iied

Trees on-farm: removing the obstacles to enterprise

A review of current climate-smart tree-based experiences in Malawi

Bright Sibale
Robert Kafakoma
Abel Shaba
Duncan Macqueen

About the author

Bright Sibale is the Director at Centre for Development Management based in Lilongwe, Malawi

Robert Kafakoma is the Director at the Training Support for Partners based in Lilongwe, Malawi

Abel Shaba is a Research Associate at the Centre for Development Management based in Lilongwe, Malawi

Duncan Macqueen is a Principal Researcher and leader of the Forest Team at the International Institute for Environment and Development

Acknowledgements

The research team would like to sincerely thank the management of the International Institute for Environment and Development and Forest Connect for providing it with the opportunity to conduct this important research. The team particularly acknowledges the technical support provided by Duncan Macqueen and also the work of his colleagues, Lucile Robinson and Leianne Rolington, for support with the publication process. Without your support, the research would not have been implemented successfully.

We would like to thank the Programme for Forests (PROFOR) at the World Bank for the financial assistance under which this research was produced and the UK Government's Department for International Development (DFID) for support with publication.

The research team particularly appreciates the valuable support that it received from all people who were consulted during the study.

The team takes full responsible for all errors of omission, judgement or misinterpretation of facts. The report reflects the opinions of the authors alone. This research was funded by PROFOR and UK aid from the UK Government, however the views expressed do not necessarily reflect the views of the UK Government or PROFOR.

Thank you and God bless.

Printed by: Park Communications Ltd

Designed by: Andy Wilkinson

Layout by: Regent Typesetting

Cover photo: flickr.com/Bread for the World

Table of Contents

Acronyms

ASWAp	Agriculture Sector-Wide Approach, Malawi
BERL	Bio Energy Resource Limited
BEST	Biomass Energy Strategy, Malawi
CO_2	Carbon dioxide
DFMP	District Fuelwood Management Plan
FRIM	Forest Research Institute of Malawi
GDP	Gross Domestic Product
GoM	Government of Malawi
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
ICRAF	World Agroforestry Centre
IFMSLP	Improved Forest Management Sustainable Livelihoods Program
JANEEMO	Jatropha Neem Moringa
JICA	Japan International Cooperation Agency
Kg	Kilogram
LRC	Land Resources Centre
MBS	Malawi Bureau of Standards
MDGs	Millennium Development Goals
MDHS	Malawi Demographic Health Survey
MERA	Malawi Energy Regulatory Authority
MGDS	Malawi Growth and Development Strategy
MWK	Malawi Kwacha
NAPAs	National Adaptation Programme Actions
NGO	Non-governmental organisation
NSO	National Statistical Office
OVOP	One Village One Product
REDD	Reducing Emissions from Deforestation and Forest Degradation
TJ	Terajoule
UNDP	United Nations Development Programme
WAG	Wildlife Action Group

Executive Summary

Malawi faces a precarious future. High growth rates within a predominantly rural population (87 per cent) are placing pressure on natural resources in a context of ongoing poverty. Deforestation between 2001 and 2009 ran at 3.49 per cent annually, or approximately 100,000 hectares per year. Hunger has been temporarily abated by a fertiliser subsidy programme but this has questionable sustainability, given the country's foreign exchange deficit. Biomass use now exceeds the sustainable carrying capacity of the environment in the centre and south west of the country.

An urgent response is required to this situation. The creation of models and incentives that restore tree cover must be central to any response. Trees not only provide vital subsistence products (food, energy to cook with, construction materials) but also help to maintain the ecosystem services (soil and water cycles, pollination, biodiversity conservation and carbon sequestration) upon which continued production depends. What is more, in a resource scarce country, tree-based enterprises have been shown to provide a unique source of income generation that can help improve livelihoods and build long-term security.

The government of Malawi is not blind to these issues. With the support of international and national civil society and private sector development partners, a range of agroforestry and sustainable forest management programmes are being implemented. The overarching Malawi Growth and Development Strategy (MGDS II)[1] identifies nine priorities, two of which are directly relevant to the restoration and entrepren**e**urial use of tree cover: agriculture and food security**,** and integrated rural development. Malawi's Agriculture Sector-Wide Approach[2] (ASWAp) specifically mentions the promotion of Jatropha agroforestry for climate adaptation and income generation from the production of bio-diesel. Although not formally approved or implemented, the Malawi Biomass Energy Strategy[3] promotes the professionalisation of the entire wood fuel and charcoal supply chain. The National Forest Policy (1996) explicitly enco**u**rages agroforestry, the production of trees on farm and the commercial co-management of forest reserves.

The subsequent Forestry Act (1997) stipulates how village forest areas on customary land are to be managed and enhanced. In response to climate change, the National Adaptation Programme of Actions (NAPAs) specifically targets afforestation and re-afforestation programmes to control soil loss, provide fuel wood and generate income from tree products.

With such a supportive policy environment, it is little wonder that some advances have been made in the restoration and commercial use of tree crops. Since the early 1990s, research institutions such as the Land Resources Centre (LRC), the Forest Research Institute of Malawi (FRIM) and the World Agroforestry Centre (ICRAF) have implemented programmes dedicated to tree crops – with a history of agricultural experimentation. This report surveys developments using five important tree crops that all form the basis of sustainable forest enterprises to differing extents. For example, the oil bearing seed of *Jatropha curcas* is now used by a number of private sector companies (Bio Energy Resources Ltd (BERL), Demetre Agriculture Ltd, Toleza Farm Ltd, Exagris Ltd, Tree Tops and Mary's Meals) in association with local farmer groups to produce bio-diesel, lamp-oil, soap and a range of other products. *Azadirachta indica* is now widely planted as a source of cosmetic and medicinal products (such as malarial, intestinal and skin treatments). *Moringa oleifera* is planted in hedges from which leaves are used as a nutritional supplement – containing all eight essential amino acids required for **healthy** human development – and stems are used for construction purposes and fuel wood. *Faidherbia albida* is widely planted on farms where its reverse leaf phenology (shedding nitrogen rich leaves in the wet season) has doubled or tripled farm yields. *Acacia polyacantha* is one of a number of fast growing native species that regenerates naturally and makes an excellent source of fuel wood or charcoal. A range of other trees, including native fruit trees such as *Sclerocarya birrea, Uapaca kirkiana, Parinari curatellifolia, ziziphus mauritania* and *Adansonia digitata* have supplemented more conventional plantings of tropical fruit trees to improve food security.

1 http://www.imf.org/external/pubs/ft/scr/2012/cr12222.pdf
2 http://www.caadp.net/pdf/Investment per cent20plan per cent20- per cent20Malawi.pdf
3 http://www.euei-pdf.org/sites/default/files/files/field_pblctn_file/EUEI per cent20PDF_BEST_Malawi_Final per cent20report_Jan per cent202009_EN.pdf

One specific initiative, known as JANEEMO,[4] was the subject of particular investigation within this report. Established in 2007, JANEEMO (the title taken from three tree species – Jatropha, Neem and Moringa) the initiative now has over 4000 farmers actively engaged in commercial tree planting and product processing. Average incomes for farmers producing Jatropha seed, Moringa powder and Neem wood per harvest ranged from MWK 688 to MWK 9536 (US$1.91–US$26.49). In addition to solid economic benefits, the use of trees on farm has also been shown to increase agricultural yields and resilience to climate change. The availability of tree products close to households has reduced pressure on the remaining off-farm tree resources.

Operational challenges to scaling-up are various, despite the progress made in a number of climate-smart, on-farm, tree-based enterprises. A failure to adequately resource policy implementation has left many District Forest Officers without the means to provide technical assistance to communities to establish on-farm tree crops, village forest areas or co-management plans for forest reserves. The Malawi Biomass Energy Strategy has not yet been implemented, despite charcoal constituting the country's third largest industry. The bureaucracy involved in developing and administering certification and quality standards for products such as medicines, fruit juices and other tree crop products, is another obstacle. There is also the real challenge of population pressure on Malawi's natural resources and any planting that diminishes food crop production is an obvious threat to livelihoods. Even where tree enterprises have been developed, there is often a lack of organisation between farmer groups to enable them to get better prices for their products, develop robust regular markets, and invest in value-added processing.

In order to strengthen future prospects for climate-smart, on-farm, tree-based enterprises, a way must be found to resource policy implementation, especially through extension work by District Forest Officers – moving away from an enforcement role towards an entrepreneurial support service. Helping to facilitate the organisation of newly established on-farm enterprises will help strengthen knowledge transfer and market bargaining power. Where company-community partnerships have emerged from sub-contractor or out-grower schemes, information on best practices should be shared. Since much of this work will require investment, it is proposed that the strengthening of climate-smart, on-farm, tree-based enterprises is made an integral component of any REDD+ finance distribution mechanisms in Malawi.

4 http://www.janeemo.org/

1 Introduction

1.1 Background

High levels of deforestation in Malawi have been the subject of intense debate at policy, planning and community levels. Between 2001 and 2009 Malawi lost approximately 100,000 hectares of forest per year or 3.49 per cent annually (Cassells, 2011). The high levels of deforestation are being attributed to demand for land from an increasing population (2.8 per cent average annual growth rate) which is now at about 13.2 million according to the National Statistics Office (NSO, 2009). Much of this population expansion comes in rural areas where people are poor and almost completely dependent on natural resources for their survival. Around 80 per cent of the population depends for its survival on rainfed farming. Nearly two thirds of Malawian children are malnourished, with 67 per cent of children under the age of five being classed as either 'under-weight', 'stunting' or 'wasting' according to World Health Organisation figures for 2006–2010 and life expectancy is just 54 years.[5] The drought of 2002 led to the worst famine in half a century with three million Malawians requiring food aid to survive.

Trees are a critical resource for the livelihoods of rural people and especially small scale farmers. They maintain soil fertility and can help control erosion, provide fuel wood or charcoal energy for cooking and lighting, construction materials, and medicines as well as being a source of food products such as fruits and insects.

Satellite maps that plot the balance between total net primary production (NPP) and total NPP appropriated for use by humans, show that in some areas of Malawi (especially the centre and south west) biomass use is now exceeding the sustainable carrying capacity of the environment (Macqueen, Kafakoma and Sibale, 2011). This is extremely worrying – especially in a country where agricultural yields are being propped up by fertiliser subsidies whose future economic viability is questionable at best. The biggest demand for biomass comes from the subsistence energy sector. Biomass accounts for 97 per cent of the total primary energy supply and the current total of 1.2 million tonnes of biomass energy use is likely to rise to 2.1 million tonnes under even the most conservative of future scenarios (GoM, 2009)

Restoring tree cover, to replenish Malawi's biomass at a landscape level, is a pressing issue if the government of Malawi is to stave off future starvation. Trees also offer prospects for generating income for rural households – which will be critical in Malawi's search for sustainable economic development. Recent studies report an increase in household incomes from the sale of various products and services from trees as rural populations look for income generation options (Salam et.al, 2000; Campbell et al., 2002; Mithofer 2004; Kambewa and Utila, 2008).

flickr.com/tonrulkens

Human-induced climate change has resulted in unprecedented changes to the patterns of rainfall and temperature within Malawi. Malawi is one of the countries whose agriculture is most severely at risk from climate change (Maplecroft, 2011). Many stakeholders are concerned that the current trends are also significantly reducing the ability of tree-based ecosystems to maintain provisioning services (e.g. food, fuel, fibre and water), regulating services (e.g. global temperature, hydrological cycles, soil fertility) and supporting services (e.g. pollination, seed dispersal). Agroforestry

5 http://www.unicef.org/infobycountry/malawi_statistics

systems in southern Africa have the potential to store substantial amounts of carbon – both helping populations adapt to climate change, but also accumulating approximately 0.2–0.8 Mg C /ha/yr in parklands, live fences, home gardens and potentially between 2.2 and 5.8 Mg C /ha/yr in rotational woodlots. Commercialising such carbon sequestration would require considerable transaction costs, but at a carbon price of US$10 per Mg C could nevertheless involve small payments to farmers (of no more than approximately US$30 per ha for the highest sequestration rates) (Luedeling et al. 2011)

To engage with some of the problems mentioned above the government of Malawi, with support from development partners, is implementing a number of agroforestry and sustainable forest management initiatives. These include devolving control over forests to community forest management groups and encouraging communities to engage in commercial on-farm tree planting. One example of the latter is the JANEEMO agroforestry initiative that was born of the realisation that the majority of households in rural parts of Malawi are extremely poor; their nutrition levels are low; access to health and education services is limited; and agriculture is the main source of income, but most smallholder farmers have limited access to inputs and are heavily reliant on shrinking forests for energy. The fundamental notion was that tree-based enterprise could encourage the cultivation and harvesting of fuel crops that also enhance agricultural productivity. This would empower local economic development through the production of biogas power, firewood, highly nutritious foods and oils, soap, green fertilizers, organic pesticides, medicine and mosquito repellents.

