Opportunities for climate-smart, on-farm, tree-based enterprises

A review of current experiences in Malawi

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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
MK	Malawi Kwacha
NAPAs	National Adaptation Programme Actions
NGO	Non Government 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 (87%) rural population are placing pressure on natural resources in a context of ongoing poverty. Deforestation between 2001 and 2009 ran at 3.49% 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 countries 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. Central to any response must be the creation of models and incentives that restore tree cover. 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 generate 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 support of international and national civil society and private sector development partners a range of agroforestry and sustainable forest management progroammes are being implemented. The overarching Malawi Growth and Development Strategy (MGDS II) identifies nine priorities, two of which are directly relevant to the restoration and entreprenurial use of tree cover: agriculture and food security and integrated rural development. The Agriculture Sector Wide Approach 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 promotes the professionalisation of the entire woodfuel and charcoal supply chain. The National Forest Policy (1996) explicitly encoruages 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 (BERL, Toleza Farm Ltd, Demetre Farm Ltd, Exagris Ltd, Tree tops, Bio Energy resources Ltd and Mary 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 helathy human development – and stems are used for construction purposes and fuelwood. *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 fuelwood 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.

One specific initative, known as JANEEMO, 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 ranged from MK 688 to MK 9536 (US$ 2.5 – US$ 35.0 per harvest). 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 falure 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 countries third largest industry. To these financial and administrative failings can be added the impediment of bureaucracy – for example in developing and administering certification and quality standards for products such as medicines, fruit juices and other tree crop products. In addition to policy issues, 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 marekts, 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 partnership have emerged in sub-contractor or outgrower schemes, it will be important to share information on best practices. Since much of this work will require finance, it is proposed that the strengthening of climate-smart, on-farm, tree-based enterprises is made an integral componenet of any REDD+ finance distribution mechanisms.

1. Introduction

1.1 Background

High levels of deforestation in Malawi have been the subject of intense debate at the policy, planning and community levels. Between 2001 and 2009 Malawi lost approximately 100,000 hectares of forest per year or 3.49% annually (Cassells, 2011). The high levels of deforestation are being attributed to demand for land from an increasing population (2.8% average annual/intercensal 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% of the population depends for its survival on rainfed farming, over one third of Malawian children are malnourished 7, 4 and 47 per cent of children (2006-2010)[1] under-five of age under-weight either moderate and severe or severe, wasted and stunted, respectively (See: http://www.unicef.org/infobycountry/malawi_statistics) and life expectancy is just 46 years. The drought of 2002 led to the worst famine in half a century with 3 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, supply construction materials, medicines and act as asource of various 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. Perhaps the biggest demand for biomass comes from the subsistence energy sector. Biomass accounts for 97%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 future scenarios (GoM, 2009)

Restoring tree cover, so as to replenish Malawi's biomass at a landscape level is a pressing issue – if the Government of Malawi (GoM) is to stave off future starvation. Trees also offer propsects for generating income for rural households – which will be critical in Malawi's search for sustainable economic development. 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; Kafakoma et.al. 2011).

Human induced climate change has resulted in unprecedented changes to the patterns of rainfall and temperature within Malawi. Malawi ranks among 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 the provision of provisioning services (e.g. food, fuel, fibre and water), regulating services (e.g. global temperature, hydrological cycles, soil ferility) and supporting services (e.g. pollination, seed dispersal). Agroforestry systems in Southern Africa have the potential to store substantial amounts of carbon – both helping populations adapt to climate change, but also accumulating approxiamtely 0.2-0.8 MgC /Ha /yr in parklands, live fences, homegardens and potentially 2.2-5.8 Mg C /ha / yr in rotational woodlots. Commercialising such carbon sequestration would require considerable transaction costs but at a carbon price of US$10 per Mg C could involve small payments to farmers (of no more than approximately US$ 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 the support from development partners is implementing a number of agroforestry and sustainable forest management initiatives – that include devolving control over forests to community forest management, 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 reslizationthat 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; agriculture is the main source of income but access to inputs is limited to most smallholder farmers and are heavily reliant on shrinking forests for energy. The fundamental notion was the 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 repellants.

