g. which mangoes produce best juice or jam, or finding a baobab selection that produces better pulp
- Crop diversification for risk management – economic research into how to balance risk across a single farm or a cooperative
- Demand side consumption – to understand if there is latent demand or if there are factors (such as nutritional education) that could drive increased demand (see Appendix F)

### *Training partnerships with:*

- Microfinance institutions – to train field officers that train potential farmers so that it is easier for them to get loans
- Government extension workers – greater alignment with and training of extension workers on fruit tree farming
- Commercial entities and organizations (e.g. PhytoTrade) – to have a pulse on that part of the economy
- Nurseries – provide more research on clone selection for selected species

### *Get more active by:*

- Working with microfinance institutions to financially back potential borrowers so that it is easier for them to get loans
- Getting started slowly with farmers – aim to have many farmers plant 5-10 trees that will produce fruit in 3-5 years – but still prioritize diversification by offering different fruit seedlings
- “Pushing” more of the ICRAF research to NGOs that might not read journals or attend conferences
- Doing projects with a small number of cooperatives that can be used to teach other groups and to spread word-of-mouth

## APPENDIX A

### PRIORITIZED FRUIT LANDSCAPE

#### Indigenous Fruits

*Baobab (Andansonia digitata)*. Baobab fruit has great potential in both the domestic and international markets. In 1998, an ICRAF survey found that baobab was not listed as a top 10 priority indigenous fruit for domestication in the region of Malawi, Tanzania, Zambia and Zimbabwe. However, by 2003, baobab was deemed a priority fruit at the Magomero workshop hosted by ICRAF.

Baobab is a Rift Valley fruit that grows extensively in hot areas. It grows particularly well in the Shire Valley where temperatures are higher and a low water table provides easy access to water. Baobab's prime harvest season is from November to January, but it fruits as late as May. Baobab trees are large, majestic trees that normally take over twenty years to begin bearing fruit. Improved trees, however, are able to produce fruit within six years. There is no distinguishable threat from disease, but improper cutting and harvesting methods limit the quality of fruit produced by the trees. The Wildlife Society is currently active in encouraging farmers to replant baobab trees in areas where improper harvesting methods were used.<sup>29</sup>

While Baobab is sold as a fresh fruit, the majority of its commercial value lies within its pulp and seeds. As a fresh fruit, baobab can be sold as low as 15 MK per fruit. The fruit is versatile, as the pulp can be processed with water to create juices, jams and wines, while the raw form can act as a natural food flavoring. Baobab seed oil has a high interest in the export market as an ingredient in natural and organic cosmetics.

Several farmer cooperatives produce Baobab juice and wine, including Village Hands Limited, Magomero Women's group and the Association of School Leavers from Southern Malawi and the Ngolowindo Cooperative in Central Malawi. Village Hands Malambe juice managed to achieve small retail penetration. Tree Crops, an exporter of fruit extracts, is heavily invested in baobab for its pulp and seeds.

Baobab has high potential as an export and as a smallholder farmer crop. If properly grown and harvested, Baobab trees can live for hundreds of years and consistently provide quality fruit. The fruit can last as long as 6 months in storage after harvest. The main issue lies with extracting the seeds without contaminating with pulp, which diminishing market value. Seed oil purification in particular is expensive and complicated to process.

*Ziziphus Mauritiana (Masawo, Masau)*. Ziziphus fruit trees begin producing fruit within three years, flowering in the winter months; it is most prevalent in southern Malawi's dry, warm environment.<sup>30</sup> Ziziphus grows in neighbouring countries like Zambia, Zimbabwe, and Mozambique, but not in South Africa. According to one study, there is immense potential for the domestication and

---

<sup>29</sup> Daolus Mauambeta, Director of Wildlife Society Malawi, Interview, 2007

<sup>30</sup> Ham et al, 2006

commercialization of ziziphus.<sup>31</sup> It has the potential to contribute significantly to household food security and income. However, like other fruits ziziphus has an inefficient market process. For example, a large proportion of ziziphus sold in Lilongwe came from Mangochi (240 km away) instead of the much closer Salima area.

Ziziphus has many advantages for smallholder farmers. First, it is one of the few fruits in Malawi that is harvested from June and August. Second, it grows in areas where other fruits do not flourish, even in areas where there is drought or waterlogging. Third, it is nutritious with a high proportion of vitamin C. Last, its leaves can be used as fodder for livestock and its wood for high quality charcoal. This positions Ziziphus well in terms of food security.

In Zimbabwe, collectors and traders of ziziphus have been able to capture better prices for their fruits by cleaning and packaging the fruit in plastic bags.<sup>32</sup> Ziziphus can also be processed into dried Masau slices, jam, and juice.

As ziziphus is originally a low yielding tree, more research can be done to produce improved varieties. ICRAF has already done research on improvements for Ziziphus and is a knowledgeable partner for any entity that intends to focus on this fruit.