1.2 Study objectives

This study was commissioned by Forest Connect[6] – an ad hoc international alliance that seeks to reduce poverty and protect forests by better linking small forest enterprises to each other, as well as to markets, service providers and decision-makers. The study explores opportunities for climate-smart, on-farm, tree-based enterprises in Malawi with particular focus on the recent use of Jatropha (*Jatropha curcas*), Neem (*Azadirachta indica*), Moringa (*Moringa oleifera*) and Albida (*Faidherbia albida*) within the aptly named 'JANEEMO' initiative.[7] The study specifically tries to explore and discuss how on-farm tree-based enterprises can develop products that reduce poverty while also intensifying production to meet local demand for food, fuel and construction materials in ways that are climate resilient.

1.3 Methodology

This paper is based on a literature review, stakeholder interviews with those engaged in commercial development of on-farm tree-based enterprises, and field visits to farms, organizations, and individuals involved in the JANEEMO initiative. It is structured in five sections. The **first** section covers the background of the study and the study objectives. The **second** section outlines the policy context within which on-farm tree-based enterprises are emerging in Malawi. The **third** section introduces some of the key commercial tree crops currently being developed in Malawi. Section **four** presents the main operational barriers to optimising the potential of climate-smart, on-farm, tree-based enterprises in Malawi. Finally, section **five** concludes with some recommendations for how to overcome those barriers and strengthen prospects for these enterprises within Malawi.

6 http://forestconnect.ning.com/
7 http://www.janeemo.org/About

2 Economic and policy context for the production and marketing of tree crops

2.1 Economy

Malawi has a predominantly agricultural economy. According to the 2008 Malawi Population and Housing Census[8] about 87 per cent of the population lives in rural areas. The country's main export commodities are tobacco, tea and sugar – but some domestic products such as charcoal production fall between tea and sugar in terms of value to the national economy (Kambewa et al 2007). Agriculture is the most important sector of the economy: it employs about 80 per cent of the workforce, contributes over 80 per cent of foreign exchange earnings, accounts for 39 per cent of gross domestic product (GDP) and contributes significantly to national and household food security. National surveys estimate that crop production accounts for 74 per cent of all rural incomes.

The agricultural sector has two main sub-sectors, the smallholder sub-sector that contributes more than 70 per cent and the estate sub-sector that contributes less than 30 per cent to GDP originating from the agricultural sector. Smallholder farmers cultivate mainly maize – the main staple grain – to meet subsistence requirements, while estates focus on high-value cash crops for export: tobacco, tea, sugar and coffee. Smallholder farmers cultivate small and fragmented land holdings under customary tenure and yields are lower than in the estate sector.[9]

Agricultural exports remain undiversified with very little value addition. Malawians remain poor, with 52.4 per cent of the population living below the poverty line (MWK 44 / US$0.12 per person per day) with 22.4 per cent barely surviving (GoM, 2008). Most of the socio-economic indicators illustrate the depth and intractability of poverty. The infant mortality rate and morbidity remain high, 104 deaths per 1,000 live births in 2004/05 and 984 deaths per 100,000 births in 2004, respectively (National Statistics Office, 2006). There is also a high prevalence of HIV and AIDS, estimated at 11 per cent of the population (GoM, 2010).

2.2 Development policy framework

Malawi's development policy is guided by the Malawi Growth and Development Strategy. Overall, the government of Malawi has the policy and legal frameworks in place that govern the production, as well as efficient use, of sustainable biomass energy or on-farm tree-based enterprises. Some of the policies include the Malawi Growth and Development Strategy II (2012), Malawi Biomass Energy Strategy (2009), National Energy Policy, National Forestry Policy and legal provisions are provided by the Forestry Act.[10] Other relevant documents that have helped in the development of the biomass energy sector in Malawi are the Land Policy and the Malawi National Adaptations Programme Actions (NAPAs). The National Energy Policy is primarily directed towards the development of the electricity and petroleum sectors, with a fundamental objective of reducing dependence on biomass fuels (GoM 2009a).

2.2.1 Malawi Growth and Development Strategy II 2011–2016

The government of Malawi has a new national development strategy to help attain the country's long-term development aspirations. In order to sustain and accelerate development gains achieved during Malawi's first Growth and Development Strategy (2006–2011), the government formulated the second medium term national development strategy, known as MGDS II. The objective of MGDS II remains wealth creation and reduction of poverty through sustainable economic growth and infrastructure development (GoM, 2012). Briefly, the MGDS 2006–2011, which succeeded the Malawi Poverty Reduction Strategy,[11] outlined the government's priorities for

8 http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=106:2008-population-and-housing-census&catid=8&Itemid=6
9 GoM (2001) notes that owing to population pressure, resulting in the fragmentation of land, the national mean land holding size has fallen from 1.53 hectares per household in 1968 to 0.80 hectares per household in 2000.
10 See references below for full details of these policies.
11 http://documents.worldbank.org/curated/en/2006/12/7286063/malawi-poverty-reduction-strategy-paper-malawi-growth-development-strategy-joint-ida-imf-staff-advisory-note

the five year period between 2006 and 2011 and highlighted a policy shift away from subsistence consumption towards sustainable economic growth and infrastructure development. It placed emphasis on six themes, which were: Sustainable Economic Growth; Social Development; Social Support and Disaster Risk Management; Infrastructure Development; Improved Governance; and Cross-Cutting Issues.

These six key priority areas were also expected to accelerate the attainment of the Millennium Development Goals (MDGs) in the areas of health, education, gender, environment, and governance.

Within the six priority themes, the MGDS II identifies a further nine key priorities. These are:

- Agriculture and food security;
- Transport infrastructure and Nsanje World Inland Port;
- Energy, industrial development, mining and tourism;
- Education, science and technology;
- Public health, sanitation, malaria and HIV/AIDS management;
- Integrated rural development;
- Green belt irrigation and water development;
- Child development, youth development empowerment;
- Climate change, natural resources and environmental management.

The choice of the key priority areas is meant to sustain and accelerate economic growth within a short period of time, and with the available resources.

It is clear that on-farm tree-based enterprises are central to at least two of the nine MDGS II priorities – those of agriculture and food security, and integrated rural development. Specifically in the area of natural resources and environmental management, the government aims to increase forest cover and increased incomes from forestry-based products (GoM 2012). Therefore from the policy perspective, tree-based enterprises have been recognized as a source of economic growth for the country.

2.2.2 The Agriculture Sector Wide Approach (ASWAp)

The Agriculture Sector Wide Approach (ASWAp) is Malawi's prioritised and harmonised agricultural development agenda. The objectives of the ASWAp are to: increase agricultural productivity; contribute to growth in the agricultural sector; improve food security; diversify food production; improve nutrition at household level; and increase agricultural incomes of the rural people. The ASWAp is, therefore, a priority investment programme in the agricultural sector and is based on the priority agricultural elements of the Malawi Growth and Development Strategy (MGDS) (GoM 2009b). The ASWAp specifically mentions the promotion of Jatropha trees for climate adaptation and income generation from the production of bio-diesel.

2.2.3 Malawi Biomass Energy Strategy (2009)

The overall objective of the National Biomass Energy Strategy is to ensure a sustainable supply of affordable wood fuels (GoM, 2009a). The strategy has three specific objectives:

i) Increase the supply of sustainable wood fuels (section 8.2);

ii) Increase the efficiency of energy use (section 8.3); and

iii) Create the institutional capacity to manage the biomass energy sector effectively and implement the strategy (section 8.4).

The strategy states that the underlying idea behind an increase in the sustainable supply of wood-fuels is *professionalization of the entire supply chain*, from local communities managing their natural resources and private farmers growing trees, via charcoal producers who cut trees and make charcoal, to transporters who bring wood fuels to the market. This is a process that has started by itself but which needs to be nurtured and accelerated through better regulation. The aim behind the professionalization of the supply chain is to create greater incentives for growing wood, for making charcoal, and for transporting wood fuels to increase poor people's income, while sustainably managing natural resources.

The following four sub-components are identified in the strategy as being necessary to increase the sustainable supply of wood fuels, through a more professional and entrepreneurial functioning of the supply chain:

a) Designing a 'Supply Master Plan' for wood fuels;

b) Designing and implementing 'District Forestry wood fuel Management Plans';

c) Modernizing and strengthening charcoal flow monitoring and control; and

d) Promoting the production of affordable alternative fuels

The aim of the District Forestry Wood fuel Management Plans (DFMPs) proposed by the Biomass Energy Strategy, would be to increase progressively the market share of commercial wood fuels that are sustainably produced and to generate significant and long-term tax revenue for local and national forestry management funds. Through these plans, district authorities would work collaboratively with smallholder farmers to promote more adoption of tree-based resources and products with triple objectives of: poverty reduction (through food and income production); energy production; and environmental conservation and management. In order to develop and enact the DFMPs the productivity of forest resources must increase. Three different approaches are proposed to increase the output of woody biomass:

agroforestry, on-farm tree planting initiatives and tree planting in woodlots.

However, although Malawi has a Biomass Energy Strategy, the resources for its implementation have not yet been put in place. Furthermore, the strategy does not adequately articulate specific policy objectives on biofuel. In the absence of a concise policy framework, biofuel production is hampered (Wambua, 2011). Nonetheless, there have been concerted efforts by key stakeholders, such as the Biofuel Association of Malawi, to provide input on the creation of appropriate biofuel policy.

2.2.4 National Forestry Policy (1996)

The National Forestry Policy provides a framework for sustainable production and conservation of wood resources and recognizes the importance of wood fuels in the national energy supply and the need to bring about improvements in their sustainable production and supply. It is the main sectoral policy framework regulating production from tree-based enterprises. The goal of the policy is to sustain the contribution of the national forest resources to the quality of life in the country, by conserving the resources for the benefit of the nation.

In relation to on-farm tree-based initiatives, in section 2.2 of the policy, the general objectives of the policy are to contribute to improving the quality of life in rural communities and providing a stable local economy, in order to reduce the degenerative impact on the environment that often accompanies poverty. In order to realise this objective, the policy explicitly encourages agroforestry, co-management of forest reserves, ecotourism, and the production of trees on farms and along river banks.

In the same section, the policy aims to establish appropriate incentives that will promote community-based conservation and a sustainable utilisation of the forest resources as a means of alleviating poverty, including on-farm trees, fostering the growing of trees by all sectors of communities in order to achieve sustainable self-sufficiency of forest-demand products. Despite such worthy aspirations, the policy is not backed by fiscal measures or funding streams to make the investments that might be required.

According to the government (GoM 2009a), implementation of the forest policy has, in a practical sense, been constrained by entrenched views amongst both politicians and law enforcement authorities that wood fuels should not in fact be encouraged. This is a view also propagated by the National Energy Policy, which has made it difficult to enact the wood fuel-friendly provisions of the National Forestry Policy. While the forestry policy provides for the government to license charcoal production from sustainable sources, no single license has ever been issued in the country. Policy implementation on charcoal production focuses on confiscation of illegal charcoal. Potentially, this is a disincentive for private sector investment in tree-based enterprises, particularly those that relate to energy production. Farmers are not encouraged to grow their own tree crops from which they could produce and market charcoal. In addition, advancement of biomass energy source plants is been seen as being in conflict with the National Food Security policy (GoM, 2009a).

