Darwin Initiative Main Project Annual Report

Important note: *To be completed with reference to the Reporting Guidance Notes for Project Leaders: it is expected that this report will be no more than 10 pages in length, excluding annexes*

Submission Deadline: 30th April 2017

Darwin Project Information

Project reference	23-026
Project title	Domestication of the Mulanje cedar for Improved Rural Livelihoods
Host country/ies	Malawi
Contract holder institution	Botanic Gardens Conservation International
Partner institution(s)	Mulanje Mountain Conservation Trust, Forestry Research Institute of Malawi
Darwin grant value	£252,172
Start/end dates of project	April 2016 – March 2019
Reporting period (e.g., Apr 2016 – Mar 2017) and number (e.g., Annual Report 1, 2, 3)	April 2016 – March 2017
Project Leader name	Paul Smith
Project website/blog/Twitter	http://www.bgci.org/where-we-work/malawi/ http://globaltrees.org/projects/save-our-cedar-malawis-national-tree/ http://globaltrees.org/news-blog/save-our-cedar-working-together-to-save-malawis-national-tree/ #SaveOurCedar
Report author(s) and date	Kirsty Shaw and Paul Smith

1. Project rationale

Malawi's national tree – the Mulanje cedar (*Widdringtonia whytei*) – occurs naturally only in the Mulanje Mountain Biosphere Reserve, and is critically endangered. Prior to the initiation of this project, it was estimated that cedar forest cover had declined by 37% in the last 28 years. The ecological baseline survey carried out in year 1 of this project indicates that the decline has been much more severe than this, and Mulanje cedar is now practically extinct from its natural habitat.

The loss of Mulanje cedar and associated forest species on the mountain has resulted in soil erosion and flash flooding during rainy periods, resulting in the loss of 18 lives in 2016. Mulanje cedar is a high value timber tree and both legal and illegal cutting have represented an important source of income for local communities.

In response to the cedar's decline, the Malawi Forestry Department developed a Cedar Management Plan (2014-2019). This document recommends that:

(i) large scale ecological restoration of the cedar should be undertaken, and

(ii) off-take of the cedar should be prohibited for at least the next five years.

Previous attempts to restore cedar forests and to grow the species more widely have been limited by its poorly understood ecology, pathology and horticulture. The cutting ban will have a serious and detrimental impact on local livelihoods. Although efforts to plant the tree on Mulanje Mountain have proved challenging, it has been successfully planted at small scale elsewhere in Malawi with better growth rates than on Mulanje. The cedar also grows in botanic gardens in Kenya, Tanzania, Indonesia and New Zealand.

The Cedar Management Plan, combined with consultation with local partners, identified these problems and the need for this project. The project will generate new knowledge and deliver biodiversity and livelihood benefits by:

- Defining optimal growing conditions, and improving horticultural protocols for cedar restoration on Mulanje Mountain and for wider cultivation in Malawi.
- Generating alternative sustainable income sources for poor people through the sale and planting of cedar seedlings.
- Significantly reducing unsustainable exploitation and habitat loss of natural stands of cedar.

The main project activities are taking place on and around Mulanje Mountain Forest Reserve. Trial plots have also been set up across Malawi to test growth limits and identify optimal growing conditions for Mulanje cedar.

Mulanje Mountain Forest Reserve

2. Project partnerships

The two main implementing partners in Malawi are the Mulanje Mountain Conservation Trust (MMCT) and the Forestry Research Institute of Malawi (FRIM). Good partnerships between BGCI and these organisations, and between the two organisations in Malawi, have ensured successful delivery of project activities in year 1.

MMCT's mandate is to ensure conservation and sustainable utilisation of the natural resources of Mulanje Mountain, including the Mulanje cedar. MMCT has over 20 years' experience working on Mulanje Mountain and is well known by community members and the two district government offices that the mountain spans: Mulanje and Phalombe. FRIM's technical expertise in cultivating and managing stands of Mulanje cedar, on Mulanje Mountain and elsewhere, adds experience to the project team. FRIM staff, including the Acting Director, Dr. Tembo Chanyenga, have decades of experience working on the Mulanje Cedar, and work closely with the Mulanje and Phalombe District Forest Officers.

BGCI's involvement in the project is based on the need for identification of optimal growing conditions (indicator 0.1) and improved horticultural protocols (i0.2) for cedar restoration on Mulanje Mountain and for wider cultivation in Malawi. BGCI's network of experts is helping to answer these questions. In year 1, staff from Bedgebury National Pinetum in the UK delivered training to nursery supervisors and forestry extension staff which was then disseminated to 150 people working in the community cedar nurseries (i3.2). The Project Manager from BGCI, Kirsty Shaw, visited Mulanje four times during the first year of the project. The Principal Investigator from BGCI, Paul Smith, visited Mulanje twice during the first year of the project.

All lead partners were involved in project design, make joint decisions about project implementation and are involved in project activities. For example, the baseline ecological survey conducted in early 2017 involved team members from BGCI, MMCT and FRIM and benefitted from the complementary skills of these partners (activity 1.2, baseline for i0.5).