1.2 Study objectives

This study was commissioned by Forest Connect – an ad hoc international alliance that seeks to reduce poverty and protect forests by better linking small forest enterprises to each other, markets, service providers and decision-makers. The study explores opportunities for climate-smart, on-farm, tree-based enterprises in Malawi with particular focus on recent use of Jatropha, Neem and Moringa – and Faidherbia (within the aptly named JANEEMO initiative). 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 four 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 chapter introduces some of the key commercial tree crops currently being developed in Malawi. Chapter four presents the main operational barriers to optimising the potential of climate-smart, on-farm, tree-based enterprises in Malawi. Finally, chapter five concludes with some recommendations about how to overcome those barriers and strengthen prospects for these enterprises within Malawi.

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 about 87%live in the 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% of the workforce, contributes over 80% of foreign exchange earnings, accounts for 39% of gross domestic product (GDP) and contributes significantly to national and household food security. National surveys estimate that crop production accounts for 74% of all rural incomes.

The agricultural sector has two main sub-sectors - the smallholder sub-sector that contributes more than 70% and the estate sub-sector that contributes less than 30% 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.[2]

Agricultural exports remain undiversified with very little value addition. Malawians remain poor, with 52.4% of the population living below the poverty line (MK44 per

[2] 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.

person per day) with 22.4% barely surviving (GoM, 2008). Most of the socio-economic indicators illustrate the depth and intractability of poverty. For example, the levels of malnutrition remain high, with 43.2% of under-five children stunted and 22% underweight in 2004 (NSO, 2005). 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 (Nsational Statistics Office, 2006). There is also high prevalence of HIV and AIDS, estimated at 11% (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 policy guides include the Malawi Growth and Development Strategy, Malawi Biomass Energy Strategy, National Energy Policy, National Forestry Policy and the legal provisions include the Forestry Act. Other relevant documents reviewed that help in the development of biomass energy sector in Malawi are Land Policy and the Malawi National Adaptations Programme Actions. The energy policy is primarily directed towards the development of the electricity and petroleum sectors, with a fundamental objective of reducing dependence on biomass fuels (Government of Malawi 2009a).

2.2.1 Malawi Growth and Development Strategy II 2011-2016

The Government of Malawi has a new national development strategy help to attain the country's long term development aspirations. In order to sustain and accelerate development gains achieved during Malawi Growth and Development Strategy (2006-2011), the Government of Malawi 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/MGDS II, 2012). Briefly, the MGDS 2006-2011 , which succeeded the Malawi Poverty Reduction Strategy, outlined the Government's priorities for the five year period between 2006/07 and 2010/11 highlighted a policy shift away from subsistence consumption towards sustainable economic growth and infrastructure development and 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 (Government of Malawi, 2009a).

Within the six priority themes, the MGDS II identifies 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; and 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 of Malawi aims to increase forest cover and increased incomes from forestry-based products (Government of Malawi 2012). Therefore from the policy perceptive, 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 Agriculture Sector Wide Approach (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) (Government of Malawi 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 Biomass Energy Strategy is to ensure a sustainable supply of affordable wood fuels (GoM, 2009a). The strategy has three specific objectives, of which are to:

(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 Biomass Energy 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 charcoalers 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 needs to be nurtured and accelerated through better regulation. The essence behind 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 have been identified to increase the sustainable supply of wood fuels, through a more professional and entrepreneurial functioning of the supply chain:

a) Designing a wood fuels Supply Master Plan;
b) Designing and implementing District Wood fuel Management Plans;
c) Modernizing and strengthening charcoal flow monitoring and control; and
d) Promoting the production of affordable alternative fuels

The Biomass Energy Strategy proposed to formulate District Forestry Wood fuel Management Plans (DFMPs).The aim of these plans will 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. One of the actions required to develop and enact the DFMPs is increasing the productivity of forest resources. Three different approaches are proposed to increase the output of woody biomass: agroforestry, farm tree planting initiatives and tree planting in woodlots. Although Malawi has a Biomass Energy Strategy, the document has not been approved yet. Further, the strategy does not adequately articulate specific policy objectives on biofuel. In the absence of a concise policy framework, biofuel production is hampered (Wambua . Nonetheless, there have been concerted efforts by key stakeholders, such as Biofuel Association of Malawi, to provide input on the creation of appropriate biofuel policy.