2.2.5 Energy Laws (2004)

Four Energy Acts, together referred to as the Energy Laws (2004), were created to help in the formation of a regulated and liberalised energy sector in Malawi (GoM, 2009a). These acts set out the legal framework that governs the establishment of the Malawi Energy Regulatory Authority (MERA), the formation of a Rural Electrification Fund, and the development of liberalised electricity and liquid fuels sectors. None of the acts directly addresses the use of biomass as a cooking fuel, but they do provide a direction for the development of policy and incentives for the overall sector.

Act 20, the Energy Regulation Act, is chiefly concerned with the development of MERA, which has recently been operationalised. MERA has the legal authority to regulate 'all forms of energy'. Biomass is included and specifically mentioned, however, the act does not elaborate how MERA should regulate biomass energy in practice.

2.2.6 Forestry Act (1997)

The Forestry Act (1997) creates a Forest Administration, a Forest Management Board, Forest Reserves/Protected Areas, Customary Land Forests, afforestation and forest protection procedures, utilisation practices and a Forest Development and Management Fund.

In Part V (Customary Forest), the act stipulates how communities or villages can participate in forest management on customary land, and share in the resulting benefits with support from the Forestry Department.

For instance in Section 29:

> *The purpose of this Part is to provide for participatory forestry on customary land through protection, control and management of trees and forests by the people on customary land, the demarcation and management of village forest areas, ownership of indigenous trees, establishment of tree nurseries and regulation of forest produce.*

Furthermore, with reference to Part VI (Afforestation), Section 35, the act endorses the promotion of tree growing in forest reserves, public land, customary land and private land by the government, non-governmental organizations and the community.

2.2.7 Malawi National Adaptation Programmes Actions (NAPAs)

With the adverse effect of climate change on poor and vulnerable households, in 2006 the government developed a list of activities that it wanted to implement in order to start adaptation to climate change. Malawi's National Adaptation Programmes of Action (NAPAs) aim to improve community resilience, restore forests, improve agricultural production,

and improve preparedness for floods and droughts and boost climate monitoring (GoM, 2006).

The Malawi NAPAs propose interventions in eight sectors of agriculture, water, human health, energy, fisheries, wildlife, forestry, and gender in order to advance adaptation of the vulnerable households to climate change while contributing to national growth and development. Thirty-one adaptation needs, with emphasis on vulnerable rural communities of Malawi were identified and were narrowed down further to 15 urgent and priority needs. These were ranked for urgency as low [L], medium [M,] or high [H). The on-farm tree initiatives, such as JANEEMO, categorically respond to the following needs:

- Sustaining life and livelihoods for the most vulnerable communities [H], (Option 1);
- Enhancing food security and developing community-based storage systems for seed and food [M], (Option 2);
- Improving crop production through the use of appropriate technologies [M], (Option 3)
- Targeting afforestation and re-afforestation programmes to control siltation, and the provision of fuel wood, and for their benefits, such as sources of alternative cash income [H], (Option 5);
- Improving energy access and security in rural areas (e.g., through extension of rural electrification programme, improved stoves and development of ethanol-based stoves), [M], (Option 6);
- Improving rural nutrition (e.g., through the promotion of fish farming, rearing of small stock, and nutritional supplements for children and the sick) [M] (Option 7);
- Developing technologies to mitigate climate change [M] (Option 12);

flickr.com/Bread for the World

3 History of on-farm tree-based enterprise development in Malawi

3.1 Definition of tree crops

Tree crops are "trees grown for some type of economic or environmental benefit". While fruit or nut trees are the most common type of tree crop planted in Malawi, trees may also be grown as crops for other purposes – for example the production of nitrogen-rich manure, wood energy, medicinal products etc. Tree crops may be grown in monoculture plantations or orchards, but are also popular in less regimented planting patterns in appropriate on-farm locations – especially hedgerows – where they are used to sustain small income-generating activities. In many regions within Malawi, tree crops make up a significant portion of the farming economy. Unlike wild plants, crops are grown for a specific purpose. Most tree crop products are grown specifically to be sold on the open market, often domestic, but occasionally exported as well.

3.2 Customary use of tree crops in Malawi

Tree crops have been associated with agriculture in Malawi since pre-colonial times. Traditionally, smallholder farmers have integrated both trees and livestock on the same piece of land as a way of diversifying the risks in farm systems. In Malawi, evidence shows that care and management of trees on farms and around households is better than on customary land, even with high and increasing population densities. According to Place and Otsuka (2000) in Malawi, farm holdings on customary land are generally small and the land is communally-held by the clan or village headman. These lands are often virtual open access resources with few rules on user-group membership or rates. Because of the immediate benefits (shade, income, wood, medicine and food) that smallholder farmers get from trees on their farm or around their households, they tend to care for such trees more than those growing on open access or private land. This provides an opportunity for scaling up production of tree-based enterprises, particularly trees which have multiple uses at household level.

Since the early 1990s several institutions within Malawi (such as the Land Resources Centre (LRC), the Forest Research Institute of Malawi (FRIM), and the World Agroforestry Centre (ICRAF) began dedicated programmes to collect, propagate and manage tree crops and now have a substantial history of agricultural experimentation in Malawi (Nyoka et al. 2011).

Most trees on farms were traditionally managed, at least in part, as safety nets that bailed the smallholder farmers in times of crop failure or vulnerability. They were also used widely for medicinal purposes. For example, Anna Masache, a smallholder farmer in Chikhwawa district in southern Malawi, grows Neem at her household and calls the tree a "village pharmacy" because she claims it heals "over 3000 ailments". She also uses Neem leaves as a fertilizer, and therefore does not need to buy expensive and often scarce inorganic fertilizers. Perspectives such as this are common across the country, which is why trees are a dominant feature in the agricultural landscape in Malawi. It is common to see a diversity of important tree species on farms, which are not readily available on uncultivated land. A local leader in Balaka district Mr Yohane Jussab said that "trees left on-farm have many purposes but most of these relate to source of fruits, soil improvement, fodder, medicine, building materials, fuel wood, timber, and more recently a feed stock for production of biodiesel".

3.3 Introducing some important commercial on-farm tree crops

On-farm trees, as noted above, are one way of crop diversification and a key strategy used by the climate vulnerable groups to increase food security. But they can also form the basis of tree-based enterprises. In this section we introduce five important tree species that could be used for such purposes (Table 1) and explain why these (and other species) are so important as options for climate-smart, on-farm tree-based enterprises.

Table 1
Household benefits selected trees on farm

Part	Jatropha curcas	Azadirachta indica (Neem)	Moringa oleifera	Faidherbia albida	Acacia polyacantha
Leaf	Organic fertiliser	Organic fertiliser, natural insecticide, medicine,	Organic fertiliser, food supplement, medicine, livestock feed	Organic fertiliser (with reverse leaf phenology)	Organic fertiliser
Flower	Bee pollen	Medicinal	Medicinal, bee pollen	Bee pollen	Bee pollen
Trig/Branch cutting	Propagation	Firewood, charcoal, dental hygiene	Propagation, nutritional supplement, medicinal	Firewood	Firewood, charcoal
Fruit/Pod			Food, medicinal	Livestock fodder	–
Seed press cake	Fertilizer, biogas feedstock	Fertilizer, biogas feedstock	Fertilizer, biogas feedstock, water flocculants, livestock feed	–	–

Source: Adapted from McLellan, L. (2009)

3.3.1 Jatropha (*Jatropha cusca*)

Jatropha is a multipurpose perennial tree belonging to the Euphorbiaceae family. It is locally known in Malawi as 'Msatsimanga'. The tree is resistant to drought and can grow on most soil types (although not waterlogged soils) and will flower if there is more than 600mm rainfall and warm temperatures. It is the fruit which is used – containing oil-bearing black seeds that can be used as a feedstock for biodiesel production or as a replacement fuel for kerosene for cooking and lighting.

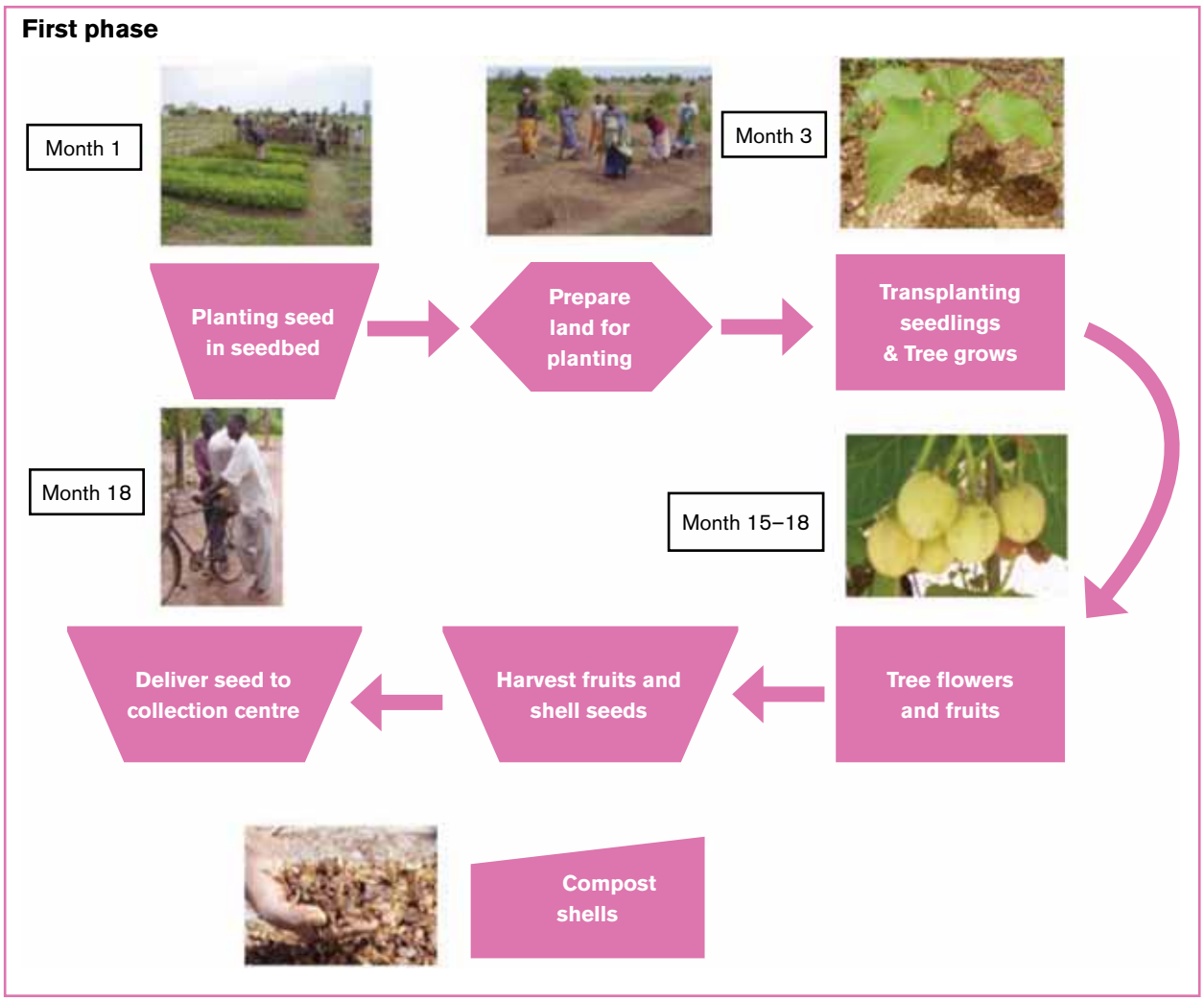
According to JANEEMO, the seed yields range from 0.1–15 tonnes/hectare/year and 1kg of nuts can produce 0.2 litres of oil. JANEEMO describe how it is possible to make a simple lamp using Jatropha oil by taking an old water glass, a shoe polish lid and a shoe lace or wick. This is done by threading the lace through a tight hole in the lid and floating on top of the oil. Just 100ml of oil can provide lighting for over a week. Jatropha can also be a key ingredient for soap making by mixing the oil with water and caustic soda.

William Kamoto, a Jatropha farmer at Nsundwe village in Lilongwe district, central Malawi, reported that he planted Jatropha as his "savings bank". He said that it does not take many inputs or agro-economic processes to manage it. Incorporation of trees on the farm is seen as a way of increasing and diversifying the household economy while also adapting to the negative impacts of climate change. The high prices of farm inputs such as fertilizer are influencing many smallholder farmers to incorporate Jatropha trees on their farms to improve the fertility of the soils.