A project Steering Committee was established to evaluate project progress, identify risks and actions to mitigate these risks (Activity 1.1). The Steering Committee has representation from

the Traditional Authorities, the National Botanic Garden and Herbarium of Malawi, African Parks and the District Forest Officers (i1.1, see Annex 4.1 for Steering Committee minutes).

Additional partners to those included in the original project proposal have been brought on board to further support project implementation, either on a contractual basis, or through the development of an MOU. These partners include the United States Forest Service (USFS) and Starfish Malawi. Andy Bower from the USFS took part in the ecological baseline survey and collected samples of Mulanje cedar for genetic analyses (i1.2). Starfish Malawi is an NGO linking schools in Malawi and the UK that will support the outreach component of the project in years 2 and 3 (i5.3).

All partners involved in the project, including lead partners, contractors, BGCI members and new partners, have contributed to the successful delivery of year 1 activities.

3. Project progress

3.1 Progress in carrying out project Activities

Output 1 - Optimal cedar growing conditions characterised to improve reforestation success on Mulanje Mountain and to define areas suitable for cedar cultivation elsewhere in Malawi.

An inaugural project workshop was held in June 2016. This involved representatives from Traditional Authorities, local government and national government. The project plan was communicated and comments received and incorporated. A balanced project Steering Committee was established who are leading monitoring and evaluation of the project at regular meetings. Two meetings have been held so far (June 2016 and February 2017). Appropriate external consultants were appointed to support project implementation as planned. This included a nursery consultant, GIS consultants, a socio-economic consultant and a business skills consultant. Detailed briefs were written by BGCI and MMCT to guide the work of consultants, and all consultants delivered work to a high standard. Training from the business skills consultant will conclude by 6th May 2017 (Activity 1.1).

An ecological baseline survey of remnant cedar populations was carried out from 27th January – 7th February 2017, involving team members from BGCI, MMCT, FRIM and the United States Forest Service (USFS). The team measured numbers of trees, size classes and level of exploitation across the mountain. Genetic samples were collected for analysis by USFS. Parameters were determined for an international study on microbial associations and pathology of cedar which will be carried out in year 2 (a1.2).

Eight Mulanje cedar research plots have been set up across Malawi and edaphic and climatic conditions are being measured using data loggers to test the limits for cultivation of Mulanje cedar. Additional data loggers are currently being reconditioned for placement at potential planting sites on Mulanje Mountain. Comparable information will be obtained from botanic gardens in year 2 (a1.3).

Output 2 - Improved horticultural protocols developed for the Mulanje cedar to improve survival and growth rates in community nurseries

Survival and growth rates are currently being monitored at each of the 10 community nurseries (a2.2). Nursery trials have been designed by the UK Forestry Commission and set up at Bedgebury National Pinetum in the UK, to investigate optimal growing media, pot size, watering regimes, light and temperature. These trials will be written up and replicated at each nursery at the start of year 2 (a2.1). Activities 2.1 and 2.2 will inform the development of optimal horticultural protocols that will be published and available in local languages by the beginning of year 3 (a2.3).

Output 3 - Cedar propagation in community nurseries generates income for local households

Ten community nurseries have been set up and equipped with shade netting, seed beds, terracing and taps as required (a3.1). In each nursery, at least 1 experienced person was appointed as part of the nursery group. Training was provided to FRIM, MMCT and forestry extension workers from Mulanje and Phalombe District Forest Offices by the contracted nursery consultant, Dan Luscombe from Bedgebury National Pinetum, UK (a3.2). Kingsley Mulekan from Malawi Lake Basin Programme has been contracted as the project business skills

consultant. Training will be given to representatives from each nursery at the start of year 2 (a3.3).

10kg of Mulanje cedar seed was collected by FRIM from stands on Zomba Mountain. 7.2 kg of Mulanje cedar seed has been distributed to the nurseries (a3.4). Seed from other species will be distributed to the nurseries in the next few months now that the cedar seed has been sown and the infrastructures are all in place.

Germination rates of cedar seedlings so far are 80 – 90%. The aim is for 500,000 cedar seedlings and 50,000 seedlings of other species to be available for sale and planting at the end of year 2 (a3.5). The ecological baseline survey carried out in year 1 has identified potential planting sites on Mulanje Mountain which will be refined based on parameters agreed by the Steering Committee. Year 2 planting sites will be selected by August 2017, and prepared from September 2017 onwards, ready for planting in December 2017 – January 2018 (a3.6).

Charles Jumbe from Lilongwe University of Agriculture and Natural Resources was appointed to carry out a baseline socio-economic survey of recruited nursery staff, to identify current income sources and attitudes towards income generation from sale of cedar seedlings and restoration. The survey will be repeated in year 2 and at the end of the project (a3.7). In addition, an MSc study is being carried out by Clemmie Borgstein from Wageningen University in the Netrherlands, which will provide additional information on the attitudes of people living close to Mulanje Mountain towards alternative livelihood sources.