2.2.4 National Forestry Policy (1996)

The 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 for the production of tree-based enterprises. The goal of the National Forest 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 tree on-farm initiatives, in **section 2.2** of the policy, the general objectives of the policy aim at contributing towards 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 contribute to the realization of this objective, the policy explicitly encourages agroforestry, co-management of forest reserves, ecotourism, production of trees on-farm and along river banks.

In the same section, the policy aims at establishing appropriate incentives that will promote community-based conservation and a sustainable utilization of the forest resources as a means of alleviating poverty, including on-farm trees, fostering the growing of trees by all sectors of the communities in order to achieve sustainable self-sufficiency of and 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 of Malawi (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, a view also propagated by the National Energy Policy, which has made it difficult to enact the wood fuel-friendly provisions of the Forest Policy. While the forestry policy provides for 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 own tree crops, from which they could produce and market charcoal. In addition, advancement of biomass energy source plants has on the other hand been viewed as in conflict with the national food security policy (Government of Malawi, 2009a)

2.2.5 Energy Laws (2004)

Four Energy Acts, together considered the Energy Laws (2004), were created to help in the formation of a regulated and liberalized 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 liberalized 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 the Authority 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, utilization practices and a Forest Development and Management Fund.

In Part V - Customary Forest, the Act stipulates how communities or villages can participate in forestry management on customary land and share benefits supported by the Forestry Department. For instance in Section 29:

> *The purpose of this Part is to provide of 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 the poor and vulnerable households, the Government of Malawi in 2006 developed a list of activities that it wants 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 (Government of Malawi, 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 fifteen urgent and priority needs. The urgency were ranked from low [L] medium [M] to high [H) and promised. The tree on-farm initiatives such as the JANEEMO initiative 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)

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 occassionaly 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 been integrating 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 the farm and around household is better than on customary land, even with high and increasing population densities. According to Place and Otsuka (2000) reported in Coote et al. (1993a;1993b), in Malawi, farm holdings on customary land are generally small and are also communally held lands, held by the clan or village headman, which are reported to be 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 (Nyoka et al. 2011).

Most trees on farm were traditionally managed, at least in part, as safety nets that bailed the small holder farmers in times of crop failure or vulnerability. They were also used widely for medicinal purposes. For example, Anna Masache, a smallholder female farmer in Chikhwawa grows neem at her household and calls the tree a "village pharmacy" because to her 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 and that 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 farm 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 which relate to source of fruits, soil improvement, fodder, medicine, building materials, fuelwood, 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 Table 1: Household benefits selected trees on farm (Neem, Moringa and Jatropha)

Part	**Jatropha curcas**	**Azadirachta indica**	**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,	Propagation, nutritional	Firewood	Firewood, charcoal

		dental hygiene	supplement, medicinal		
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)

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 resitant 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 (see http://www.janeemo.org/jatropha) 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 reported that he planted Jatropha as his “savings bank”. He said that it does not take many inputs oragro-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 os 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 diminish the effects of weather extremes such as droughts, or heavy rains by improving soil organic matter. A farmer in Chikhwawa said that because there area is usually very hot, with temperatures rising to 40 degrees centigrade at times, Jatropha trees 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 hence increased production and more food and money to the smallholder farmers.

Each of the trees planted on farm 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 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 oil extraction process whose mineral composition is reported to be comparable to that of chicken manure making the fertilizers ideal for rural communities. The fumes from the lantern are a high quality mosquito repellent, most ideal in the Lower Shire where mosquitoes are in multitudes (Gondwe, 2009).

The increase in jatropha growing has come as a result of the demand for alternative sources of energy, high fossil fuel prices, advent of energy crops and carbon sequestration. The increase realization that they can make money out of this tree crop has fueled 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 and the anti-smoking global 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 an out-grower scheme where it has subcontracted smallholder farmers to produce the biodiesel feed stock which is going to be sold the company. Toleza Farm limited has also 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.