According to the smallholder farmers interviewed, planting trees in their gardens or around their homesteads diminishes the effects of weather extremes such as droughts, or heavy rains by improving soil organic matter. A farmer in Chikhwawa said that because the area is usually very hot, with temperatures rising to 40 degrees centigrade, the Jatropha tree with its broad leaves becomes a source of shade for the household. In his opinion, agro-forestry has been shown to increase soil biomass and moisture retention, providing annual crops with greater water availability and therefore increased production and more food and money for the smallholder farmers.

Each of the trees planted on farms have particular uses. However, market forces are influencing which trees are preferred. For example, with the advent of biofuel, many farmers are now growing Jatropha as a farm enterprise. It is mainly planted as a fence because it is fast sprouting once a cutting is planted and can be used to demarcate homestead boundaries or those of bordering farms and gardens. The trees can be grown from either tree cuttings or seed. They grow easily in marginal lands, and naturally discourage

flickr.com/CIFOR



Source: Adapted from original diagram by BERL ltd

browsing livestock because their leaves and stems are toxic to animals which can also help keep goats away.

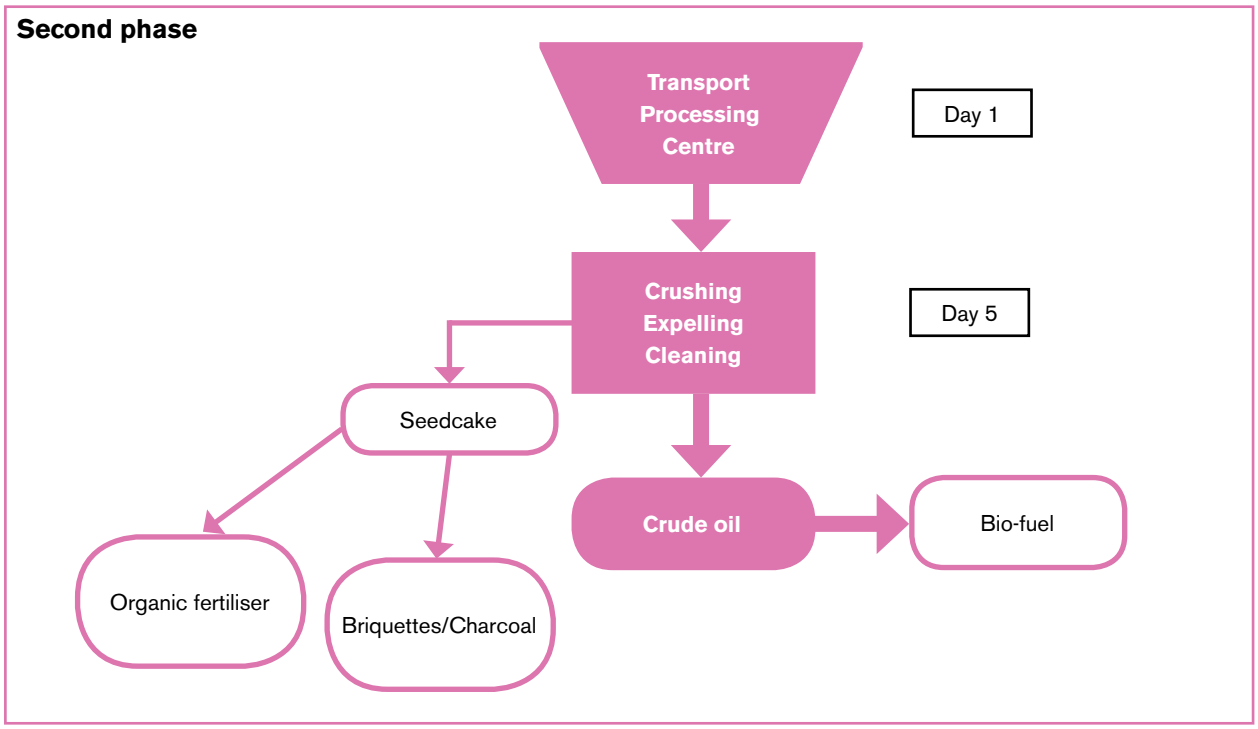
Because of their shallow spreading root system, Jatropha trees reduce soil erosion and can be useful in reclaiming eroded land. They also produce a high quality organic fertilizer during the oil extraction process the mineral composition of which is reported to be comparable to that of chicken manure, making the fertilizers ideal for rural communities. The fumes from the Jatropha oil lanterns are a high-quality mosquito repellent, most ideal in the Lower Shire where there is a multitude of mosquitoes (Gondwe, 2009).

The increase in Jatropha growing has come as a result of the demand for alternative sources of energy, high fossil fuel prices, the advent of energy crops and carbon sequestration. The increasing realisation that they can make money out of this tree crop has fuelled the growth and increase in the number of small holder farmers and estates growing Jatropha in the country. The low prices of crops like tobacco, compounded by the global anti- smoking campaigns, are also influencing many farmers to grow alternative crops that can bring in income in case tobacco growing is phased out. A number of companies like BERL have established out-grower schemes which subcontract smallholder farmers to produce the biodiesel feed stock to be sold by the company. Toleza Farm Ltd also has an out-grower scheme (smaller in scale compared to BERL) but its focus is to produce biodiesel for its internal use like operating farm machinery and equipment.

Other organizations are also supporting smallholder farmers to grow Jatropha for their own household use. For example, the Malawi Department of Forestry has provided support through the EU-funded 'Improve Forestry Management for Sustainable Livelihood Project' and Enviro Africa (an NGO) is promoting the growth and use of Jatropha at household level. Other organizations involved in promoting growing and processing of Jatropha as a business include Enviro Fuels, the Malawi Bureau of Standards (MBS), and Entech.

According to BERL Malawi, the first phase of production of biodiesel from Jatropha (planting to harvest) is limited by nature; Jatropha takes approximately 15 to 18 months to yield seed. The second phase (collection to expelling and cleaning) is a matter of logistics and processing capacity and takes about three weeks.

The first phase begins with preparing the seedbeds for planting the seeds. Also the land will be prepared for planting during the dry season. Pits are dug and manure added. This stage takes a month or more depending on the area and number of labourers deployed. With the start of the rains, seedlings are transplanted. The Jatropha plant rests during the dry season and flowers during the rains, ten–twelve months



Source: Adapted from original diagram by BERL ltd

later. Mature seed is harvested and de-shelled in months 15 to 18. The seed is taken to the nearest collection centre while the shells are composted either at the farm or at BERL's processing centre. The process is complete in about 19 months

The second phase begins with seed being delivered to the processing centre. Here the seed is crushed to expel the crude oil. The crude can be used for lighting, or engine fuel in rural areas. Cleaning the oil further will create a composition suitable as an additive in petrol-diesel

3.3.2 Neem (*Azadirachta indica*)

Neem, referred to locally as 'Nimu', is easy to grow in a wide range of temperatures and conditions. The tree can live for 150 to 200 years. As well as being a useful fuel wood tree, all parts of the Neem tree can be used for cosmetic or medicinal purposes. For example, leaves (often in powder form) may be used to treat malaria, intestinal problems and rashes. It stimulates the immune system, improves liver function, detoxifies the blood and generally promotes a healthy circulatory, respiratory and digestive system. It is famous for assisting in the treatment of stomach upset, malaria and diabetes. Both the Neem leaf and seed oil have been shown to relieve dry skin, soothe itchiness and irritation, including improving general skin health and immunity, and combating bacterial infections as in acne, boils and ulcers. The seed oil can be used when you want to avoid using harsh chemicals to treat psoriasis, eczema, scabies and even head lice. The oil is often used to improve hair condition and avoid a dry itchy scalp as well as being used to treat brittle nails and nail fungus. Neem leaf is an essential ingredient in many herbal remedies. Neem can also be used in animal husbandry and farming. It can improve the overall health of your animals and be used as a natural pesticide on crops (JANEEMO).

flickr.com/adaduitokla

Amongst farmers interviewed for this study, knowledge about Neem tree planting is passed on from one generation to another. Historically, households have planted trees around their houses as live fences for wind breaks, shade, and medicinal trees. At the village level, 70–80 per cent of people seek traditional medicine before they seek medical help at the hospital. Medicinal plants such as Neem play a significant part in the medicinal needs of the rural households. It is a longstanding tradition for rural people to plant trees around their homestead to ensure easy access to the leaves, seeds, bulk and roots for medicine if they fall sick. A lot of trading in traditional medicine, fruits, firewood, and poles, is also taking place within the villages which brings money to the rural poor households, traditional healers, traditional birth attendants and many others.

Neem trees were mainly planted as shade and medicinal plants but now that the medicinal value is well-known there are increasing commercial opportunities. Like Jatropha, Neem is regarded by local people as the "village pharmacy" because it is well recognised in at least the Lower Shire (Chikhwawa and

Nsanje Districts) as being able to cure many ailments. Many research reports indicate that Neem seeds, bark, and leaves contain compounds called 'limonoids' which have proven antiseptic, antiviral, antipyretic, anti-inflammatory, anti-ulcer and antifungal uses. The tree leaves are eaten by livestock such as goats and Neem poles are used for construction purposes.

Over the years, a number of individuals, organizations and companies have started to promote and process Neem leaves, seed and bark to produce medicines. This is encouraging many farmers to improve the management of the trees around the homesteads and also increase the production of the tree on farms. In the JANEEMO initiative, there are over 4000 smallholder farmers involved in the processing of Neem leaves, bark and roots for medicine. In addition to the individual farmers, there are many other companies that are processing Neem into various medicinal products. For example, some are processing leaves into powder and bottling to sell on the market at prices of US$50 per half litre tin.

In Salima district, Charity Kamodzi said she has planted Neem trees around her house particularly to supply leaves for medicinal purposes to traditional healers and all the people in around the district who want Neem medicine. She noted that with high prevalence of HIV and AIDS pandemic, the demand for traditional medicine is increasing, partly because the majority of people living with HIV are poor and cannot afford most of the medicines prescribed for them at health centres. The easiest options for many such people are to access traditional medicines or buy from the smallholder farmers that have such medicinal plants as Neem. In Chikhwawa, one farmer said that he managed to realize MWK 85,000.00 in a year (about US$236) from sale of leaves and seeds to traders from Blantyre and surrounding areas.

Beyond Neem, NGOs are also developing community programmes that promote multiplication and consumption of various medicinal plants. The small farms where these trees crops are grown are called "herbal gardens". Herbal gardens are becoming an important source of income-generating activities for smallholder farmers at the household level. However, a policy barrier that constrains the production, distribution and consumption of medicinal herbs is that there is no robust legal framework to either regulate production, or to verify the efficacy and quality of the products of traditional medicine in the country. Because of the inexistence of the legal framework, the trade in traditional medicines is not fully benefiting either the producers who are selling their products at giveaway prices, or the buyers, who may be purchasing substandard or ineffectual remedies.

3.3.3 Moringa (*Moringa oleifera*)

Moringa (locally known as 'Sangowa') is planted mainly as a hedge and for fencing because of its characteristics of sprouting quickly once a cutting is planted. Moringa is used primarily as a nutritional supplement, its unique combination of essential amino acids as proteins, phyto-chemicals, antioxidants, minerals and vitamins appear to improve and relieve many medical conditions. So far no other plant source in the world has been discovered to contain all eight essential amino acids. These eight amino acids cannot be made by our own bodies they have to be obtained outside and they are critical for maintaining a healthy body.

flickr.com/Mauricio Mercadante

Table 2
Moringa leaf powder compared with other products

Nutrient/unit	Moringa leaf powder (Malawi)	Comparisons	Comparable product figure	Moringa leaf powder higher or lower
Beta-carotene *µg*	21,960	Carrots	12,472	Higher
Protein *g*	35.1	Peas	6.7	Higher
Vitamin C *mg*	22.28	Oranges	54	Lower-although higher in the fresh leaf form
Calcium *mg*	1223	Milk	118	Higher
Potassium *mg*	2022	Bananas	400	Higher
Iron *mg*	22	Spinach	2.1	Higher

Source: McLellan (2009)

Some of these amino acids have been found to regulate blood sugar and energy levels, and help to maintain a calm state. Healers have used Moringa for stress relief, hypertension, and anaemia, and also as an anti-inflammatory and to improve overall well-being. The tree leaves are a nutritional supplement which can be mixed in porridge or relish, taken as tea, or swallowed directly with some water. They can also be mixed in flour for bread or cakes. The fresh leaves can also be cooked into a relish either as a vegetable or even mixed in with a curry. The seed pods can also be eaten as green beans and provide a source of protein and medicine (JANEEMO).