Output 4 - Local and national cedar stakeholders work together with international experts to identify cedar markets, develop mechanisms for tapping into those markets and promote the cedar.

Output 5 - Unsustainable exploitation and damage to natural stands of cedar significantly reduced as a result of local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje mountain

All activities under outputs 4 and 5 are planned activities for years 2 and 3. Public outreach has been a key component of this project since its initiation, even though this activity was scheduled to commence in year 2. A project logo has been designed, T-shirts were provided to project launch attendees, a leaflet in Chichewa (the local language) was prepared explaining the project aims, and the project has received good coverage in local and national press in Malawi. A partnership has been developed with Starfish Malawi, an NGO that links schools in the UK and Malawi, with educational activities planned for year 2 (a4.2).

3.2 Progress towards project Outputs

Baseline conditions and change recorded to date is outlined for each project Output and evidence is provided through hyperlinks or accompanying annexes.

Output 1 - Optimal cedar growing conditions characterised to improve reforestation success on Mulanje Mountain and to define areas suitable for cedar cultivation elsewhere in Malawi.

Prior to project initiation, there was limited understanding of the optimal growing conditions for Mulanje cedar. It occurs naturally on Mulanje Mountain between an altitudinal range of 1800 and 2300m, but also grows well at lower altitudes on Zomba Mountain, 50 miles to the north, and various botanic gardens around the world.

Since project initiation, 8 research plots have been set up to determine the growth limits of Mulanje cedar. Growth and survival rates are being monitored at each plot, along with climatic and edaphic conditions. Information obtained will inform where markets for Mulanje cedar can be developed later in the project (information on trials and location in Annex 4.4). Information has also been obtained on remnant Mulanje cedar populations on Mulanje Mountain through an ecological baseline survey. This survey identified that the decline of Mulanje cedar populations has been much more severe than previously documented. Some evidence of successful plantings and natural regeneration were observed. Genetic samples were collected and are currently being analysed by USFS (the ecological baseline survey report is provided in Annex 4.2). Data loggers are being reconditioned for placement on the mountain. This information will help identify optimum sites for planting Mulanje cedar in years 2 and 3.

The success of this Output is indicated by establishment of a good project infrastructure, that involved obtaining comments from attendees at the project launch (http://globaltrees.org/news-blog/save-our-cedar-working-together-to-save-malawis-national-tree/), a good working relationship between the lead project partners (BGCI, MMCT and FRIM), a strong project Steering Committee who are leading project monitoring and evaluation (meeting minutes are provided in Annex 4.1) and identification of appropriate consultants to implement project activities.

The success of this Output will be further indicated by an improved understanding of the genetic diversity of remnant and planted Mulanje cedar stands (data and a scientific paper), an improved understanding of pathogen and microbial relationships (both of which will be achieved in year 2) and the ability to map areas suitable for Mulanje cedar cultivation in Malawi (year 3).

The project team are happy with progress under this Output in year 1 and do not wish to add additional or alternative indicators at this stage.

Output 2 - Improved horticultural protocols developed for the Mulanje cedar to improve survival and growth rates in community nurseries

Prior to project initiation, success rates of growing Mulanje cedar had varied depending on nursery conditions, and seedling growth rates were generally slow and there was no written guidance available on propagation requirements. There is also no data on protocols, growth rates or survival from previous efforts to cultivate the species.

Since project initiation, cedar seedlings are being raised at 10 community nurseries and all nurseries are recording survival and growth rates (copies of log books from nurseries are available on request). Nursery trials have been designed by the UK Forestry Commission and set up at Bedgebury National Pinetum in the UK, to investigate optimal growing media, pot size, watering regimes, light and temperature. These trials will be written up and replicated at each nursery at the start of year 2 and success rates monitored. This will inform development of optimal horticultural protocols.

The success of this Output will be indicated by the publication and dissemination of protocols by the end of year 2 and an increase in seedling establishment and survival rates throughout the project from the baseline established in year 1.

The project team are happy with progress under Output 2 in year 1 and do not wish to add additional or alternative indicators at this stage.

Output 3 - Cedar propagation in community nurseries generates income for local households

Prior to project initiation, Mulanje cedar nurseries had been set up on Mulanje Mountain by MMCT and FRIM, but provided limited opportunity for community engagement or employment and survival rates were low due to frost killing seedlings.

Since project initiation, 10 nurseries have been set up around the base of Mulanje Mountain and 150 community members are receiving an income for growing cedar seedlings. At least 1 experienced person was appointed in each nursery group, all group members have received training in propagation techniques and business skills training is being provided at the start of year 2. The socio-economic status of nursery groups was measured through a baseline survey (provided in Annex 4.3). 7.2kg of cedar seed has been distributed to nurseries so far.

The success of this Output in year 1 is indicated by the establishment of 10 nurseries, appointment and training of 150 people (60% women), distribution of 7.2kg of cedar seed for sowing with 80-90% germination so far.