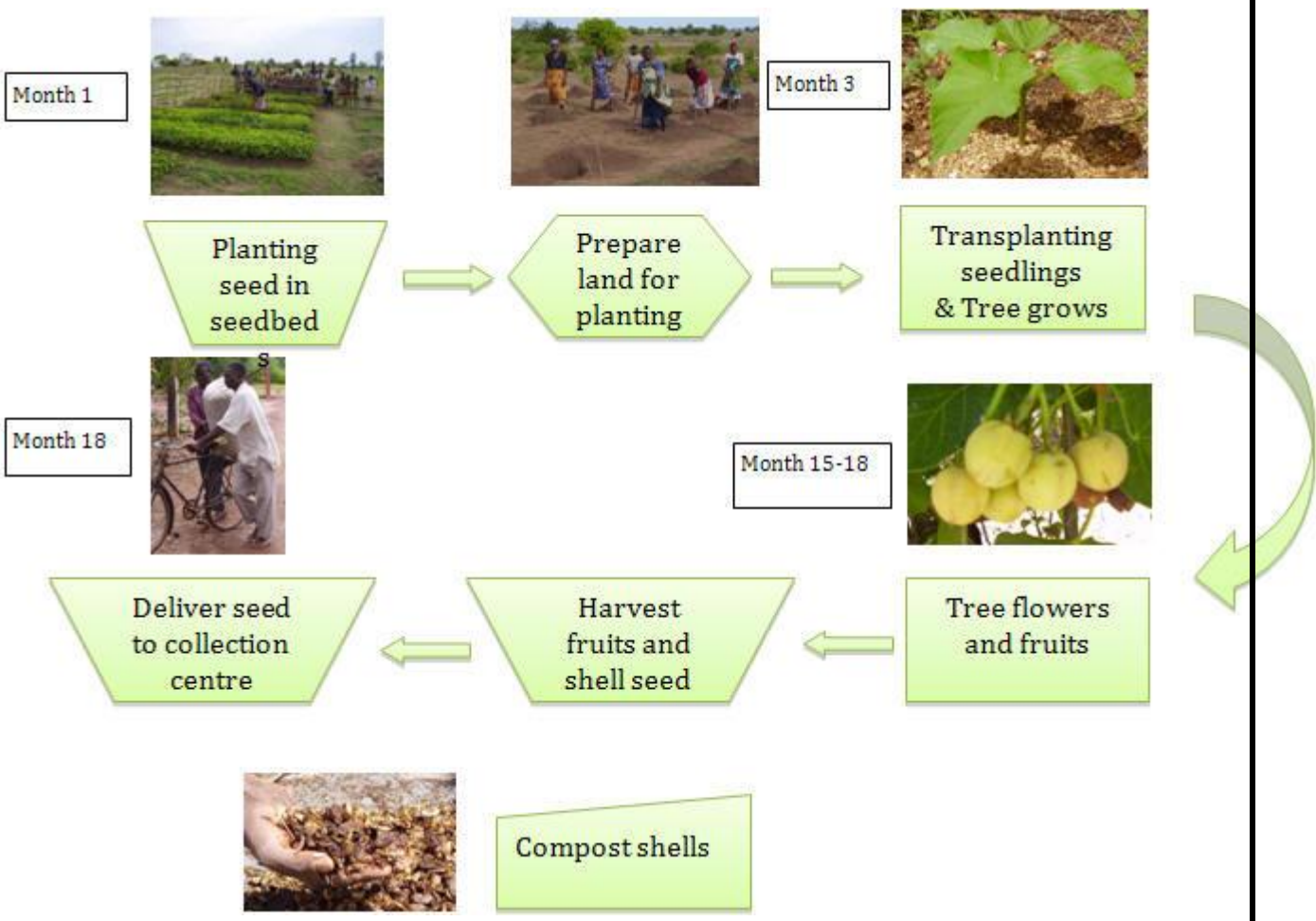
Other organizations are also supporting smallholder farmers to grow Jatropha for their own household use. For example, the Department of Forestry has provided support through the EU funded Improve Forestry Management for Sustainable Livelihood Project and Enviro Africa, (an NGO) is promoting growing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