Experience at JANEEMO and elsewhere has shown that Moringa consumption has a highly significant positive impact on reducing malnutrition in children. This discovery has led to an increase in cultivation of the tree by rural communities. The increased level of attention and business opportunities for cultivating trees on farms is influencing many people plant and manage these trees therefore improving their management.

In the past, Moringa has been widely grown and consumed in times of food crisis or shortage along Lake Malawi and the Lower Shire in Malawi. Local people assert that Moringa leaves have more beta-carotene than carrots, more protein than peas, more vitamin C than oranges, more calcium than milk, more potassium than bananas, and more iron than spinach as shown in **Table 2** above. The Moringa tree can also be harvested for firewood and timber for construction. Moringa tree crops are mainly grown by rural farmers around their homesteads. However, some companies are also getting involved, such as Moringa Miracle Limited[12] which is piloting a project in Chikhwawa district to commercialize production of Moringa. At the time of this study, the company had invested about US$100,000 into the pilot project.

3.3.4 Faidherbia (*Faidherbia albida*)

Faidherbia is known locally as 'msangu', or 'the magic tree' and it is renowned for its resistance to drought, its nitrogen-fixing properties, and for protecting soil. It exhibits an extremely unusual 'reverse phenology', which means it holds its leaves in the hot, dry season, shading understory crops, and drops them in the rainy season when crops are growing and need light – while also fertilizing the soil. Its timber is also useful as a wood fuel.

The remarkable properties of Faidherbia have led to more than 500,000 farmers across Malawi, Tanzania and Zambia cultivating their crops in Faidherbia agroforests. Farmers report that their maize yields have doubled or tripled through use of the species (ICRAF, 2012). Field research in Malawi showed that maize yields were increased up to 280 per cent in the zone under the tree canopy compared with the zone outside the tree canopy (Saka et al. 1994). Fertility is enhanced through natural nitrogen fixation, organic matter recycling and carbon sequestration. Depending on its age, a good stand of Faidherbia fixes 80–90 kg of nitrogen per hectare and sequesters between 5 and 30 tonnes of carbon per hectare (UNCCD, 2012). While yield gains vary from site to site (and seem to be most pronounced in very low soil fertility sites), a study comparing 286 Faidherbia projects showed an average increase of crop harvests of 79 per cent.

In recent research on farmer perceptions of Faidherbia in Malawi (Phombeya et al. 2005) it was found that the majority of farmers with Faidherbia trees on-farm never applied mineral fertiliser because of the nutrient gains of those trees that began when the trees were four to six years old. As a result, the majority were willing to expand the number of trees planted. The authors of the report called on the government to mobilise a national programme to make people aware of the benefits of the tree-based on their research.

The use of Faidherbia is slightly dissimilar to the three preceding tree crops in that its main product (green manure / soil fertility) is not directly tradable. However, the tree does contribute to the increase in sales of existing farm enterprises. In common with many other agroforestry trees (e.g. species such as 'Gliricidia sepium' or 'Calliandra calthyrsus' – see ICRAF, 2009) trees such as this are being used to enhance on-farm, tree-based, climate-smart enterprises in Malawi.

12 http://www.moringamiracle.net/

3.3.5 Acacia polyacantha

Acacia polyacantha (also known as 'whitethorn') is a relatively fast growing native species which is particularly useful as a source of managed fuel wood or charcoal production. It occurs naturally in wooded grassland from sea level to 1800m. The species is easy to propagate (often with abundant natural regeneration) and in trials shows high rates of survival (70 to 90 per cent), drought tolerance, resistance to diseases, termites and other pests (Bunderson et al. 2006). It responds well to pollarding and coppicing. Woodlots can be thinned at 10 years and then a full harvest can take place at 25 years. Information is available for the carbon savings that can accrue through the integration of this species in boundary planting (ESD, 2009). Growth rates are relatively fast and the wood is a particularly good source of charcoal. The main constraint for establishing managed woodlots for charcoal production is the prevention of fire damage or grazing to young seedlings.

Of course *Acacia polyacantha* is only one of a number of possible sources of managed charcoal in Malawi. Because fuel wood and charcoal are relatively generic products that can be sourced from a range of species, it would be possible to envisage a range of potential commercial models from managing natural Miombo woodland, to the establishment of exotic plantations of species such as Eucalyptus etc. for charcoal production. We introduce the use of *Acacia polyacantha* here simply because it is one of the native species with optimal properties for such a purpose and one that has been trialled by the Wildlife Action Group (WAG)[13] in the Salima district.

The potential for commercial charcoal production in Malawi is high. The industry is Malawi's third largest and employs 133,000 people (Kambewa et al, 2007). Yet all of this is technically illegal as no licenses have yet been issued by the Department of Forestry.

High population growth, increasing energy costs and low access to electricity grids (restricted to urban centres) mean that the vast majority of the population will continue to be dependent on fuel wood and charcoal as their main energy source for the foreseeable future. In an effort to solve the problem of energy supply, the government produced the Biomass Energy Strategy but as its implementation has not yet been resourced, its positive impact may take a while to be noticed. The Malawi Forest Governance Learning Group (FGLG)[14] carried out a charcoal study (Kambewa et al, 2007) to influence the government to consider options for sustainable charcoal production in the country, but the policy makers in the country have not yet decided to address the issue.

Because the demand for charcoal continues to increase, some farmers are being forced to cut down their trees on farm for charcoal production. In Chikhwawa, one farmer said that he sold his Neem tree to a charcoal burner to make charcoal. Smallholder farmers in Mangochi in Lilongwe said that they are now selling their mango trees to charcoal burners to produce charcoal for sale in urban centres like Lilongwe City, the capital of Malawi.

If the feedstock for charcoal is managed sustainably, charcoal and fuel wood can be very low-carbon energy alternatives. But turning the current situation around, and making charcoal a climate-smart, on-farm, tree-based enterprise will require some major changes in attitude from the government. First, the policy and legal framework for forestry need to be adjusted in line with the Malawi Biomass Energy Strategy. While the existing National Forest policy and Forestry Act provide for production of charcoal from a sustainable forest resource, none of the forestry resources in Malawi has achieved the sustainable source status. Producing charcoal from a sustainable source requires that a forest area should have an approved management plan. The technical intricacies of producing one mean that none of Malawi's forests yet have one. The Forestry Department (being an institution responsible for forest resources in the country) has failed to take a meaningful stand on charcoal production despite the various recommendations that have been made towards charcoal production in the country. Second, because charcoal production is illegal, its market is also not organized and the efficiency of production is very low. No farmer will invest in a more efficient charcoal production kiln if that infrastructure merely serves to advertise what is deemed an 'illegal' activity.

3.3.6 Other fruit trees and agro-commodities

Fruit tree production is of course a major component of the Malawian agricultural system. In addition to conventional international fruit species (such as mangos, Guava, citrus, bananas, peach, paw paw etc.) there are also a range of lesser-known indigenous fruit trees that have been developed to varying degrees as commercial on-farm crops (such as *Sclerocarya birrea, Uapaca kirkiana, Parinari curatellifolia, Ziziphus mauritiana* and *Adansonia digitata*). Yet few of these have yet reached commercial production status. For example, it is only mainstream crops that have so far been developed under the 'One Village One Project' (OVOP)[15] Secretariat of the Ministry of Industry and Trade which has been operational since October 2005 with assistance from Japan's International Cooperation Agency (JICA). The first phase of the project was completed in October 2010 and phase two was launched in 2011 and will run up to 2016. The project mobilises farmers into cooperatives which produce products that are unique to their group and village and the OVOP secretariat, through a network of satellite markets. It then facilitates exportation of final products to the international market. A recent survey showed the following types of cooperative by nature of their enterprise.

The socio-economic study of the OVOP programme found that of the total income earned from the three main sources of income by group members, OVOP-related activities (OVOP final product, OVOP raw materials and OVOP labour and related activities), contributed 22 per cent to the livelihood total.

13 http://www.wag-malawi.org/
14 http://www.iied.org/forest-governance-learning-group
15 http://www.ovop.org.mw/

Table 3
Examples of OVOP enterprises in Malawi

District	Name of OVOP Group and type of enterprise	Number of group Members	Type of crops used
Lilongwe	Mitundu Agro processing	80	Non-tree crops
Ntcheu	Biriwiri Potato Crisps Making	37	Potatoes
Mwanza	Mwanza Prison Beekeeping	34	Honey
Blantyre	Kumbo Oil Refinery	105	Tree-crop (Moringa)
Mulanje	Mapanga Honey Processing	95	Honey
Mchinji	Kamwendo Oil Processing	22	Sunflower
Nkhatabay	Mkondezi Winery	25	Tree crop (Banana)
Karonga	Wovwe Rice	67	Rice
Karonga	Kaporo Palm Oil Producers	120	Tree crop (oil palm tree)
Totals		956	

Source: Sibale and Chunga, 2011

3.3.7 The JANEEMO initiative

In 2007, a new initiative was launched that actively encouraged planting and use of Jatropha, Neem and Moringa (JANEEMO) trees in combination at the smallholder level, in the Lower Shire districts. It began with funding of £398,658 from the EU and Scottish Government International Development Fund, and worked closely with the Forest Department.

In 2011, JANEEMO moved its focus to the Lilongwe and Dowa districts. A new partnership was formed, with permaculture experts from the Kusamala Institute of Agriculture & Ecology. More diversity was introduced to the planting model, with the introduction of new trees and shrubs, and the creation of a food forest with vegetables. Additional sustainable farming techniques are also being promoted, including diversified planting, use of swales, rainwater conservation, use of vetiver grass and mulching. These are helping to better manage water, soil and land, reduce the impact of climate change on agricultural production and protect the environment for the improvement of lives and health.

JANEEMO is an agricultural design system that integrates trees, shrubs and vegetables. These create diverse food production systems for sustainable living and enterprise development. These are grown by farmers, as living fences around household and field boundaries, intercropped with maize and other staples and planted as gardens. The food, timber and other income-generating products are used at the household level or sold locally.

The initiative, which started with farmers in the Lower Shire in Nsanje and Chikhwawa districts in 2007, now has over 4000 registered farmers actively engaged in planting, processing and selling Jatropha, Neem and Moringa products.

3.4 Who are the main actors supporting on-farm tree-based enterprises

3.4.1 Public sector enabling investments

Over the past 40 years, the government of Malawi with support from development partners, research institutions, and academia has introduced various agroforestry technologies and trees species to promote food production and increase farmers' income. The Forest Research Institute of Malawi (FRIM), the Land Resource Conservation Department (LRC), the Department of Agriculture Extension Services and Bunda college of Agriculture have all played a role from the Malawian side. Such organizations have introduced various technologies such as domestication of indigenous fruit trees, processing of fruit juice from indigenous fruits, and inter-planting of fruit trees with crops. The fuel price increases, the need for locally available food supplements, together with the anticipated income generation potential of some tree crops has influenced

flickr.com/tgerus

Case Study BERL Malawi

Bio Energy Resources Ltd. (BERL), a Malawian company, was established in 2006 with the sole purpose of producing bio fuel on a commercial basis within a sustainable framework. BERL Malawi has established a community farmer-based planting programme to plant Jatropha trees throughout 10 districts of Malawi. It currently has contracts with roughly 3000 farmers. This will provide the feedstock for its processing plants. In the long term, BERL intends to provide Malawi with products whose demand will continue to increase.

BERL is currently rolling out an extensive tree planting programme to smallholder farmers using internationally recognised responsible practices. Through its extension agents farmers receive training and support and are registered as BERL farmers. Oil seed is then purchased from contracted BERL farmers. The company cleans crude Jatropha oil for use as a bio fuel, to be blended with fossil-diesel for sale and use in Malawi. It also develops and offers various by-products to the market, including bio fertiliser and green charcoal. Some of its staff offer technical services to interested parties who would like to promote an additional, secure cash crop to rural communities at a grass root level.