The success of this Output will be indicated by the number of seedlings of cedar and other tree species produced and sold (year 2 onwards), and annual income of nursery group members.

The project team are happy with progress under Output 3 in year 1 and do not wish to add additional or alternative indicators at this stage.

Output 4 - Local and national cedar stakeholders work together with international experts to identify cedar markets, develop mechanisms for tapping into those markets and promote the cedar.

Output 5 - Unsustainable exploitation and damage to natural stands of cedar significantly reduced as a result of local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje Mountain

All activities under outputs 4 and 5 are planned activities for years 2 and 3. Public outreach has been a key component of this project since its initiation, even though this activity was scheduled to commence in year 2.

3.3 Progress towards the project Outcome

Outcome - Income from Mulanje cedar propagation supports Malawian households currently dependent on unsustainable harvesting of the cedar, and prospects of the cedar becoming a sustainable forest product are improved.

Good progress has been made towards the project Outcome in year 1.

At project initiation, there was limited information available on optimal growing conditions for Mulanje cedar. Success so far is indicated by the establishment of 8 trial plots that are generating important information to inform suitable sites for developing a market for Mulanje cedar as a sustainable commercial timber tree.

At project initiation, the growth rate of Mulanje cedar in nurseries was slow and published protocols for cultivation were not available. Success so far is indicated through the design and establishment of nursery trials to identify how to improve growing conditions in the nursery and the necessary baseline and subsequent data collection practices. Trials will be written up and replicated in community nurseries in year 2 of the project and protocols published in year 3.

At project initiation, low remaining cedar stocks on Mulanje Mountain and the ban on cedar cutting was forecast to have a detrimental effect on local livelihoods and there were limited alternative income opportunities in the area, particularly for women. Success so far is indicated through 150 community members (66% women) receiving performance-based payments from the project, according to nursery construction, number of pots filled, etc. (see payment schedule in Annex 4.5).

At project initiation, the unsustainable exploitation of Mulanje cedar resources on Mulanje Mountain has continued at a completely unsustainable rate. In fact, it is probable that all marketable timber from the mountain will be exhausted by the end of the project – and possibly within the next few months. Whilst, it has been difficult to ensure the inclusion of sawyers and sawyer families in nursery groups as people do not openly admit to being involved in illegal activities, some success is indicated as at least 2 sawyers have been recruited to work in nurseries. The year 1 socio-economic study indicates that involving local people in cedar planting in years 2 and 3, will generate an increased sense of ownership and empowerment to care for natural resources. This will be critical in protecting the seedlings planted on the mountain as restoration activities accelerate.

3.4 Monitoring of assumptions

Project risks and assumptions are discussed at Steering Committee meetings. So far the project team and Steering Committee is happy that the assumptions still hold true.

Assumption 1: Technical challenges can be overcome.
Comments: No major technical challenges have been encountered so far. This has been aided by a good support from FRIM, e.g. by providing a tractor to deliver soil to the nurseries, and by participation in the project from GIS, conifer and forestry experts from the UK and the USA.

Assumption 2: Full participation of local communities.
Comments: Participation of local communities has been a key component of project success so far, aided by engagement of Traditional Authorities from the project outset (see project launch news article) and regular visits to the nurseries by project staff.

Assumption 3: Local politics and ethnic differences not inimical to creating a cohesive and representative Cedar Growers and Planters Association.
Comments: The Cedar Growers and Planters Association will be established in year 2.

Assumption 4: Income obtained from selling and planting cedar seedlings replaces income from the exploitation of cedar timber and is regarded as an alternative, not an additional activity.
Comments: The first cedar sales will be in year 2. In fact, the cedar timber on Mulanje mountain is very nearly exhausted. We estimate that by the end of this project, the only income to be made from the cedar will be by growing it and planting it.

Assumption 5: Expertise is available to solve the technical challenges
Comments: The involvement of the UK Forestry Commission, Bedgebury Pinetum and the USFS, is helping solve technical challenges, and has complemented the in-country expertise from FRIM.

Assumption 6: Expertise is available to optimise propagation
Comments: Nursery trial designs to optimise propagation have been developed and implemented by the UK Forestry Commission and Bedgebury Pinetum and will be written up and replicated in community nurseries.

Assumption 7: New communities are receptive to nursery establishment
Comments: There is high morale and enthusiasm for the project from all nursery groups (see photos of some of the nursery groups on the BGCI website: http://bgci.org/where-we-work/malawi/). Two people from Kazembe nursery could not see that the benefits proposed by the project would be realised so left the nursery group, but no other nursery group members have shared that view.

Assumption 8: Suitable nursery managers can be recruited from trainees
Comments: All nursery groups appointed nursery managers through group decision making. There has been no changeover of nursery managers or evidence of problems with appointment so far. Nursery managers will receive business skills training, to conclude by 6th May 2017.