Picture 1: Left: Jatropha planted on hedgerow and Right: Moringa tree growing

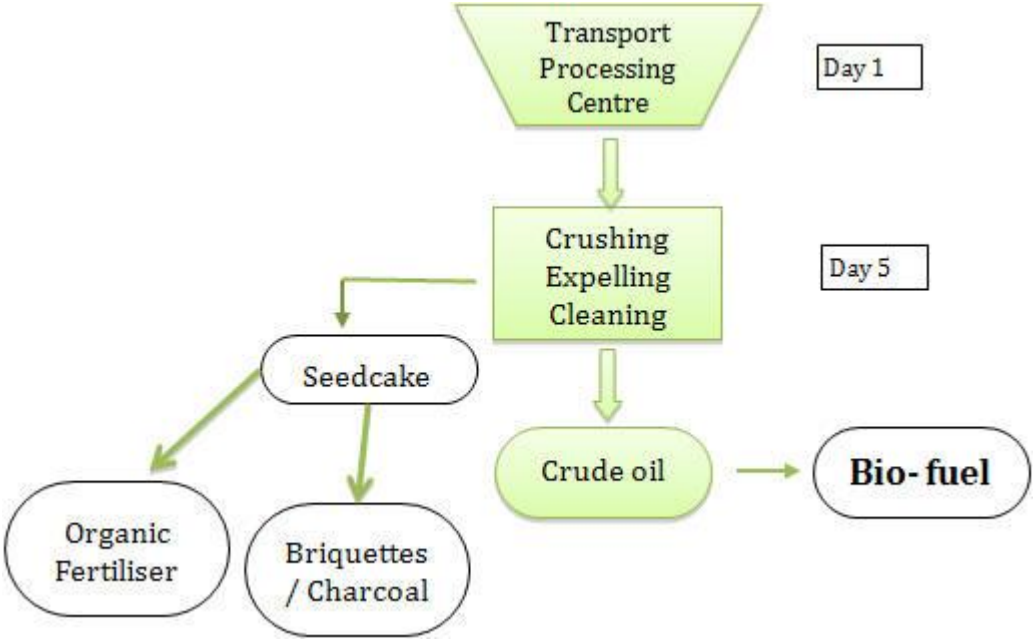
naturally and pruned to allow free branches to germinate

In discussions with BERL Malawi[3] on the production of biodiesel from Jatropha it was clear that timeline for the first phase, planting to harvest, is limited by nature; Jatropha takes approximately 15-18 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.

[3] http://www.berl.biz/How.html



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. The 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 later. Mature seed is harvested and de-shelled in month fifteen to eighteen. 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 an composition suitable as an additive in to petrol-diesel

Neem (*Azadirachta indica*) - Neem (locally called Nimu) is easy to grow in a wide range of temperatures and conditions. The tree can live for 150-200 years. As well as being a useful fuel wood tree, all parts of the Neem tree can be used for cosmetic or medicial 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 circulative, respiratory and digestive system. It is famous for assisting in the treatment of stomach upset, malaria and diabetes. Both 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 your crops.

Amongst farmers interviewed, knowledge about Neem tree planting is passed on from one generation to another. Historically, households have planted trees around their houses for live fences as wind breaks, shade, and medicinal trees. At the village level, 70-80% of the 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 long outstanding 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, 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. 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 the 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 the neem poles are good for construction purposes.

Over the years, a number of individuals, organizations and companies have started to promote and process neem leaves, seed and barks to produce medicines. This is encouraging many farmers to improve the management of the trees around the homesteads and also increased the production of the tree on farm. It was noted that in the JANEEMO initiative, there are over 4000 smallholder farmers involved in the processing of the neem leaves, barks 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 it into bottles which are being sold on the market at prices of USD 50 per half liter 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. In Chikhwawa, one farmer said that he managed to realize K85, 000.00 in a year (about $340) from sale of leaves and seeds to traders from Blantyre and surrounding areas. 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 centers. 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.