BERL is working towards a Certified Carbon Credit Programme with re-vegetation by planting Jatropha and is contributing to the development of bio fuel policy in Malawi.

Even though the interest of BERL is the seed which is the feedstock from production of the biodiesel, the smallholder farmers are currently being paid MWK 3 per tree that survives annually which is paid thrice a year. A lead Jatropha farmer visited by the authors of this study reported that he oversees 11 Jatropha farmer clubs. Each club has about 12 members (with a quota of 50 per cent men and 50 per cent women). Each club on average receives about MWK 10,000 (US$ 27.8) a year as an incentive to manage Jatropha plants they have in their fields. This amount of money is given per tree survived to maintain the interest in the programme prior to seed sales and assists the farmers to buy various households requirements.

Source: http://www.berl.biz/about_Us.html

many individuals, companies, smallholder, estate owners to grow various types of tree species for business.

Support for public investment has come from research institutions such as the International Centre for Agroforestry Research (ICRAF) which has undertaken substantial work in promoting trees on farm and also the domestication of fruit trees.

3.4.2 Private sector investment

In addition to public sector investments and support by research institutions, a number of private companies and individuals have also been promoting the growing of various tree species on-arm as a business. These include companies like BERL Ltd,[16] Demetre Agriculture Ltd,[17] Toleza Farm Ltd,[18] Exagris Ltd,[19] Tree Tops and Mary's Meals.[20] For example, by 2010, BERL has engaged over 3000 smallholder farmers to grow Jatropha as feed stock for its biodiesel business. Various individual estate owners have also ventured into the business of growing Jatropha for biodiesel production, processing of Neem into various medicinal derivatives, and processing of Moringa into food supplements for children. Some investments have been achieved with support from offshore borrowing and grants from parent companies based outside Malawi, but it is difficult to quantify the amounts of money that have been invested in the business ventures.

3.4.3 Smallholder involvement

Smallholder farmers and estate owners look at Jatropha as an alternative tree crop that can enable them to generate household income. Small scale farmers have been advised to grow this crop in marginal pieces of land in order to reduce completion for land with crops. Most of the investments by smallholder farmers are being supported by the various companies. For example, BERL provide all the technical support services, seed material and quality control services to the smallholder farmers under its contractual agreement. BERL makes sure that all its farmers receive about MWK 3 (US$0.008) per annum per Jatropha tree that survives. This is an incentive provided to farmers to ensure that they take care of their Jatropha woodlots. In addition BERL has marked and mapped all the areas and villages where contract farmers are based. It has also developed a robust monitoring and evaluation system to ensure that all smallholder farmers are tracked and provided with the required technical support and advice.

Not many farmers have yet started harvesting their Jatropha tree crop. However, the current price per kg of feedstock

16 http://www.berl.biz/
17 http://www.farmersworld.net/index.php?iframe=demeter
18 http://www.tolezafarms.com/
19 http://www.exagris.com/
20 http://www.marysmeals.org.uk/

ranges from MWK 45 to 90 (about US$0.12 to 0.25). This price range offers an opportunity for smallholder farmers to generate the much needed income from selling oil feedstock. Because most of them are already assured of the market (based on the out-grower scheme contracts) they are encouraged to manage their tree crops in line with BERL's set management and husbandry standards of Jatropha production. However, the current study found that most farmers interviewed around Nsundwe Trading Centre received limited agronomic extension about Jatropha. Most of the plants visited had been seriously attacked by pests and their growth was not attractive.

It is expected that once the smallholder farmers start selling their harvests, they will be able to sustain their business from the income generated. According to BERL, once they start processing biodiesel each farmer will get the seed cake produced as a by-product from the factory which they can use a fertilizer in the gardens. Which means that in addition to part of the income from sales, a tree survival rate bonus, and technical advice and support, the small holder farmers will also get back seed cakes (waste product from the factory after producing biodiesel) which they can use as manure in their gardens.

3.5 Impacts of the on-farm tree-based enterprises

Promotion of tree-based farm enterprises are increasingly demonstrating their potential for improving the livelihoods of the rural poor, stabilizing fragile ecosystems, improving soil fertility, increasing incomes and yields, climate change adaptation and greenhouse gas mitigation. In this study a number of positive impacts from these enterprises were identified.

3.5.1 Local economies and household income

Several smallholder farmers are planting trees on their farm as a long-term enterprise. They are selling firewood, medicines, charcoal, fruits, seedlings and a number of tree-based products which in turn improves the household level incomes. The high population growth and high HIV and AIDS pandemic in Malawi are some of the key drivers for increased demand for tree-based products such as medicines, fuel wood, charcoal, firewood and others. New markets are being created, especially in urban centres which are providing strong incentives for more investment in on-farm tree-based products by smallholder farmers.

Women's groups in Chikhwawa district indicated that they get an income of close to MWK 75, 000 (US$208) per month from sales of medicinal products as the demand for them has increased both within the district and from urban centres in the southern region. The money realised from the sale of tree-based products is used for buying many households needs such as buying uniforms for their children, buying other basis household necessities. One woman said that the money she obtained from the sale of Neem leaves was reinvested to buy shares from the village saving and loan group (VSL) that was established in the village. With the shares she bought she is able to borrow from the VSL and her share in the group has increased from 10 to 20 during the two year period she has been a member of the VSL.

The JANEEMO initiative procured grinding mills for women in Chikhwawa and Nsanje which they are using to process Neem, Moringa and Jatropha to produce various products. These products are being sold in the villages and in urban centres which is a good source of income to the women groups. Using the grinding machine, farmers are able to produce Moringa powder, biodiesel and Jatropha seed cake which they are locally using and selling. Some of the grinding mills are also used for milling maize and sorghum, hence reducing the distance women travel to mill the maize for household food preparation. Non-members of such clubs mill their maize at some cost, hence raising income for club members. Recent reports from the media (Zodiak Broadcasting Corporation, 2012),[21] however, have indicated that other mills, installed by the EU supported 'Integrated Forest Management for Sustainable Livelihoods project' for communities to process their tree crops in Chikhwawa and Nsanje, have faced challenges in terms of patronage because they were located far from market centres where they could have been used for multiple uses other than just tree crops.

Since most of the people are operating in a group, farmers in the JANEEMO project indicated that even though some income is being realised from processing adding value to Neem, Moringa and Jatropha, the amount is still too low to make significant impacts on the livelihoods of the people. A similar picture came from farmers that have planted Jatropha under the BERL out-growers scheme. Farmers under the BERL initiative believe that significant impact on their lives will be made when they start selling the seeds (feed stock) for biodiesel production. Currently none of the farmers has started selling significant amount of Jatropha seeds to BERL hence the impact on the livelihoods is still small (see BERL case study box above). Table 4 below summarises the levels of income realised by farmers from the various tree-based products, especially from Neem, Moringa and Jatropha.

Some companies like the Moringa Miracle Limited (MML) have invested over US$100,000 to raise *Jatropha olifera (jatropha)* on irrigated land. This investment has provided employment opportunities to over 10 people from the surrounding villages

Table 4
Farmers' income levels per harvest from JANEEMO products

	Jatropha Seed (n=61)	Neem Wood (n=42)	Moringa Seed/ Seedlings (n=24)	Moringa Powder (n=14)
Income range (MK)	60–20,000	1,000–66,000	60–4,500	25–37,000
Average Income (MK)	688.85	9,536.00	1,048.00	3,730.71
Unit Price	MK60/Kg	MK500/M^3	MK60/Kg	MK250/Kg

Source: Entech Assessment (2012)

of the project in Chikhwawa who are working in the tree nursery.

3.5.2 Impacts on agricultural resilience

Many households have planted trees on their farms in order to adapt and mitigate the negative impacts of climate change. Trees integrated into farming systems have significant potential for meeting all the three measures of what constitute climate-smart agriculture which are: 1) reducing poverty and improving food security; 2) increasing resilience to climate change shocks (adaptation); 3) helping to mitigate climate change by locking up carbon in trees and agriculture land (PROFOR, 2011). In all the districts visited during the study, increased tree populations were apparent on farmlands, in comparison with open access (customary land) and in some cases public land (state-owned). People are feeling the negative impacts of climate change and at the same time want to improve the productivity of their pieces of land hence integrating trees on farm is seen as the way forward.

There is greater awareness amongst smallholder farmers on the linkages between food security, poverty and climate change which has led many of them to adopt various climate-smart agriculture techniques such as conservation agriculture and agro-forestry. The high level of awareness amongst farmers has led to increased interest and appreciation for climate-smart agricultural solutions which include tree-based farm enterprises. For example, recent work by ICRAF and partners has seen a total of 345 farmer groups and 17 individual nurseries raise over 2.1 million seedlings of a wide variety of agroforestry species (Pye-Smith, 2008)

Farmers interviewed in Salima and Balaka district noted that those who practised conservation agriculture (e.g. using Faildebia albida) during the rainy seasons between 2010 and 2012 were able to harvest higher maize yields than those that did not practice conservation farming and did not plant nitrogen fixing trees in their gardens.

Evidence exists that integrating trees on farms increases crop yield and resilience to climate change impacts. However, the number of farmers adopting climate-smart agriculture practices is still small compared to the total population of the country and hence the national impacts are still small. Climate-smart techniques are relatively new and the need for increased investment in building the capacity of farmers cannot be overemphasised. The low adoption rates of soil conservation techniques are related to the perception that planting trees on the farm does not bring immediate benefits. Farmers have to wait for a long period before realising benefits. This perception is fading but the government needs to invest a lot in promoting the approved and tested techniques that yield results in both short and long-term.

3.5.3 Impacts on forest ecosystems

The high deforestation rates in the country have led to the loss of biodiversity, high level of soil erosion, siltation of rivers and dams, increased incidences of water borne diseases and malaria, and loss of flora and fauna. Tree-based enterprises have demonstrated high potential for rehabilitating the degraded ecosystems. It was noted that in Nkhatabay and Nkhotakota districts, once people have adequate tree resources on their farms or gardens, they are less likely to walk long distances to cut down trees for poles, fuel wood and other uses. One beach village committee said that they are able to dry their fish from firewood collected from their individual gardens and they now spend less time collecting firewood from further away areas. The groups are also able to sell firewood and poles to other people around the village's fishing area. The availability of trees farm based products to the BVC has allowed the nearby forest area which is on an ecologically unstable area to regenerate.

21 ZBC News Bulletin of May 21, 2012

4 Operational challenges

The growth of tree-based enterprises continues to face a number of challenges including the following:

4.1 Policy barriers

4.1.1 Lack of policy implementation and finance

The Government of Malawi has published numerous documents that place strong emphasis on community forest management within Malawi (see FGLG, 2009). Perhaps the clearest articulation of the roles and responsibilities of government in supporting the roll out of community forest management (and specifically the key implementers – District Forest Officers) comes in the "Standards and guidelines for participatory forestry in Malawi" which provides step by step guidance for District Forest Officers on how to ensure that relevant actors and authorities at village level are included in the development of community based forest management activities (GoM, 2005). Despite such documents, financial support for District Forest Officers to carry out this mandate has been constrained. As a result, the pre-conditions of formal registration of village level organisations (Village Natural Resource Management Committees or their equivalent in community forest areas or Block Management Groups in forest reserves), and development of management plans for those forest areas have been painfully slow. The process of formal approval and registration of Forest Management Agreements that require signatures from the Department of Forestry has also been slow.

Many highly progressive policies, such as the new Malawi Biomass Energy Strategy (GoM, 2009), have detailed provisions for the establishment of a Biomass Energy Agency, to oversee the development of a Woodfuel Supply Master Plan, District Woodfuel Management Plans, a range of agroforestry, trees on farm and woodlot schemes, and the professionalisation of woodfuel and charcoal value chains. But nothing has happened in practice – either in terms of financial support, institutional developments, or tax incentives and funds for local small forest enterprises. By way of contrast, in countries such as Ghana, the government pledged US$2 million to assist a large scale Jatropha cultivation scheme in the centre of the country (Eleri and Eleri, 2009).