3.5 Impact: achievement of positive impact on biodiversity and poverty alleviation

This project is contributing to biodiversity conservation by preparing for restoration of populations of Mulanje cedar on Mulanje Mountain. As evidenced by the results of the ecological baseline survey carried out in year 1 (see Annex 4.2), Mulanje cedar is practically extinct in its natural habitat. 7.2 kg of cedar seed have been distributed to nurseries, and a total of 10kg will have been distributed for sowing by the end of the current sowing season, equivalent to 900,000 seedlings. Potential sites for planting have been identified, final sites will be decided upon, and prepared for planting in December 2017 – January 2018. In addition, 8 trial plots have been established across Malawi (see information and location of trial plots in Annex 4.4) providing *ex situ* conservation of Mulanje cedar, and data on optimal growing conditions. A public awareness campaign has been launched to highlight the status of Mulanje cedar on Mulanje Mountain, and communication with government officials with the aim to increase protection of remaining cedar on the mountain.

This project is contributing to poverty alleviation by providing employment opportunities to 150 people from low-income rural communities, on a performance-based payment scheme (see payment schedule included in Annex 4.5), and then through the sale of seedlings. Baseline evidence has been collated in year 1 so the project's impact on poverty alleviation can be quantified in years 2 and 3 (see baseline socio-economic report in Annex 4.3).

4. Contribution to the Global Goals for Sustainable Development (SDGs)

SDG1: End poverty in all its forms everywhere. Project contribution: 150 people in low-income rural communities receiving income through the project, and gaining the skills to derive income from growing and selling tree seedlings in the future

SDG5: Achieve gender equality and empower all women and girls. Project contribution: 66% women appointed in nursery groups in an area where employment opportunities for women are limited.

SDG8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Project contribution: Employment opportunities already offered, and a plan to develop a sustainable national commercial market for Mulanje cedar seedlings is being developed.

SDG13: Take urgent action to combat climate change and its impacts. Project contribution: The project will replant Mulanje cedar forests on Mulanje Mountain that will help offset carbon emissions

SDG15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Project contribution: The project will lead to enhanced protection, restoration and sustainable use of cedar populations on Mulanje Mountain, and will help to reverse land degradation. The project will halt biodiversity loss by increasing conservation of Mulanje cedar and ensuring it does not go extinct in its natural habitat. The ecological survey carried out in year 1 provides the baseline for measuring impact.

5. Project support to the Conventions, Treaties or Agreements

This project is helping Malawi to meet its obligations to the CBD by addressing the following Aichi Targets;

Target 1: Raising awareness. Project contribution: Public outreach components of the project are raising awareness of the need for biodiversity conservation

Target 2: Integration of biodiversity values into development. Project contribution: The project will promote and enable sustainable commercial use of Mulanje cedar as a mechanism for community development

Target 3: Development of positive incentives for conservation and sustainable use. Project contribution: The project is providing employment opportunities that help conserve and ensure sustainable use of Mulanje cedar, as an alternative to unsustainable exploitation

Target 5: Rate of loss of natural habitats reduced. Project contribution: A baseline ecological survey was carried out, identifying areas requiring enhanced protection to reduce the rate of loss of Mulanje cedar

Target 7: Forestry areas managed sustainably. Project contribution: The project is identifying suitable areas for restoration of cedar forests on Mulanje Mountain and planting will commence in year 2

Target 12: Prevention of species extinction. Project contribution: In year 1, 8 trial plots have been set up that are providing *ex situ* conservation of Mulanje cedar and *in situ* areas requiring protection have been identified as a result of the baseline ecological survey. In year 2, restoration will commence *in situ.*

Target 13: Genetic diversity of domesticated species maintained. Project contribution: Genetic analysis of Mulanje cedar samples collected during the ecological baseline survey is currently being carried out to determine the genetic diversity of remnant and planted cedar stands. This will inform future planting activities and ensure maximum genetic diversity is maintained, including in planted stands across Malawi.

Target 14: Ecosystems safeguarded. Project contribution: Safeguarding of Mulanje Mountain will be enhanced through practical action and awareness raising measures

Target 15: Ecosystems restored. Project contribution: The project is identifying priority sites for cedar forest restoration on Mulanje Mountain, and planting will commence in year 2

Target 16: Equitable sharing of benefits. Project contribution: The project is providing payments for cedar cultivation in nurseries, following a performance-based scheme developed by the project Steering Committee

Target 19: Knowledge transferred. Project contribution: 10 staff from MMCT, FRIM and forestry extension workers, and 150 community nursery group members have received training through the project

Target 20: Resources mobilised. Project contribution: Additional funding will be leveraged for planting on Mulanje Mountain

Malawi's CBD Focal Point provided a letter of support for this project during the application process. Following the recommendations received, the project has incorporated an environmental and social impact assessment baseline study (see Annex 4.2 and Annex 4.3) and, in relation to the Nagoya Protocol, the project will develop Access and Benefit Sharing measures at the community and district level as the project progresses.