Beyond Neem, nongovernment organizations 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 hence becoming important income generating activities at smallholder farmer 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 to 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 give away prices, or the buyers, who may be purchasing substandard or ineffectual remedies.

Moringa (*Moringa oleifera*) - Moringa (locally known as *Sangowa*) is planted mainly a hedge and for fencing because of its characteristics of sprouting so 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.

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, anaemia, as an antiinflammatory 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.

Experience at JANEEMO and elsewhere has shown that Moringa consumption has a highly significant positive impact on reducing malnutrition in children. This discovery has influenced the level of management on the tree by rural communities. The increased level of attention and business opportunities on tree on farm is influencing many people to start claiming strong ownership of the tree therefore improving their management. Moringa has already been widely grown and consumed in times of food crisis or shortage along the lake 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** below. Moringa tree can also be harvested for firewood and timber for construction. The moringa tree crops are mainly grown by rural farmers around their homesteads. However some companies like Molinga Miracle Limited is piloting a project in Chikhwawa District to commercialize production of Moringa. At the time of the study, the company had invested about $100,000 into the pilot project.

There is however, limited private sector interest in terms of growing this tree species on a larger scale.

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)

Albida (*Faidherbia albida*) - Faidherbia albida is known locally as msangu, or 'the magic tree', 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 woodfuel.

The remarkable properties of Faidherbia albida have led to more than 500,000 farmers across Malawi, Tanzania and Zambia cultivating their crops in Faidherbia agroforests. Farmers report that their maize yeilds have doubled or tripled through use of the species (ICRAF, 2012). Field research in Malawi showed that maize yields were increased up to 280% 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 albida fixes 80-90 kg N per hectare and sequesters between 5-30 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%.

In recent research on farmer percpetions of Faidherbia albida 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 4-6 years old. The majority were willing to expand the numbers of tree planted for precisely that reason. 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 albida is slightly dissimilar to the three preceding tree crops in that its main product (green manure / soil fertility) is not directly tradeable. However, the tree does contribute to the increase in sales of existing farm enterprises. In common

with many other agroforestry trees (e.g. specieis 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.

Acacia polyacantha – Whitethorn or *Acacia polyacantha* is a relatively fast growing native species which is particularly useful as a source of managed fuelwood 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 (70-90%), 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 fuelwood 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 speceis with optimal properties for such a purpose and one that has been trialled by the Wildlife Action Group (WAG) 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 centers) mean that the vast majority of the population will continue to be dependant on fuelwood and charcoal as their main energy source for the forseeable future. In an effort to solve the problem of energy supply, the government produced the Biomass energy strategy but its implementation is slow and its positive impact may take a while to be noticed. The Malawi Forest Governance Learning Group (FGLG) carried out a charcoal study (Kambewa et al, 2007) with a purpose to influence 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 centers like Lilongwe city.

If the feedstock for charcoal is managed sustainably, charcoal and fuelwood 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 Government. First, the policy and legal framework for forestry need to be adjusted in line with the Malawi Biomass Energy Strategy. While the existing policy provides 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 infrasturcture merely serves to advertise what is deemed an 'illegal' activity.

Other fruit trees and agro-commodities – Fruit tree production is of course a major component of the Malawian agricultural system. Inaddition 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) Secretariat of the Ministry of Industry and Trade which has been operational since October 2005 with assistance from Japan International Cooperation Agency (JICA). The first phase of the project was completed in October 2010 and phase 2 was launched in 2011 and will run up to 2016. The project mobilises farmers into cooperatives produce products that are unique to their group and village and the OVOP Secretariat, through a network of satellites markets, facilitates exportation of final products to the international market. A recent survey showed the following types of cooperative by nature of their enterprise.

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

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% to the livelihood total.

The JANEEMO initiative – Since 2007, a new initative 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, 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.

JANEEMO now has over 4,000 registered farmers actively engaged in planting, processing and selling Jatropha, neem and moringa products. The initiative started with farmers in the Lower Shire in Nsanje and Chikhwawa districts in 2007

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

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 Institue 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 fruits trees processing of fruit juice from indigenous fruits, inter-planting of fruit trees with crops. The fuel price increases, the need for locally available food supplements, the anticipated income generation potential of some trees crops has influenced 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 ICRAF (International Centre for Agroforestry Research) which has undertaken substantial work in promoting trees on farm and also domestication of fruit trees.