4.1.2 Bureaucracy

Some of the tree-based products such as medicines, fruit juice, and other products require certification from the Malawi Bureau of Standards (MBS). The MBS is mandated by an Act of Parliament to certify all products before they are consumed or used. However, most of the tree-based products and their derivatives have not been certified. The socioeconomic assessment of the OVOP programme found that many farmers were actually prevented from producing their products by the Malawi Bureau of Standards because of registration, which is a complicated process and expensive for smallholder farmers. This is affecting production and marketing of various tree-based products thereby compromising growth in the industry. Similarly, trade in medicinal plants is not organised and there is no robust legal framework to regulate production and marketing of traditional medicine in the country. This lack of legal framework means that the trade in traditional medicines is not fully benefiting the producers, who as a result are selling their products at giveaway prices due to undervaluing of the products by both the farmers and the vendor/traders.

4.1.3 Lack of Quality Standard Guidelines

Currently, there are no clear standard guidelines on the quality and chemical composition of tree-based product, including for example oil, medicinal, cosmetic, and soap (among others) products from Neem, Moringa and Jatropha trees. Many products are being sold on the market without proper standards and many buyers question the quality of the products resulting in farmers losing out on the market value of their products. In order to maintain consumer confidence, especially in the medicinal and cosmetic sectors, there is a need for clear guidance on optimal processing techniques and standard assessment methods to verify the active ingredients in those products.

4.2 Biophysical and demographic barriers

4.2.1 High rates of deforestation

Tree-based enterprises have not been spared from the rampant deforestation taking place in the country. Since many trees have been cut down in most woodlands, forest areas and protected forest areas, many people have turned on the remaining trees on farms as a source of firewood, charcoal and other products. The rate and scale of both deforestation and degradation, and the biomass supply and demand profiles for different areas in Malawi have now been accurately mapped (see Macqueen et al., 2011). In the centre, south and west of the country the situation is particularly acute. It was noted in Chikhwawa and Lilongwe that people are selling remaining trees on farms to charcoal producers in order to get immediate cash returns. This is threatening the growth of the tree-based on-farm enterprises since more trees are being cut than replanted for short terms household gains.

4.2.2 Further pressures through competition for land

Malawi's growing population requires increasing areas of land to ensure food security. At the same time, the increased commercial demand for biofuel production has influenced many small holder farmers and estate owners to venture into production of such tree crops as Jatropha. Even though many believe that Jatropha does well on marginal pieces of lands, some farmers are planting the tree crop on pieces of land that could be used for growing such crops as maize. Increased production of energy crops may have a negative impact on crop production. More money in biofuel production could easily result in encouraging many smallholder farmers to plant more biofuel crops at the expense of food production. Currently Malawi is experiencing a growing pressure to convert land to commercial biofuel production from Jatropha. This involves a monoculture plantation system that is not conducive to food security in a country with high land pressure (Maumbeta, 2009). In addition, land constraints amongst many farmers, especially in the southern and central region, are also likely to hamper promotion of tree-based on-farm enterprises for particular crops such as Jatropha.

4.1.3 Undermining of indigenous knowledge and agro-biodiversity

Over many years, people in rural areas have built up a considerable knowledge of different uses of tree species and have maintained agricultural biological diversity which has in turn enabled them to sustain and enhance their livelihoods. However, this knowledge and its value have for many years been undermined and not promoted. It has often been replaced by formal agricultural and forestry extension, which is in most cases not available to all farmers, due to limited capacity of extension providers. Most farmers are using their local knowledge to promote their on farm tree-based products.

4.3 Business development barriers

4.3.1 Weak coordination of key stakeholders supporting tree-based enterprises

There has been little coordination amongst players involved in tree-based enterprises. While the OVOP provides a forum coordinating cooperatives under the programme, it does not cover other enterprises such as the JANEEMO initiative, although there is potential to do so. The inexistence of established structures to coordinate farm-based enterprises underlines the point that there is lack of coordination amongst the various players. For example many players are involved in the Neem, Moringa and Jatropha production, marketing and processing but there is no mechanism to strengthen coordination and collaboration amongst the various players.

4.3.2 Lack of secure markets

The lack of organised market structures and stable markets is one of the biggest challenges for promotion of on-farm tree-based products. For example, there are no organised markets for products from Neem, Moringa even though there is increased demand for the products. In some instances smallholder farmers have entered into market contractual agreements to sell their products. For example, in Chikhwawa and Nsanje, smallholder farmers have been contracted by Mary's Meals (a Scotland-based charitable organisation caring for orphans and needy children in Chikhwawa) to supply Moringa powder. Farmers in several districts in the central, northern and southern regions have entered into contractual agreement with BERL to grow and sell Jatropha seed for biodiesel production. Apart from these arrangements, farmers have no readily available organised market for their various tree-based products. While farmers cultivating tobacco, tea, maize and other crops know where to sell their produce and how much they can gain from a particular product, the situation is not the same for most tree products, where most markets are kangaroo markets.

4.3.3 Limited value addition

Smallholder agriculture is associated with lack of added value in agricultural products. There is very little agro-processing and most smallholder farmers sell raw agricultural produce without adding value. Central to the promotion of on farm tree-based enterprises is the development of the alternatives for smallholder farmers to generate income. A lot of opportunities exist for farmers to add value to their forest-based products in order to enhance profitability of their investments. However, farmers face a lot challenges in Malawi. Apart from the limited knowledge and skills amongst smallholder farmers about adding value, the country has not provided support mechanisms to assist the smallholder farmers in adding value to their farm-based products. Farmers continue to sell their products without adding value which end up fetching low prices on the market. Technology availability is limited due to cost and infrastructural (roads, communication, back-up services and electricity problems). The government has also not provided enabling mechanisms to simplify and reduce transaction costs of value addition at community level.

5 Strengthening future prospects

5.1 Implement the supportive policy environment

As noted in Chapter 2, Malawi already has a supportive Growth and Development Strategy, an Agriculture Sector Wide Approach (ASWAp), and forestry legislation (including a highly progressive Malawi Biomass Energy Strategy) all of which endorse the importance of community-based forest management and tree-based enterprises in tackling both forest protection and rural poverty alleviation. Yet this supportive **policy framework is suffering due to a lack of financial investment and incentives** at district level (especially for District Forest Officers) to support small forest enterprises, be they on-farm, in village forest areas, or in the co-management of forest reserves. In the case of biomass energy (the pre-eminent use of forest resources within the country), the institutional structures and finance investment to enact plans and develop rural partnerships simply do not exist. These policy barriers require urgent attention if Malawi is to capitalise on the opportunities for climate-smart, on-farm, tree-based enterprises.

In addition, the government of Malawi urgently needs to develop a system of tax incentives and subsidies and extension support in favour of promoting tree-based enterprises. For example, currently, the country has no discernible policy framework or incentives for the production of biodiesel. Despite the increased number of farmers, companies and other organizations promoting Jatropha as a feed stock for production of biodiesel, the government has not **put in place a framework to guide its production, processing, marketing and use and to incentivise production in a way that benefits small forest enterprises.**

From a small farm-forest enterprise perspective, farmers have long recognized the value of trees in providing a varied range of goods and services (many of them important sources of local income). Despite this recognition, smallholder farmers plant trees cautiously on their farms since trees take time to mature and produce value in the future – whereas they often need immediate cash to support their households. The capital investment of tree growing is viewed as more risky than any alternative because of the time trees take to produce results.

Anything that can be done to **increase the security with which farmers can be assured of profiting from trees in the future, or anything that offsets the initial costs of tree planting** would be welcome. The deteriorating prices for staple commodities and crops such as tobacco are driving some smallholder farmers to diversify into tree crops. The commitment of farmers could be strengthened by: **government tax incentives and subsidies** (equivalent to those given to conventional chemical fertilisers); **support to organise farmers into groups that are attractive to financial investors**; research by state and NGO actors to develop **value added processing technologies and quality standards**; **extension services to provide technical support for tree planting, management and processing**. Our research showed that the majority of farmers interviewed reported that they lack extension support from government, NGOs and the private sector service providers. The inadequate extension support limits the capacity of farmers to expand production, add value and develop markets for tree crops.

5.2 Encourage enterprise-oriented organisations at district level

There is growing evidence that growing trees on farms is promoting entrepreneurism amongst smallholder farmers. The value addition (although not very developed) and processing technologies that are being developed for tree crops such as Neem, Moringa and Jatropha are helping to encourage many farmers to enter into value-added business while at the same time sustaining their tree-based enterprises. The high demand for tree-based products and increased income from the sale of the various tree-based products will encourage many farmers to grow more trees on farm. What is now needed is for **consolidation of those producer groups into strong enterprise-oriented organisations that can negotiate for better prices by dint of the scale of their production.**

One of the factors behind the success of the JANEEMO model has been the focus on “pass-on” – the principle whereby farmer-to-farmer approaches are encouraged to transfer skills and knowledge about tree growing, processing and marketing to other farmers. The basic model is that, in

the first year , 30 farmers are each trained and given 5000 tree seedlings – and each is tasked with producing 15,000 cuttings (3 from each plant), keeping 5000 for themselves (of which 600 or so mature into productive trees) and passing on 10,000 spread across ten other farmers each (e.g. 1000 plants per farmer). By the second year there are therefore 300 farmers – who both expand their own production to ensure they have approximately 600 trees and supply cuttings to and train a further 2 farmers each. By the third year, there are now 600 farmers and so on (Edwards et al. 2010). This type of approach strengthens linkages between farmers to strengthen the market information flow.

Despite such initiatives, many private companies are contracting the farmers as individuals and hence putting them in a weaker bargaining position. **Helping to convert farmer-to-farmer exchanges into strong local associations or cooperatives can help to turn this around.**

5.3 Establish best-practice guidelines for private sector out-grower schemes

The motivation for many private sector organizations to invest in tree-based enterprises is an acceptable return on investments. Private sector companies have seen this potential in tree-crop enterprises in Malawi and are committing themselves to establish plantations of Neem, Moringa and Jatropha and other tree crops because they expect to generate profits from their investments. They are already using various methods such as subcontracting or establishing out-grower schemes in order to expand their investments. One estate owner said the realisation that one can make more money in investing in tree-based enterprises, is a big driver and the continued positive returns on investment shall continue to influence many investors to stay in the business. In Malawi, the high energy prices, high HIV and AIDs rates, increased population and others all affect the sustainability of their businesses.

What is needed now is to **document best-practice in such sub-contractor or out-grower schemes and provide space to bring groups together to discuss how to optimise the impacts of such schemes for Malawi's growth and development strategy**. The development of these models might be directly transferable into other tree-crop sectors – for example into any attempt to professionalise the traditional fuel wood and charcoal supply chains.

5.4 Develop climate-related investment packages to achieve the above through REDD+

Many farmers are encouraged to plant trees on farm to both mitigate and adapt to the impacts of climate change. Studies provide evidence of the carbon sequestration potential of agroforestry systems which vary greatly, from under 100 Mt CO_2e per year to over 2000 Mt CO_2e per year over a 30 year period. Regardless of the exact amount, agroforestry systems tend to sequester much greater quantities of carbon than agricultural systems without trees (ICRAF, 2009b). In addition to carbon sequestration, tree-based enterprises provide other benefits including production of marketable tree products for income generation, fuel, food, and an enhancement of local livelihoods. Some of these options are more resilient to the climate change that is predicted to have a crippling effect on Malawi's agriculture. On-farm tree-based enterprises are therefore a climate-smart option – providing the two-fold benefit of climate change mitigation and adaptation.

Trees take a long time to mature and therefore to encourage more farmers participate in the growing of trees on the farm, there is a need to provide some financial resources to assist the farmers meet their short terms needs while waiting for their trees. For example BERL provides MWK 3 (US$0.008) per surviving tree to a farmer. This money help to relieve the suffering the farmer encounters by investing in a process that takes a long time to produce benefits. The payments to the farmers could cover labour and costs of planting and nurturing trees before longer-term benefits materialise. The obvious link between tree planting and climate change mitigation within national strategies (such as the embryonic REDD+ plans within Malawi) offer an opportunity to structure climate change finance to tree-based enterprise groups contingent on adequate Monitoring, Reporting and Verification systems.