6. Project support to poverty alleviation

150 people from low-income rural communities around Mulanje Mountain have received performance payments from the project so far (see payment schedule in Annex 4.5). From year 2 onwards, these people will earn income from selling cedar saplings for restoration of Mulanje mountain and more widely to farmers and foresters. Additional people from the local communities will be recruited and paid to plant Mulanje cedar seedlings in year 2. This project is directly providing income to these communities, and the impact will be quantifiable against the baseline socio-economic data collected in year 1 (see socio-economic baseline report in Annex 4.3). Poverty alleviation in the long-term will be secured through the development of a national commercial market for cedar seedlings from certified nurseries.

7. Project support to gender equality issues

The project is creating employment opportunities for women in an area where currently there are limited opportunities. 66% of nursery workers are women. All of these women have received training in propagation techniques during year 1. Baseline socio-economic data has been captured (see Annex 4.3) against which project impact will be measured in years 2 and 3. Additional income will be obtained through cedar seedling sales in years 2 and 3. Project success will be indicated against a target for these women to earn >US$250 per annum.

8. Monitoring and evaluation

A project Steering Committee (SC) was established to lead monitoring and evaluation of project progress. The SC has so far met twice and the next meeting will take place in May 2017. At each meeting, the SC analyses progress against each Activity and Output, provides advice to address any shortfalls or delays and identifies any risks to successful project implementation. This approach has been successful as a result of appropriate people being appointed to sit on the SC (see meeting minutes in Annex 4.1). Monitoring and evaluation is also ongoing by the Project Manager (Kirsty Shaw, BGCI) and Henry Chintuli (MMCT).

9. Lessons learnt

A key part of project success has resulted from our early engagement of Traditional Authorities and ensuring their comments on the project were incorporated in the project implementation. The project team recommends that similar projects also engage all leadership authorities from the outset. The project will continue to engage Traditional Authorities throughout the project, aided by Senior Chief Chikumba's membership of the Steering Committee.

It has been difficult to ensure that sawyers and sawyer families are included in nursery groups, in part because people do not openly admit to being involved in illegal activities, and partly because of our 60% women employment in nurseries target as most of the sawyers are male. There will be more opportunity to employ sawyers for cedar planting. The public outreach component of the project will help us engage sawyers and recruit them to planting teams.

10. Actions taken in response to previous reviews (if applicable)

N/A

11. Other comments on progress not covered elsewhere

A key risk identified by the Steering Committee and evident from the ecological baseline survey carried out in year 1, is that illegal activities may continue on Mulanje Mountain and hinder the success of plantings. For example, intentional fires are common in the dry season, for hunting and locating remnant pieces of cedar. Sites for planting will therefore be selected taking this risk into account, and site preparation work will be carried out, including clearing fire breaks. The public awareness component of the project also aims to reduce illegal activities on the mountain by highlighting the impacts, and the involvement of local people carrying out cedar growing and planting will hopefully lead to an enhanced sense of ownership and responsibility for natural resources and a decrease in illegal activities.

12. Sustainability and legacy

The public outreach component is due to start in year 2 of the project, but efforts to raise awareness of the need for the project, the project aims and the status of Mulanje cedar on Mulanje Mountain commenced in year 1. With the support of MMCT's Environmental Education and Communications Officer, the project has received good coverage in local and national press (see summary in Annex 4.6).

The project exit strategy is still deemed valid. BGCI and MMCT are identifying potential funders to enable purchase and planting of cedar seedlings on Mulanje Mountain, and the development of a national market for sustainably sourced Mulanje cedar seedlings will ensure continued benefits to communities beyond the timeframe of this project.

13. Darwin identity

The Darwin Initiative logo has been used on project promotional and informational resources, including T-shirts given to launch participants, the leaflet about the project and on the project web pages (see for example, http://www.bgci.org/where-we-work/malawi/ and http://globaltrees.org/projects/save-our-cedar-malawis-national-tree/).

The Darwin Initiative project has been recognised by all project partners and stakeholders as a distinct project, building on previous work to develop a Cedar Management Plan, funded by Save Our Species. There is good understanding that the funding comes from the UK government's Darwin Initiative at all levels.

We use #SaveOurCedar to promote the project and often link to the Darwin Twitter account.

14. Project expenditure

Table 1: Project expenditure during the reporting period (1 April 2016 – 31 March 2017)

Project spend (indicative) since last annual report	2016/17 Grant (£)	2016/17 Total Darwin Costs (£)	Variance %	Comments (please explain significant variances)
Staff costs (see below)			0.7%	
Consultancy costs			0.7%	
Overhead Costs			0.0%	
Travel and subsistence			0.4%	
Operating Costs			2.6%	
Capital items (see below)			-3.9%	
Others (see below)			-0.8%	
TOTAL				

Annex 1: Report of progress and achievements against Logical Framework for Financial Year 2016-2017