*Uapaca kirkiana*. Uapaca grows throughout Malawi, and is one of the country's most widely traded indigenous fruits. It is harvested from October and January and grows throughout Southern Africa. Uapaca trees on average yield 2000 fruits per tree. This equates to an average yield of 50 kilograms of fruit per tree per fruiting season. The pulp is fleshy, sweet, and eaten raw and generally surrounds 3 to 4 seeds. It grows most extensively in deciduous woodlands, upland wooded grasslands and along streams, often on stony soils or rocky slopes. Besides consumption as a fresh fruit, several processed products are made from uapaca, including jam and wine. Juice can also be extracted by squeezing the fruits in water or by using more sophisticated juicer machines. Important considerations with uapaca fruit is its relatively high water requirements and the short shelf-life of harvested ripe fruit, which is around 3- 4 days.<sup>33</sup>

### Uapaca fruit



---

<sup>31</sup> Kaaria, 1998 [full title]

<sup>32</sup> Kaaria, 1998 [full title]

<sup>33</sup> Kadzere, Irene. Dissertation: Pre- and Post- Harvest Factors Influencing the Quality of Uapaca Kirkiana Fruit, 2006.



## Exotic Fruits

*Mango.* Mango is one of the most consumed exotic fruits in Malawi. It grows throughout the country, although the quality is generally highest in the northern and southern regions. The areas of Machingo, Mangochi (near Lake Malawi), and Chikwawa (southwest of Blantyre) produced the highest volumes of mango fruit. Mango trees have a relatively high water requirement and only bear fruit during the summer, rainy season, which occurs from October through February. When mangoes are in season, they are widely available for purchase in markets and for free by individual picking, which drives down prices.

Mango is a high priority fruit because of its historic importance to the Malawian marketplace and its potential for income generation even when out of season. This requires proper storage, preservation and handling, which can be expensive. Fresh mango and mango-derived processed products have potential market opportunities, especially internationally. The volume of mango grown in Malawi each year is very high, which allows for easy fulfillment of the domestic demand for fresh mango. Up to 60% of harvested mango is wasted due to the seasonality effect, poor transportation and storage infrastructure within Malawi. Because of the large volume of mango available during the fruiting season, there is also potential to process mango into products for sale post its fruiting season, such as juice, juice concentrates, or dried fruit. Improved mango trees are important to reduce the amount of fibrous versions that make it difficult to market. Less fibrous versions are more amenable to processed fruit production. Important considerations for mango are its short fruiting season and fragility once harvested.

*Citrus.* Citrus fruits grow well in Malawi, particularly in the southern region in locales such as Mwanza. Tangerines and oranges were frequently cited as having strong market potential in Malawi, along with mangos and bananas. There is a significant opportunity for locally produced orange and tangerine concentrate. All of the major commercial fruit juice producers in Malawi import the vast majority of its concentrate from neighboring countries such as South Africa. Dairibord, a Malawian juice manufacturer, expressed the desire to produce concentrate from locally sourced fruits over the next two to three years. Like mango, there is significant opportunity for locally produced citrus concentrate, particularly with oranges and tangerines. Demand is unclear for dried oranges, tangerines, limes or other major citrus fruits.

Citrus fruits are seasonal, growing from April to October. Citrus fruits are consumed predominantly in fresh form or as a juice. Citrus fruits require much less water than most fruits and grow well in the drier, warm regions of Malawi, allowing for easier scaling of planting and harvesting throughout the country. This also presents an advantage in rotation by region allowing for increased domestic supply for a longer period of time. For example, citrus fruits planted in the southern regions will bear fruit before northern regions. Therefore, with proper infrastructure, it would be possible to supply the domestic market for a longer period of time by procuring output from the south first and moving north.

There is potential for improved citrus trees to increase yield, size and variety. Grafting is often used so citrus trees produce fruits within two years of obtaining the seedling, versus six years for ungrafted

seedlings. This allows for faster fruit production versus most other tree fruits.<sup>34</sup> Citrus fruits face a threat in disease, mostly from the wooly white fruit fly. The fly's excrement causes a significant decrease in fruit quality and could damage 60% of citrus trees.<sup>35</sup> The main remedy is spraying the trees with pesticide, which is expensive, costing up to 1000 MK per liter.

*Bananas.* Bananas are mainly produced in the southern part of Malawi (Thyolo region), but they can grow and be harvested throughout the year in most areas where adequate water is available. Banana trees can survive far away from a water source, but they flower and fruit based on availability of water.



Banana Fruit Nursery

Bananas represent an interesting market because local demand already exists. We hypothesize that this demand is driven by regular availability and relatively low prices. Banana is a widely traded fruit at the local fresh markets in Malawi, and is currently imported (alongside mangos) to address seasonal supply issues, so there is an opportunity for import substitution. Especially in northern parts of Malawi, there is potentially high local demand without local supply to meet it. Bananas also represent a good opportunity because grafting is not required to successfully propagate seedlings. Seedlings can be produced by taking cuttings from a successful plant.

Farmer cooperatives have come together to transport bananas to markets in urban areas where they can capture higher prices.<sup>36</sup> There is also high variation in pricing based on geography and regional supply. The prices from farmers to vendors varied from 10 MK to 100 MK per kilogram. In May, it appears that pricing in urban markets is close to 25 MK per kilogram. This usually amounts to 2 MK per banana.