Private sector investment – In additon to public sector investments support by research institutions, a number of private companies and individuals have also been promoting growing of various tree species of farm as a business. These include companies like BERL Ltd, Demetre farm limited, Toleza Farm Limited, Exagris limited, Tree Tops and Mary Meals. 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, 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 was difficult to quantify the amounts of money that have been invested in the business ventures.

Smallholder involvement - Smallholder farmers and estate owners look at Jatropha as an alternative tree crop that can enable them 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 small holder farmers under its contractual agreement. BERL makes sure that all its farmers receive about MK3 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 systems to ensure that all

smallholder farmers are tracked and provided 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 ranges from K45-MK90.00 (about $0.2 to $0.4)). 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 the 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 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 process 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 part from the income from sales, tree survival rate bonus, 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.

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 K3/tree that survives annually which is paid thrice a year. A lead Jatropha farmer visited by the study reported that he oversees 11 Jatropha farmer clubs. Each club has about 12 members, (50% men and 50% women). Each club on average receives about MK10000 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

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 impacts were identified including the following:

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 more especially in urban centers which are providing strong incentives for more investments in on the farm tree based products by smallholder farmers.

Women groups in Chikhwawa district indicated that they get an income of close to K75, 000 (USD 300) per month from sales of medicinal products as the demand for them has increased both within the district and from urban centers in the southern region. The money realized from the sales 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 realized from sale of neem leaves was reinvested to buy shares from the village saving and loan group 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 ten 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 centers 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)[4], however, have indicated that the mills that the European Union supported Integrated Forest Management for Sustainable Livelihoods project installed 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 be used for multiple uses other than just tree crops.

Figure 1: A pilot moringa farm owned by MML in Chikhwawa District in the Southern Region of Malawi

Since most of the people are operating in a group, farmers in the JANEEMO project indicated that even though some income is being realized from processing adding value to neem, moringa and jatropha, the money realized is still small 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 sock) 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). Table 2 summarizes the levels of income realized by farmers from the various tree based products more especially from Neem, Moringa and Jatropha.

Table 2: 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

[4] ZBC News Bulletin of May 21, 2012

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)

Some companies like the Moringa Miracle Limited (MML) have invested over USD 100,000 to raise *Jatropha olifera (jatropha) tree* on a hectare piece of irrigated land. This investment has provided employment opportunities to over 10 people from the surrounding villages of the project in Chikhwawa who are working in the tree nursery.

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 include reducing poverty and improving food security, increasing resilience to climate change shocks (adaptation) and 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 and in some cases public land. People are feeling the negative impacts of climate change and at the same time would 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 to many of them adopting various climate-smart agriculture technologies such as conservation agriculture and agro-forestry. The high level of awareness amongst farmers has led to increased interest and appreciation for climate-smart agriculture 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 vaiety of agroforestry species (Pye-Smith, 2008)

Farmers interviewed in Salima and Balaka district noted that those who practiced conservation agriculture (e.g. using Faildebia albida) during the 2010/11 and 2011/12 rainy seasons were able to harvest higher maize yields than those that did not practice conservation farming and did not plant nitrogen fixing trees on their gardens.

Evidence exists that integrating trees on farm increases yield 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 technologies are relatively new and need for increased investments in building the capacity of farmers cannot be overemphasized. The low adoption rates of soil conservation technologies are related to the perception that planting trees on the farm does not quickly bring immediate benefits. Farmers have to wait for a long period before realizing benefits. This

perception is fading out away but the government needs to invest a lot in promoting the approved and tested technologies that yield results in both short and long-term.

Impacts of forest ecosystems - The high deforestation rates in the country has led to the loss of biodiversity, high level of soil erosion, siltation of rivers and dams, increased incidences of water borne diseases and malaria, 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 the now spend less time to collect firewood from distance areas. The groups is also able to sell firewood and poles to other people around the village fish landing site. 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.