Project summary	Measurable Indicators	Progress and Achievements April 2016 - March 2017	Actions required/planned for next period
Impact The Mulanje cedar is a sustainably managed commercial product, generating income for local households and the Malawian economy, and no longer threatened in the wild.		*Positive impact on biodiversity –* • 8 research plots for Mulanje Cedar have been established across Malawi providing *ex situ* conservation of this Critically Endangered species. • 7.2 kg of cedar seed has been distributed to 10 newly established local nurseries for sowing, which will provide a source of material for restoration. *Positive changes in the conditions of human communities associated with biodiversity –* • 150 community members in 10 villages engaged and benefitting from the project so far.	
Outcome Income from Mulanje cedar propagation supports Malawian households currently dependent on unsustainable harvesting of the cedar, and prospects of the cedar becoming a sustainable forest product are improved.	0.1. Optimal growing conditions for the Mulanje cedar characterised, enabling broader use of this tree in the Malawian domestic market by the end of year 3. 0.2. Improved horticultural protocols developed for establishment and propagation of the Mulanje cedar in nurseries by the end of year 2 0.3. Cedar propagation in community nurseries generates income for local households. 150 local people (at least 60% women) trained and earn >US$250 per annum each, directly from seedling sales, by the end of year	8 trial plots across Malawi have been established to determine optimal growing conditions for the cedar. 10 nurseries have been established in villages local to Mulanje mountain, and 150 people have been recruited and have received training in nursery techniques. 150 community members have received payments from the project so far, for nursery construction, pot filling, seed sowing and pricking out. These nursery groups are helping to record optimal growing conditions and	Trials will continue to identify optimal growing conditions and horticultural protocols to improve cedar growth. A market for Cedar sales will be created, initially for restoration on the mountain and later for national markets. 150 people will be employed to plant Mulanje Cedar in identified restoration sites on Mulanje Mountain. This will include sawyers and sawyer family members who will be employed to replant Mulanje Cedar populations in year 2.

	2 and 150 local people earn US$1.50 per day planting cedar on Mulanje Mountain in years 2 and 3. 0.4. Local and national markets are established for the Mulanje cedar based on the sale of 500,000 seedlings per annum for reforestation of Mulanje Mountain (years 2 and 3) and promotion and licensing of the cedar on the national market (year 3). 0.5. Unsustainable exploitation and damage to natural stands of cedar reduced by at least 50% against the year 1 baseline by the end of March 2019 as a result of local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje mountain	horticultural protocols. It has been difficult to ensure the inclusion of sawyers and sawyer families in nursery groups as people do not openly admit to being involved in illegal activities, but at least 2 sawyers have been recruited. A baseline socio-economic survey has been carried out determining income levels and attitudes to the Mulanje cedar. A baseline ecological survey of the status of the cedar on Mulanje mountain has been carried out.	A public outreach campaign will be launched to highlight the threatened status of Mulanje Cedar and the need for its conservation.
Output 1. Optimal cedar growing conditions characterised to improve reforestation success on Mulanje Mountain and to define areas suitable for cedar cultivation elsewhere in Malawi.	1.1. Project infrastructure established, including project management, employment of experts, full stakeholder engagement, acquiring Prior Informed Consent and Monitoring and Evaluation. 1.2. Genetic diversity and provenance of remaining cedar seed stocks characterised by end of year 1, and cedar pathology and symbiont biology understood by end of year 2 1.3. Optimal abiotic (soil, climate) requirements for growing cedar elucidated and areas of Malawi suitable for cedar cultivation mapped and published by end of year 3.	Trials have been set up to identify optimal growing conditions and identify where cedar can be cultivated elsewhere in Malawi. Appointment of an appropriate team made up of strong partners, a balance Steering Committee, suitable consultants and good engagement with stakeholders has helped ensure good progress on this output in year 1. This includes FRIM leading establishment of trial plots and the US Forest Service appointed to undertake genetic analyses. **Evidence –** News story from project launch: http://globaltrees.org/news-blog/save-our-cedar-working-together-to-save-malawis-national-tree/ Steering committee meeting minutes (Annex 4.1) Information and location of trial plots across Malawi (Annex 4.4) **Appropriateness of indicators** – Good for year 1	
Activity 1.1 Inaugural Project Workshop held with all stakeholders present. Project plan communicated, refined and all necessary mechanisms for acquiring permits and Prior Informed Consent defined and implemented.		**Complete** – Project launch held with representation from Traditional Authorities. Project plan communicated, comments received and integrated in project plan. Attendees were given T-shirts as the first public awareness raising measure of the project. Good press coverage. Prior Informed Consent was obtained from all	