Bananas are susceptible to disease, most notably the banana bunchy top virus, BBTV, a virus spread from plant to plant by aphids. It causes stunting of the leaves resulting in a "bunched" appearance. Generally, a banana plant infected with the virus will not produce fruit. This blight has ravaged

---

<sup>34</sup> Mr. Shawa, US Compass Project, Interview, 2007

<sup>35</sup> Thomson Chilanga interview, 2007

<sup>36</sup> From government pricing report observed at Salima. Dated 11 April 2007.

Nkhotakota to the point where almost all of the trees are infected. The government would like all farmers to chop down their banana trees and then to re-plant in two years, but this is a difficult program to enforce. The responsibility for encouraging farmers to accept this idea belongs to extension workers.

Compared to the other top opportunities, banana juice does not have as much market potential. However, it is possible to dry them or to make banana chips. There is currently a tea estate in Zowa that is partially drying and packaging sliced bananas.

#### Macadamia Nuts

Macadamia is an important cash crop in Malawi; the country remains among the top 10 worldwide producers of macadamias.<sup>37</sup> Until five years ago, the government controlled growth and export of macadamia nuts by restricting production to estate farms. Macadamia nuts capture high value, can be sold without significant processing, and do not require the same hygienic standards required for value-added processing of fruits.

Macadamia nut trees bear fruit as early as the fifth year after planting, and full production is reached in 12 to 15 years.<sup>38</sup> Malawi produces an average of 5 metric tones of macadamia nuts per year.<sup>39</sup> The total area under macadamia cultivation is 2,200 hectares. Macadamias can be produced successfully in areas where avocados, papayas, mangoes and bananas do well. A constant and significant amount of water is needed to grow macadamia nuts. Smallholder farmers in Neno, Kasungu, and Mzuzu cultivate macadamia nut trees.<sup>40</sup> The nuts can be harvested from October to April.

Almost all macadamia nuts are exported to Asian and European markets because they capture higher prices as an export crop. In terms of processing, the nuts have a variety of uses, ranging from usage in confectionery products, eaten raw or roasted as dessert nuts. They are also used for household oil extraction and cosmetics.

A more developed export infrastructure exists for macadamia nuts than for fruits, likely because of existing private businesses; many Malawian estate farms such as Naming'omba Estate grow macadamia nuts for export. The Tree Nut Authority of Malawi oversees tree nut crops. Additionally, Bvumbwe Research Station is currently working on identifying the best clones for the Malawi climate, procuring seeds and clones from Hawaii (USA). An NGO, SUNESMA, is an organization that is teaching nut grafting to farmers and offering seedlings that produce nuts in three years (vs. seven years for non-improved seedlings). Finally, there are two privately-owned processing plants and the government is encouraging additional investment in post-harvest businesses.

---

37 Thompson Chilanga interview

38 [http://www.extento.hawaii.edu/Kbase/crop/crops/i\\_macada.htm](http://www.extento.hawaii.edu/Kbase/crop/crops/i_macada.htm)

39 [http://www.mccci.org/highlights\\_export\\_products.asp](http://www.mccci.org/highlights_export_products.asp)

40 [http://www.mccci.org/agricultural\\_sector.asp](http://www.mccci.org/agricultural_sector.asp)

## **APPENDIX B**

### **SUPPLY CHAIN ANALYSIS**

The purchase of seedlings from nurseries offers two primary benefits to farmers. First, very few smallholder farmers are trained in seedling propagation and second, nurseries often provide “improved” seedlings that bear fruit earlier and are resistant to disease.

#### **Agriculture**

Seedlings are available at government-operated nurseries (e.g. Bvumbwe, Chitedze) or at private nurseries. Once a farmer has acquired a seedling, he usually must wait 3-7 years for the tree to produce fruit. Trees such as bananas require water to flower, but other fruits will bear fruit without addition of water.

In our research, we learned that the majority of fruit, between 60- 90%, in Malawi is “wasted.” This wastage is driven by the combination of short fruiting seasons and the inability to match supply with demand during this period. Fruits are perishable and processing is required to prolong their “shelf-life”. If processing opportunities existed, farmers would need to be educated on the importance of consistent quality and as well as when to harvest. There are also many indigenous fruit trees in the wild from which fruit could be harvested. The main issue at this point in the supply chain is education on:

- Which fruit trees to plant
- The benefits of fruit trees – nutritional, income-producing, and shade
- Potential fruit pests and diseases

#### **Fresh Fruit**

Once harvested, fresh fruit must be taken to market to sale. An individual smallholder farmer’s fruit is usually transported by manpower (carrying, wheelbarrows, and bicycles) to the main road, where a consumer, vendor, or middleman can purchase the fruit. A vendor or middleman then transports the fruit to a market where they sell the fruit themselves or sell to another vendor. The number of middlemen involved in transport to markets is related to a farmer’s distance from markets. It is unlikely an individual farmer will travel far because of lack of transport vehicles, travel cost, or competing farming priorities at home.

Most markets are informal, ranging from individuals selling roadside to many sellers congregating to offer a variety of produce and other agricultural products. The markets in larger cities such as Lilongwe and Blantyre are similar to the markets in market towns like Balaka, Dedza, or Ncheu, but simply larger with more vendors for each product.