4. Operational challenges

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

4.1 Policy barriers

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 (Government of Malawi, 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 equivalentin 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 (Government of Malawi, 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).

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 Act of Parliament to be certified all the 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 stopped producing their products by the Malawi Bureau of Standards because of registration, which is bureaucratic 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 organized and there is no robust legal framework to regulate production and marketing of traditional medicine in the country. Because of the inexistence of the legal framework, the trade in traditional medicines is not fully benefiting the producers who are selling their products at give away prices due to undervaluing of the products by both the farmers and the vendor/traders.

Lack of Quality Standard Guidelines - Currently, there exist no clear standard guidelines on the quality and chemical composition of some tree based products for example products from Neem, Moringa and Jatropha products such as oils, medicinal, cosmetics, soap and others. Many products are being sold on the market without proper standards and many buyers question the quality of the products resulting in farming losing out 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

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 wood-lands, forest areas and protected forest areas, many people have turned on the remaining trees on farm 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 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.

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, observations have it that farmers are planting the tree crop on pieces of land that can 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 more especially in the Southern and Central Region is also likely to hamper promotion of tree based on farm enterprises for particular crops such as Jatropha.

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 which apparently continue to be undermined by various players including government.

4.3 Business development barriers

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 s potential to do so. The inexistence of established structures to coordinate farm based enterprises underline the point that there is lack 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 strength coordination and collaboration amongst the various players.

Lack of secure markets - The lack organized market structure and stable markets is one of the biggest challenges for promotion of the on the farm tree based products. For example there are no organized 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 with the Mary's Meals (a Scotland charity based organization 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 organized market for their various tree based products. While farmers in the 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 of tree products, where most markets are kangaroo markets.

Figure 2: Smallholder farmers cannot afford moringa harvesters like this one.

Limited value addition - Smallholder agriculture is associated with lack of value added 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 skills to value add amongst smallholder farmers, the country has not provided supportive mechanisms to assist the smallholder farmers add 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 cost of value addition at community levels.

5. Strengthening future prospects

5.1 Implement the supportive policy environment

As noted in Chapter 2, Malawi already has a supportive Gorwth and Development Strategy, Agriculture Sector Wide Approach, and Forestry legislation (including a highly progressive Malawi Biomass Energy Strategy that endorses 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 finance 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 (perhaps the pre-eminent use of forest resources within the country, the institutional structures and finance to enact plans and develop rural partnerships simply does not exist. This barrier requires 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 discernable 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 alternatives because of the period tree 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 tre planting would be welcome. The deteriorating prices for staple commodities and crops such as tobacco is driving some smallholder farmers to diversify into tree crops. But 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 of farm is promoting entrepreneurism amongst smallholder farmers. The value addition (though 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 enter into business at the same time sustain 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 year 1, 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 themsleves (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 year 2 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 year 3, 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 engaging the farmers as individuals and hence putting them in a weaker bargaining positions. Helping to convert farmer-to-farmer exachanges into strong local associations or cooperatives can help to turn this around.

5.3 Establish best-practice guidleines for private sector outgrower 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 realization 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 are key to the sustainability of their businesses.

What is needed now is to document best-practice in such sub-contractor or outgrower schemes and provide space to bring groups together to discuss how to optimise he 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 fuelwood 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 CO2e per year to over 2000 Mt CO2e 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 provides 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 climate change – that is predicted to have a crippling effect on Malawi's agriculutre. On-farm tree-based enterprises are therefore a climate-smart option – providing the two-fold benefit of climate change mitigation and adaptation.

Trees take long to mature and therefore to encourage more farmers participate in the growing of trees on the farm, there is need to provide some financial resources to assist the farmers meet their short terms needs while waiting for their trees. For example BERL provides K3.00 per surviving tree to a farmer. This money help to relieve the suffering the farmer encounter by investing in an investment that takes long to produce benefits. The payments to the farmers could cover labor and costs of planting and nurturing trees before longer-term benefits materialize. The obvious link between tree planting and climate change mitigation within national strategies (such as the embrionic 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 Colledge 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.

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