In 2011, Malawi held an international workshop at Bunda College to discuss Monitoring, Reporting and Verification of deforestation and degradation. Out of that meeting was formed a multi-institutional working group to develop ideas for a national REDD+ Strategy. The government of Malawi, through the Department of Forestry in collaboration with Leadership for Environment and Development Southern and Eastern Africa (LEAD SEA) under the Lake Chilwa Basin Climate Change Adaptation Programme (LCBCCAP), has embarked on a process of getting Malawi ready for REDD+ in 2012. LEAD SEA is implementing the LCBCCAP in collaboration with the Department of Forestry and WorldFish Center. The process intends to be inclusive so that stakeholders are actively involved through multi-stakeholder consultations and participation, awareness meetings, capacity-building and drafting of a national Reducing Emissions from Deforestation and forest Degradation (REDD+) strategy. It is **crucial that the development of this REDD+ strategy pays due attention to the practical barriers and options for overcoming them that have been advanced in this report**.

References

Ard Lengkeek, 2004. Trees on farm to mitigate the effects of HIV and AIDS in Sub-Saharan Africa. Bredeweg, Randwijk, The Netherlands

Bunderson, W., Jere, Z, Chisui, J. and Kambalame, V. 2006 Enhancing rural liveihoods in Malawi, Tanzania and Mozambique. Total Land Care, Lilongwe, Malawi.

Campbell, B.M., Jeffrey, S., Kozanayi, W., Luckert, M., Mutamba, M. and Zindi, C. 2002. Households livelihoods in semi-arid regions: Options and constraints. Centre for

International Forestry Research (CIFOR), Bogor, Indonesia.

Cassells, G. 2011. Malawi deforestation map. Published in Macqueen, D., Kafakoma, R. and Sibale, B. (2011) Channelling REDD+ finance towards sustainable rural livelihoods in Malawi. FGLG Malawi Policy Brief No. 4. Training Support for Partners, Lilongwe, Malawi.

COMPASS, 2001. Natural resource Based enterprises in Malawi. Community Partnerships for Sustainable Resource Management in Malawi (COMPASS), Blantyre, Malawi.

Edwards, K., Chimusoro, J., Davidson, G., Price, K., Abbot, P. and Kayambazinthu, D. 2010. Restoring degraded land in the shire Valley, Malawi: lessons for community led initiatives that link restoration and the development of sustainable livelihoods. Paper presented at the 18th commonwealth Forestry Conference, Edinburgh, UK.

Eleri, A.I. and Eleri, E.O. 2009. Prospects for Africa-Rethinking Biomass Energy in Sub-Sahara Africa: Significant Energy Resources amid Growing Poverty. VENRO, German NGO Forum on Environment and Development and ICEED.

ESD 2009. Boundary planting technical specifications for the Trees of Hope Project. ESD, Lilongwe, Malawi.

FGLG Malawi. 2009. Making community-based forest management work. Malawi Policy Brief No. 3. Forest Governance Learning Group, Lilongwe, Malawi.

Gondwe, C. 2009. Conserve Trees and Forests, Featuring forest technologies, environment, economics, and administration. Department of Forestry, Lilongwe, Malawi.

Government of Malawi. 2005. Standards and guidelines for participatory forestry in Malawi. Government of Malawi, Lilongwe, Malawi.

Government of Malawi. 2006. Malawi's National Adaption Programmes of Action: Under the United Nations Framework Convention on Climate Change, 1st Edition, Ministry of Mines, Natural Resources and Environment, Department of Environmental Affairs, Lilongwe, Malawi.

Government of Malawi 2009. Malawi Biomass Energy Strategy, Government of Malawi, Lilongwe, Malawi.

Government of Malawi 2009. The Agriculture Sector Wide Approach (ASWAp) – Malawi's prioritized and harmonized Agricultural Development Agenda. Ministry Of Agriculture And Food Security, Lilongwe, Malawi

Government of Malawi, 2010. Demographic and Health Survey. Government of Malawi, Lilongwe, Malawi.

Government of Malawi 2012. Malawi Growth and Development Strategy II. Government of Malawi, Lilongwe, Malawi.

ICRAF 2009. Trees on farms: Tackling the triple challenge of mitigation, adaptation and food security. Policy Brief No. 07. World Agroforestry Centre, Nairobi, Kenya.

ICRAF 2009. Creating an evergreen agriculture in Africa for food security and environmental resilience. World Agroforestry Centre, Nairobi, Kenya.

ICRAF. 2012. Faidherbia albida – keystone of evergreen agriculture in Africa. World Agroforestry Centre, Nairobi, Kenya.

Kambewa, P.S., Mataya, B.F., Sichinga, W.K. and Johnson, T.R. 2007. Charcoal: the reality – A study of charcoal consumption, trade and production in Malawi. IIED Small and Medium

Forestry Enterprise Series No. 21. International Institute for Environment and Development, London, UK.

Kambewa, P. and Utila, H. (2008) Malawi's green gold: Challenges and opportunities for

small and medium forest enterprises in reducing poverty. IIED Small and Medium Forestry Enterprise Series No. 24. Chancellor College, Forest Research Institute of Malawi and the International Institute for Environment and Development, London, UK.

Faulkner, L., Harrington, J., Levy, D. and The, K. 2009. Commercial opportunities for fruit in Malawi, World Agroforestry Centre, Nairobi, Kenya

Luedeling, E., Sileshi, G., Beedy, T and Dietz, J. 2011. Carbon sequestration potential of agroforestry systems in Africa. Advances in agroforestry 8: 61–83.

Macqueen, D., Kafakoma, R. and Sibale, B. 2011. Channelling REDD+ finance toward sustainable rural livelihoods in Malawi. Malawi Policy Brief No 4. Forest Governance Learning Group. Training Support for Partners, Lilongwe, Malawi.

Maplecroft 2011. Climate change vulnerability index 2011. Available at: http://maplecroft.com/about/news/ccvi.html

Mauambeta, D. D. C. 2009. Status of Biofuels in Malawi: A study report produced for Training Support for Partners, Lilongwe, Malawi.

McLellan, L. 2009. A study to determine if dried moringa leaf powder is an acceptable supplement to combine with maize meal for Malawian children, MSc Public Health Nutrition, School of Health Science Dietetics, Nutrition and Biological Sciences, Queen Margaret University, Edinburgh

Mithoefer, D. 2004. Economics of indigenous fruit tree crops in Zimbabwe. PhD. Thesis, University of Hannover, Germany.

Nyoka, B., Mng'omba, S., Akinnifesi, F., Ajayi, O, Sileshi, G. And Jamnadass, R. 2011. Agroforestry tree seed production and supply systems in Malawi. Small-scale forestry 10 (4): 419–434.

Peque, D.P. 2003. Value- adding in forestry at farm and community level. Annals of Tropical Research 25(2): 29–36

Phombeya, H., Simmons, E. and Giller, K. 2005. Farmers' perceptions of the value of *Faidherbia albida* trees in the farming system in Central Malawi. African crop science conference proceedings 7: 1459–1463.

Place, F., and K. Otsuka. 2000. The Role of Tenure in the Management of Trees at the Community Level: Theoretical and Empirical Analyses from Uganda and Malawi, CAPRi Working Paper No. 9; 14. International Food Policy Research Institute, Washington D.C., USA.

Pretty, J. Noble, A, Bossio, D, Dixon, J., Hine, R., de Vries, F. and Morrison, J. 2006. Resource-conserving agriculture increases yields in developing countries. Environmental science and technology 40 (4): 1114–1119.

Program on Forests. 2011. Investing in Trees and Landscape Restoration in Africa: Overview. Program for Forests (PROFOR), Washington D.C., USA.

Pye-Smith, C. 2008. Farming trees, banishing hunger. How an agroforestry programme is helping smallholders in Malawi to grow more food and improve their livelihoods. ICRAF, Nairobi, Kenya.

Russell, D. and Franzel, S. 2004. Trees of prosperity: Agroforestry, markets and the African smallholder. Agroforestry Systems: 61: 345–355

Saka, A., Bunderson, W., Itimu, O., Phombeya, H. and Mbekeani, Y. 1994. The effects of *Acacia albida* on soils and maize grain yileds under smallholder farm conditions in Malawi. Forest ecology and management 64: 217–230.

Salam, M.A., Noguchi, T. and Koike, M. 2000. Understanding why farmers plant trees in the homestead agroforestry in Bangladeshi. Agricultural Systems 50:77–93.

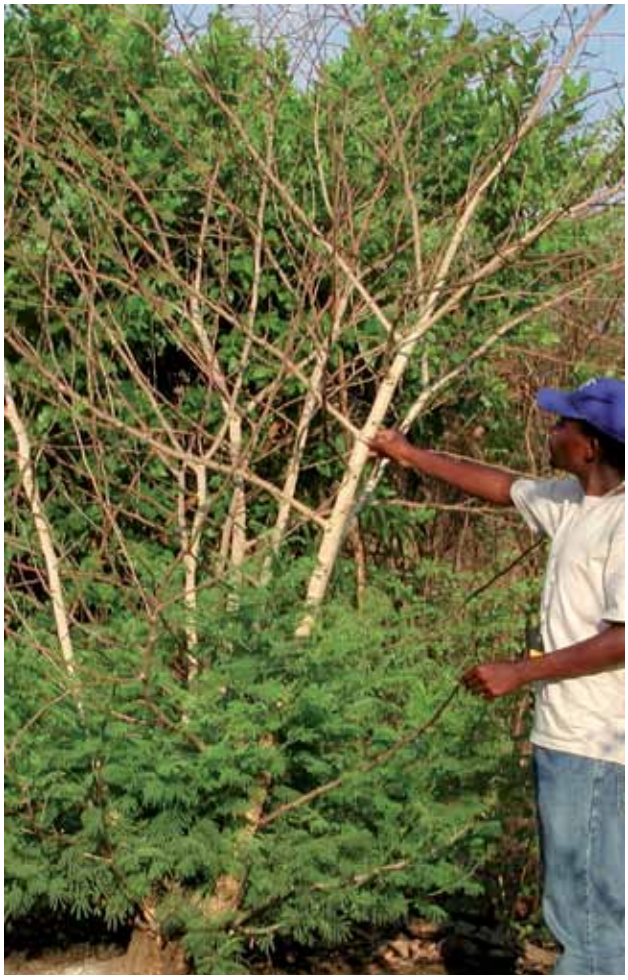
Sibale, B. and Chunga, M. 2011. The Socio–Economic Impact Survey (SEIS) of the OVOP Project, 2011, JICA-Malawi, Lilongwe, Malawi.

UNCCD 2012. Sustainable land management for food security. Available at http://www.unccd.int/en/programmes/thematic –priorities/food-sec/

Wambua, C. 2011. *Law and Policies Enabling the Production of Biofuels in Malawi. PISCES* Working Brief No 4. African Centre for Technology Studies (ACTS), Nairobi, Kenya.

Community tree nursery – Salima district

Confiscated charcoal – no incentives for sustainable production



Acacia regrowth after coppicing

Malawi faces a precarious future. Challenges include: rapid growth among rural populations; entrenched rural poverty, lack of food security; biomass use – especially for energy – that now exceeds productive capacity in some areas; widespread resource degradation including deforestation at about 100,000 hectares per year; and an increasingly unpredictable climate. An urgent response is required to this situation in which restoration of tree cover is a central component. Trees are crucial for soil conservation and food security, local energy supply, construction materials and medicines. But they are also critical for diversifying income generation. The Government of Malawi has laid out important policies that should help incentivise the use of tree products in local forest enterprises for income generation through agroforestry, on-farm tree planting and woodlot establishment. But so far these policies have failed to deliver entrepreneurial activity based on trees at any significant scale – either through lack of resources for implementation or through entrenched views that discourage such activities at field level. This report reviews some of the main enterprise developments around on-farm tree crops, assesses their operational challenges, and suggests ways to strengthen their future prospects.

Published by IIED, 2013

International Institute for Environment and Development

80-86 Gray's Inn Road, London WC1X 8NH, UK

Tel: +44 (0)20 3463 7399

Fax: +44 (0)20 3514 9055

email: info@iied.org

www.iied.org

ISBN: 978-1-84369-906-4

Product code: 13566IIED

http://pubs.iied.org/13566IIED.html