#### **Processed Fruits**

Processed fruit products include juices, jams, dried fruits, and wines. In our market assessment, we learned that there are many juice producers, but the large commercial enterprises import their

concentrate from primarily South Africa. Smaller juice processors generally struggle to remain commercially viable, though we will present a case study on Village Hands, a cooperative that is making consistent profits from the processing of baobab (malambe).

Processed fruits are rarely available in the informal markets. They are sold through superettes, small supermarkets, large supermarkets, and to hotels. Most processed fruit products currently are imported, primarily from South Africa. Mulanje Peak Foods, a subsidiary of Dairibord Malawi, processes Malawian-grown fruits into jams and sauces. On the other hand, Dairibord imports concentrate from South Africa to produce fruit juices (nectars). To further explore the business opportunities in processed fruit products, we next present the supply chain as we envision it.

### Packaged Fruit Juices

The packaged juice supply chain includes many steps, including:

- 1) Purchasing plant and equipment where fruit can be processed
- 2) Creating a sterile processing area
- 3) Sourcing fruit (either by growing, collecting, or buying)
- 4) Transporting fruit to the processing point
- 5) Processing the fruit into juice concentrate
- 6) Making juice (nectar) and pasteurising it
- 7) Bottling the juice
- 8) Marketing and selling the juice to hotels and supermarkets
- 9) Transporting the juice to the customer

One could imagine how this involved process would be difficult for a smallholder farmer. Even for a cooperative (which would be formed as step #1 in the supply chain), the obstacles are likely insurmountable without outside help. Specifically, the necessary start-up capital is typically not available to a group of smallholder farmers. Also, smallholder farmers are often constrained by a lack of running water or electricity. These obstacles can be overcome, but constrain the volume and quality that a processor can produce. The other major challenge for a small fruit processing company is the connection between the product and the market (i.e. connecting supply and demand). While the challenge of transport and delivery is difficult and costly, marketing and sales is the most difficult task for smallholder farmers to master.

### Fruit Juice Concentrates

Alternatively, a group of smallholder farmers can form a cooperative and produce bulk concentrate for local juice processors such as Dairibord Malawi, Golden Sun Foods, or Suncrest Creameries. Challenges of this approach include maintaining consistent quality and consistent supply. The supply chain steps include:

- 1) Forming a cooperative with other local farmers
- 2) Purchasing plant and processing equipment
- 3) Creating a sterile processing area
- 4) Sourcing fruit (either by growing, collecting, or buying)
- 5) Transporting fruit to the processing point
- 6) Processing fruit into juice concentrate
- 7) Transporting concentrate to the juice processor

This approach creates relationship-building opportunities for farmer cooperatives and juice manufacturers. For example, the juice processor may be willing to purchase processing equipment for the cooperative. They would most likely provide containers for transport and transport from the cooperative to the juice processing plant. The cooperative would be able to focus on producing consistently high quality juice concentrate.

#### Fruit Jams

The process of making fruit jams is similar to fruit concentrate. The processing is different in that jam processing requires unique inputs. The supply chain, however, is very similar. The key difference is that jams can be stored longer before being transported to customers. The fruit jam supply chain steps include:

- 1) Forming a cooperative with other local farmers
- 2) Purchasing plant and equipment where fruit can be processed
- 3) Creating a sterile processing area
- 4) Sourcing fruit (either by growing, collecting, or buying)
- 5) Transporting fruit to the processing point
- 6) Processing the fruit into jam
- 7) Packaging the jam into containers
- 8) Marketing and selling the juice to hotels and supermarkets
- 9) Transporting the juice to the customer

The fruit jam market represents an attractive opportunity because there is limited competition. Currently, Mulanje Peak is the only domestic producer of jams. Jam is also less perishable than other fruit products, which is an advantage for fruits that have seasonality issues.

#### Dried Fruits

Dried fruits represent a potential export opportunity because they are easier to transport. Simultaneously, they offer new challenges in the drying process. In order to properly desiccate fruits, they must be exposed to heat and/or sunlight until they have reached the correct point. Ideally, the dehydration process is completed in one day so that the fruit is not exposed to temperature variation, when bacteria forms and renders the product unfit to be sold. The dried fruit supply chain includes the following steps:

- 1) Forming a cooperative with other local farmers
- 2) Purchasing equipment for fruit desiccation
- 3) Creating a sterile processing area
- 4) Sourcing fruit (either by growing, collecting, or buying)
- 5) Transporting fruit to the processing point
- 6) Drying the fruit
- 7) Packaging the fruit into containers
- 8) Marketing and selling the fruit to exporters

Dried fruit can be produced from mangos, bananas, pineapples, and other exotic species. The primary challenge is the processing. Direct sunlight produces variable results so technologists have been working on drying machines that can operate without electricity. Solar powered technologies are still not affordable for farmers, although prices are dropping. Some simple machines are in the market, but we were not able to meet with any farmers who currently use them.

### Fruit Wine

Though we have not observed a large market for fruit wines, it does seem like they are made and consumed by Malawians. We will not explore the supply chain for this opportunity, but it is worth noting that wine can be produced from various fruits grown in Malawi.

### Nuts

Macadamia nuts are an important cash crop in Malawi. The kernels can be eaten raw or roasted, and the oil can be extracted for cooking or cosmetics. Currently, estates are the primary producers of macadamia nuts in Malawi but the smallholder farmers also have an opportunity to earn income from this tree crop. There are two processing plants in Malawi and there is a vibrant export market to which they are already connected. The supply chain for macadamia nuts includes the following steps:

1. Planting macadamia trees and harvest nuts
2. Transporting nuts to the processing plant
3. Selling the fruit to exporters

The primary issue in macadamia nut production is the long lead-time from planting to the point when a viable crop is produced. Farmers must also maintain quality, but the market exists for the product.

## APPENDIX C

### CASE STUDY OF VILLAGE HANDS COOPERATIVE



Village Hands' operations manager presents to the Haas IBD team (in Kamwamba)

One of the best cooperative success stories in Malawi is Village Hands Limited, producers of the Malambe juice brand. Village Hands was created through a partnership between GTZ and Wildlife Society of Malawi (WSEM) in response to rapid deforestation in the Mwanza region. The project, in collaboration with local villages, sought to develop a sustainable forest practice that would benefit neighboring communities. In the early stages of the project, WSEM discovered that villagers were producing baobab juice for self-consumption. However, there was significant spoilage of the juice given the lack of processing expertise and storage facilities.

WSEM observed an opportunity for a sustainable business, and actively trained the villagers to create a system whereby a cooperative managed the production of juices and jams produced by the local farmers. WSEM directly trained cooperative members how to produce quality baobab juices and jams, and introduced improved baobab trees, which produce fruit within six years instead of the normal twenty-five years.

GTZ start-up financing support was a major reason the cooperative was able to effectively operationally initially. GTZ provided nearly all the funds needed to procure water, purchase a transport vehicle, and buy the necessary production materials. Success of the cooperative also benefited greatly from strong management organization early in the process. The cooperative formed a company, Village Hands Limited, to represent the 14 villages. It established a board of directors, which included members with private sector experience. The vice-president comes with the most

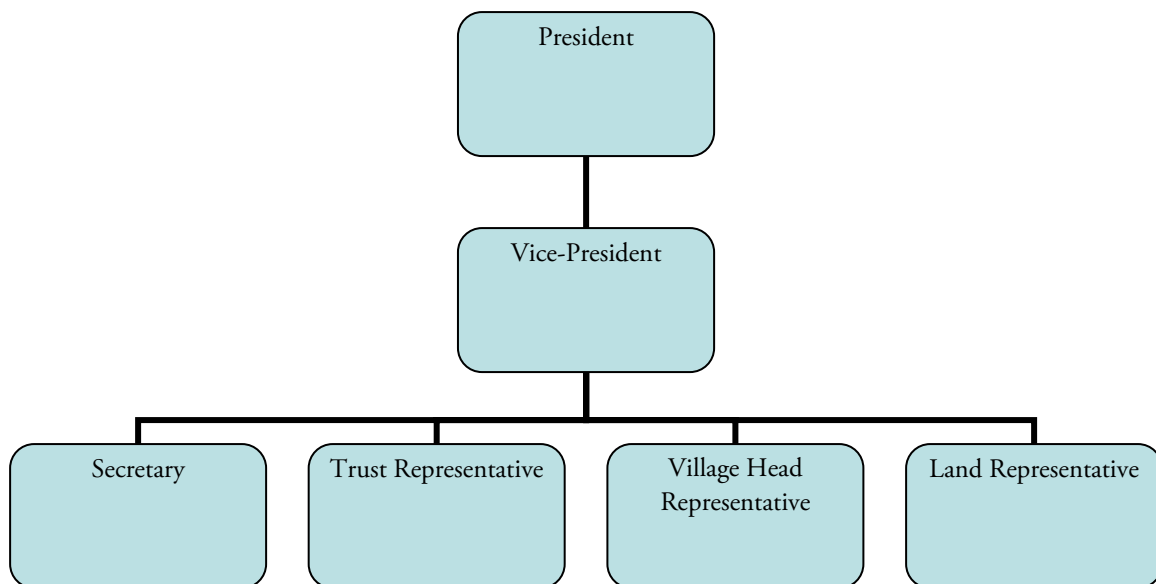


business expertise; he currently is a BP station owner and an entrepreneur. The company is owned by a trustee, Kamwamba Management Trust, and a representative sits on the board. Two representatives represent the 14 villages and land sustainability, respectively. The board made an excellent decision in hiring an operations manager from outside the village, to bring the ground-level business skills needed to boost success.

Progress was initially slow, but an early partnership and acquisition of shelf space with the People's Trading Company (PTC) gave the company credibility. Gaining distribution within PTC paved the way for penetration into BP gas station shops, 7 Eleven outlets, and other retail stores. This year, after a long ten-year process, Village Hands received approval from the Malawi Bureau of Standards, which paved the way for penetration into Shop Rite markets in the major cities of Lilongwe and Blantyre. This penetration could also lead to shelf space in Shop Rite stores in other Southern Africa markets

Village Hands is now a self-sustaining cooperative which broke-even in 2005. However, it continues to face new challenges. Their goal over the next year is to expand production to 24,000 bottles per month, a significant increase from the current 6,000-production level. They must find a way to obtain the necessary amount of supply materials to meet this level of demand. One important question is if they can they find a consistent source of material inputs like bottles, which they currently purchase from a retailer. Secondly, they need a new vehicle as the current one is breaking down...can the cooperative afford to purchase it or can they secure financing from an NGO?

**Diagram IV:** Village Hands Board of Directors



## APPENDIX D

### CASE STUDY OF ASSOCIATION OF SCHOOL LEAVERS



Haas IBD Team and the Association of School Leavers Management Team (in Zomba)

The Association of School Leavers Development Initiative (ASLDI) in Zomba illustrates a great example of the social impact fruit trees can have in Malawi. The goal of ASLDI is to improve the well-being of the youth and reduce risk factors that tend to afflict most unemployed school leavers, such as crime and drugs. Under this initiative, school leavers are given the opportunity to be involved in a group that produces and markets fruit juices and jams (i.e. mango, guava, and baobab).

Management of the group lies with the school leavers themselves. There are three main organizational functional areas: Procurement, Production, and Sales & Marketing. The heads of each area report to the President. Furthermore, the group has a board of directors consisting of senior people with extensive knowledge of fruit products.

Currently, there are 16 members. Membership is lower than in the past, mostly due to members procuring other jobs. ICRAF initially trained and funded the group. Also, Professor Saka from Chancellor College assisted by providing knowledge that increased the shelf-life of the products. The

government allows ASLDI to collect raw materials from forests. Processing is done manually, while sales occur at local markets.

Currently, they sell over 100 bottles of juice per month and 30 jars of jam. ASLDI realizes a profit of about 500 MK per month. The bottleneck is lack of capital to consistently transport the raw materials in time. The National Bank of Malawi is contemplating providing them a loan.

Not only is their business profitable, they also manage to provide youth with knowledge and skills they can employ in the elsewhere in the work force. In other words they achieve their stated goal. Some key success factors can be identified:

- Initial funding: the program could not have started without initial funding. ASLDP received a grant, but a loan would also have worked
- Training and support by knowledgeable people: professor Saka and ICRAF provided them the necessary know-how
- Good organizational structure: employees specialized in a certain part of the process
- Led by a president with business acumen

We saw most of these key success factors in other successful organizations such as Village Hands and Ngolowindo.

## APPENDIX E

### OUR SURPRISES

Given our perspective as visitors from the United States, we wanted to share what surprised us the most during the course of our project.

- Most Malawians are unaware of the nutritional value for fruit
- There is virtually no fruit in the informal markets, even though that is where most people shop
- There has not been significant government investment in new agricultural technologies for small farmers
- People are very resourceful about how to transport fruit
- There are fewer visionary entrepreneurs than we expected to see, even though the informal markets are filled with small entrepreneurs – the lack of capital makes it really difficult
- NGOs hold a big chunk of the purchasing power for seedlings

## APPENDIX F

### RECOMMENDATION FOR PRIMARY RESEARCH ON DEMAND

Many studies have shown that consumption of fruits and vegetables have a positive health impact. We also know both from studies and from our own observations in Malawi that most impoverished people consume less fruits and vegetables.<sup>41</sup> We know that the cost is a problem for many people, but we also expect that there are other factors. As we evaluated the demand for fresh and processed fruits in Malawi, it was clear that the demand was low and insufficient to support widespread fruit tree propagation. However, we also hypothesize that this is partially due to the low per capita income in Malawi. We recommend research to test this hypothesis and to learn at what income levels fruit consumption increases.

The National Statistical Office collected the most recent research on Malawian fruit consumption in 1997. That report surveyed almost 13,000 households and was named the Integrated Household Survey. For comparative purposes, it would be advisable to work with the National Statistical Office to use similar methodologies when possible.

Here are the steps we believe are necessary to complete an economic sensitivity analysis:

#### Benchmarking study to measure fruit consumption

##### 1) Major areas of data collection

- a. Consumer research
  - i. Demographic information (for segmentation) – income, where they live, size of family, where they purchase, etc
  - ii. Fruit consumption and preferences
  - iii. Fruit purchase behavior – which fruits are purchased and pricing
  - iv. Nutritional education levels
  - v. Gender roles in buying decisions
  - vi. Willingness-to-Pay
  - vii. Substitutes
- b. Data from processors
  - i. Fruit purchase behavior – which fruits are purchased and pricing
  - ii. Willingness-to-Pay
  - iii. Substitutes
- c. Groceries/supermarkets
  - i. Fruit purchase behavior – which fruits are purchased and pricing
  - ii. Willingness-to-Pay
  - iii. Substitutes
- d. Export
  - i. National Statistics – customs declarations
  - ii. Discussions with farmers close to borders

---

<sup>41</sup> [http://www.who.int/dietphysicalactivity/publications/f&v\\_africa\\_economics.pdf](http://www.who.int/dietphysicalactivity/publications/f&v_africa_economics.pdf)

- 2) Analysis
  - a. Analyze Malawi data to understand demand by segments
  - b. Perform sensitivity analysis to show how variables contribute to demand
  - c. Choose comparative countries where similar studies have already been done
- 3) Recommendations
  - a. Think about how to impact the variables, thus driving higher consumption
  - b. Create a demand model that predicts how demand will increase/decrease based on the key variables and inputs
    - i. Make comparisons to similar countries
    - ii. Show multiple scenarios based on economic growth

## WORKING PAPERS IN THIS SERIES

1. Agroforestry in the drylands of eastern Africa: a call to action
2. Biodiversity conservation through agroforestry: managing tree species diversity within a network of community-based, nongovernmental, governmental and research organizations in western Kenya.
3. Invasion of *prosopis juliflora* and local livelihoods: Case study from the Lake Baringo area of Kenya
4. Leadership for change in farmers organizations: Training report: Ridar Hotel, Kampala, 29<sup>th</sup> March to 2nd April 2005.
5. Domestication des espèces agroforestières au Sahel: situation actuelle et perspectives
6. Relevé des données de biodiversité ligneuse: Manuel du projet biodiversité des parcs agroforestiers au Sahel
7. Improved land management in the Lake Victoria Basin: TransVic Project's draft report.
8. Livelihood capital, strategies and outcomes in the Taita hills of Kenya
9. Les espèces ligneuses et leurs usages: Les préférences des paysans dans le Cercle de Ségou, au Mali
10. La biodiversité des espèces ligneuses: Diversité arborée et unités de gestion du terroir dans le Cercle de Ségou , au Mali
11. Bird diversity and land use on the slopes of Mt. Kilimanjaro and the adjacent plains, Tanzania
12. Water, women and local social organization in the Western Kenya Highlands
13. Highlights of ongoing research of the World Agroforestry Centre in Indonesia
14. Prospects of adoption of tree-based systems in a rural landscape and its likely impacts on carbon stocks and farmers' welfare: The FALLOW Model Application in Muara Sungkai, Lampung, Sumatra, in a 'Clean Development Mechanism' context
15. Equipping integrated natural resource managers for healthy Agroforestry landscapes.
16. Are they competing or compensating on farm? Status of indigenous and exotic tree species in a wide range of agro-ecological zones of Eastern and Central Kenya, surrounding Mt. Kenya.
17. Agro-biodiversity and CGIAR tree and forest science: approaches and examples from Sumatra.
18. Improving land management in eastern and southern Africa: A review of policies.
19. Farm and household economic study of Kecamatan Nanggung, Kabupaten Bogor, Indonesia: A socio-economic base line study of Agroforestry innovations and livelihood enhancement.
20. Lessons from eastern Africa's unsustainable charcoal business.
21. Evolution of RELMA's approaches to land management: Lessons from two decades of research and development in eastern and southern Africa
22. Participatory watershed management: Lessons from RELMA's work with farmers in eastern Africa.
23. Strengthening farmers' organizations: The experience of RELMA and ULAMP.
24. Promoting rainwater harvesting in eastern and southern Africa.
25. The role of livestock in integrated land management.
26. Status of carbon sequestration projects in Africa: Potential benefits and challenges to scaling up.
27. Social and Environmental Trade-Offs in Tree Species Selection: A Methodology for Identifying Niche Incompatibilities in Agroforestry [*Appears as AHI Working Paper no. 9*]
28. Managing tradeoffs in agroforestry: From conflict to collaboration in natural resource management. [*Appears as AHI Working Paper no. 10*]
29. Essai d'analyse de la prise en compte des systemes agroforestiers pa les legislations forestieres au Sahel: Cas du Burkina Faso, du Mali, du Niger et du Senegal.
30. Etat de la recherche agroforestière au Rwanda etude bibliographique, période 1987-2003
31. Science and technological innovations for improving soil fertility and management in Africa: A report for NEPAD's Science and Technology Forum.
32. Compensation and rewards for environmental services.
33. Latin American regional workshop report compensation.
34. Asia regional workshop on compensation ecosystem services.
35. Report of African regional workshop on compensation ecosystem services.
36. Exploring the inter-linkages among and between compensation and rewards for ecosystem services CRES and human well-being

37. Criteria and indicators for environmental service compensation and reward mechanisms: realistic, voluntary, conditional and pro-poor
38. The conditions for effective mechanisms of compensation and rewards for environmental services.
39. Organization and governance for fostering Pro-Poor Compensation for Environmental Services.
40. How important are different types of compensation and reward mechanisms shaping poverty and ecosystem services across Africa, Asia & Latin America over the Next two decades?
41. Risk mitigation in contract farming: The case of poultry, cotton, woodfuel and cereals in East Africa.
42. The RELMA savings and credit experiences: Sowing the seed of sustainability
43. Yatich J., Policy and institutional context for NRM in Kenya: Challenges and opportunities for Landcare.
44. Nina-Nina Adoung Nasional di So! Field test of rapid land tenure assessment (RATA) in the Batang Toru Watershed, North Sumatera.
45. Is Hutan Tanaman Rakyat a new paradigm in community based tree planting in Indonesia?
46. Socio-Economic aspects of brackish water aquaculture (*Tambak*) production in Nanggroe Aceh Darrusalam.
47. Farmer livelihoods in the humid forest and moist savannah zones of Cameroon.
48. Domestication, genre et vulnérabilité : Participation des femmes, des Jeunes et des catégories les plus pauvres à la domestication des arbres agroforestiers au Cameroun.
49. Land tenure and management in the districts around Mt Elgon: An assessment presented to the Mt Elgon ecosystem conservation programme.
50. The production and marketing of leaf meal from fodder shrubs in Tanga, Tanzania: A pro-poor enterprise for improving livestock productivity.
51. Buyers Perspective on Environmental Services (ES) and Commoditization as an approach to liberate ES markets in the Philippines.
52. Towards Towards community-driven conservation in southwest China: Reconciling state and local perceptions.
53. Biofuels in China: An Analysis of the Opportunities and Challenges of *Jatropha curcas* in Southwest China.
54. *Jatropha curcas* biodiesel production in Kenya: Economics and potential value chain development for smallholder farmers
55. Livelihoods and Forest Resources in Aceh and Nias for a Sustainable Forest Resource Management and Economic Progress
56. Agroforestry on the interface of Orangutan Conservation and Sustainable Livelihoods in Batang Toru, North Sumatra.
57. Assessing Hydrological Situation of Kapuas Hulu Basin, Kapuas Hulu Regency, West Kalimantan.
58. Assessing the Hydrological Situation of Talau Watershed, Belu Regency, East Nusa Tenggara.
59. Kajian Kondisi Hidrologis DAS Talau, Kabupaten Belu, Nusa Tenggara Timur.
60. Kajian Kondisi Hidrologis DAS Kapuas Hulu, Kabupaten Kapuas Hulu, Kalimantan Barat.
61. Lessons learned from community capacity building activities to support agroforest as sustainable economic alternatives in Batang Toru orang utan habitat conservation program (Martini, Endri et al.)
62. Mainstreaming Climate Change in the Philippines.
63. A Conjoint Analysis of Farmer Preferences for Community Forestry Contracts in the Sumber Jaya Watershed, Indonesia.
64. The highlands: a shared water tower in a changing climate and changing Asia
65. Eco-Certification: Can It Deliver Conservation and Development in the Tropics.
66. Designing ecological and biodiversity sampling strategies. Towards mainstreaming climate change in grassland management.
67. Towards mainstreaming climate change in grassland management policies and practices on the Tibetan Plateau
68. An Assessment of the Potential for Carbon Finance in Rangelands
69. ECA Trade-offs Among Ecosystem Services in the Lake Victoria Basin.
69. The last remnants of mega biodiversity in West Java and Banten: an in-depth exploration of RaTA (Rapid Land Tenure Assessment) in Mount Halimun-Salak National Park Indonesia



70. Le business plan d'une petite entreprise rurale de production et de commercialisation des plants des arbres locaux. Cas de quatre pépinières rurales au Cameroun.
71. Les unités de transformation des produits forestiers non ligneux alimentaires au Cameroun. Diagnostic technique et stratégie de développement Honoré Tabuna et Ingratia Kayitavu.
72. Les exportateurs camerounais de safou (*Dacryodes edulis*) sur le marché sous régional et international. Profil, fonctionnement et stratégies de développement.
73. Impact of the Southeast Asian Network for Agroforestry Education (SEANAFE) on agroforestry education capacity.
74. Setting landscape conservation targets and promoting them through compatible land use in the Philippines.
75. Review of methods for researching multistrata systems.
76. Study on economical viability of *Jatropha curcas* L. plantations in Northern Tanzania Assessing farmers' prospects via cost-benefit analysis
77. Cooperation in Agroforestry between Ministry of Forestry of Indonesia and International Center for Research in Agroforestry
78. "China's bioenergy future. an analysis through the Lens if Yunnan Province
79. Land tenure and agricultural productivity in Africa: A comparative analysis of the economics literature and recent policy strategies and reforms
80. Boundary organizations, objects and agents: linking knowledge with action in agroforestry watersheds
81. Reducing emissions from deforestation and forest degradation (REDD) in Indonesia: options and challenges for fair and efficient payment distribution mechanisms
82. Mainstreaming Climate Change into Agricultural Education: Challenges and Perspectives
83. Challenging Conventional mindsets and disconnects in Conservation: the emerging role of eco-agriculture in Kenya's Landscape Mosaics
84. Lesson learned RATA garut dan bengkunan: suatu upaya membedah kebijakan pelepasan kawasan hutan dan redistribusi tanah bekas kawasan hutan
85. The emergence of forest land redistribution in Indonesia
86. Commercial Opportunities for Fruit in Malawi

The World Agroforestry Centre is an autonomous, non-profit research organization whose vision is a rural transformation in the developing world where smallholder households strategically increase their use of trees in agricultural landscapes to improve their food security, nutrition, income, health, shelter, energy resources and environmental sustainability. The Centre generates science-base knowledge about the diverse role that trees play in agricultural landscapes, and uses its research to advance policies and practices that benefit the poor and the environment.



United Nations Avenue, Gigiri - PO Box 30677 - 00100 Nairobi, Kenya  
Tel: +254 20 7224000 or via USA +1 650 833 6645  
Fax: +254 20 7224001 or via USA +1 650 833 6646  
[www.worldagroforestry.org](http://www.worldagroforestry.org)