	involved partners. Activity reviewed at Steering Committee (SC) meeting and all SC members happy. **Next steps** – Continue to engage with local leaders throughout the project timeframe (and beyond).
1.1. Project Steering Committee established, including all existing stakeholders (national and local authorities, communities, NGOs, academics etc.).	**Complete –** First meeting held on 1st June 2016. TORs of SC agreed upon, project implementation plan discussed and risks identified. Second meeting on 2nd March 2017. Project progress discussed, priority actions identified and risks identified. SC members: • Forestry Research Institute Malawi (FRIM) Dr. Tembo Chanyenga • District Environmental Officer (EDO) Suzgo Gondwe • Mulanje Mountain Conservation Trust (MMCT) Carl Bruessow, Henry Chinthuli and Jeffrey Jawawo • Forestry Commission UK, Richard Jinks • Botanic Gardens Conservation International (BGCI) Paul Smith and Kirsty Shaw • National Herbarium & Botanic Garden (NHBG) Zacharia Magombo • District Forestry Officer (DFO) Mulanje, Lemos Mlaviwa • African Parks, David Nangoma • Chancellor College Biology & MMCT Research Committee, Wilbert Chitaukali • Traditional Authority representation, Senior Chief Chikumbu **Next steps** – The group will meet at 3-4 month intervals. The next SC meeting will be held in May 2017.
1.1. Detailed briefs written for external consultants	**Complete -** In year 1, briefs were written for; • Dan Luscombe, Nursery consultant from Bedgebury Pinetum • Charles Jumbe, Socio-economic consultant from Lilongwe University of Agriculture and Natural Resources (LUANAR) • Justin and Alison Moat, GIS consultants for ecological baseline survey, independent • Kingsley Mulekano, Business skills consultant from Malawi Lake Basin Programme Work is complete, except for the business skills consultant who has been

	delivering training during April 2017. **Next steps** – Training will be completed by 6th May 2017.
1.1. Monitoring and evaluation methodology defined and implemented.	**Complete -** Monitoring and evaluation (M&E) for the project is overseen by the SC. The methodology for M&E was agreed in the first SC meeting and implemented in the second SC meeting. M&E is also ongoing by the Project Manager (Kirsty Shaw, BGCI) and Henry Chintuli (M&E Officer, MMCT). **Next steps** – Next SC meeting will be held in May 2017.
Activity 1.2. Ecological survey of cedar populations (remnant and restored), measuring numbers of trees, size classes, genetic provenance, climate, soils and exploitation, carried out on Mulanje Mountain in year 1 and repeated in year 3.	**Complete for year 1** - Prior to commencing the survey, information was collated and mapped by the GIS consultants. The survey took place from 26th January - 7th February, involving staff from BGCI, MMCT, FRIM, USFS, Mulanje and Phalombe District Forest Offices, and a team of forestry porters. The majority of the mountain was covered in 2 weeks. Ecological surveys were undertaken and samples collected at survey sites for genetic analyses. *Findings of the survey* - Across all sites surveyed, practically all mature cedar had been cut. The team only saw 7 big trees during the whole survey and small trees that had missed being cut. Signs of natural regeneration were only found at Lichenya which had been recently cleared. All other sites had been burnt which killed natural regeneration. Some signs of successful planting were seen, but success varied depending on site conditions. *Follow up* - FRIM and MMCT returned to the mountain to collect seed. Fire breaks will be cleared around the natural regeneration sites before the dry season. A summary report was provided to SC members, for circulation and promotion of the status of Mulanje Cedar *in situ*. **Next steps** – Survey results will calculate population decline since 2014 (using FRIM 2014 survey data) and determine if there is genetic variation between populations and where the Zomba plantation originated from (i.e. what was the seed source). The survey results will also be used to help determine planting sites on Mulanje Mountain for this project. Data loggers will be put on the mountain and soil samples taken from potential planting sites. Public outreach component of the project will communicate the status of Mulanje Cedar on the Mountain.
1.2. International study carried out on microbial associations and pathology of cedar in years 1 and 2. Results published by end of year 2.	**In progress** – The study parameters have been defined. The study will; • Identify whether seedling death is a result of microbial associations, lack of nutrients or water • Identify alternative *Pinus* species to *Pinus patula* that can be used as nurse species, but are not invasive. • Determine whether soil from pine plantations speeds up growth rates in

		the nursery. **Next steps -** BGCI will identify an appropriate expert from our network to lead this study.
Activity 1.3. Edaphic and climatic conditions measured for *in situ* populations of cedar on Mulanje Mountain and *ex situ* stands in Malawi and in botanic gardens around the world		**In progress** - Data loggers have been donated by UK Forestry Commission to be installed on sites on the mountain to better understand the natural conditions and to inform future planting. The data loggers are currently being reconditioned. **Next steps** - Data loggers will be sent to Malawi in April / May for placement on Mountain.
1.3. Cedar trial plots designed and planted (using existing seedling stocks) in 10 edaphically and climatically diverse sites across Malawi by end of year 1.		**Complete -** 8 plots have been set up across Malawi. The cedar seedlings were stolen from one plot, but haves now been replaced. Data loggers are placed at all sites. **Next steps** – Monitor survival and growth rates at all sites.
1.3. Cedar growth rates monitored in all trial sites (years 2 and 3), and optimal requirements for cedar growth determined by end of year 3.		**In progress** – Monitoring has commenced at all sites. **Next steps** – Results will be analysed and optimal requirements for cedar growth determined by end of year 3.
1.3. Areas of Malawi suitable for cedar cultivation mapped and published by end of year 3.		**Activity not yet started** - Collate results and map suitable areas for cedar cultivation, by end of year 3.
Output 2. Improved horticultural protocols developed for the Mulanje cedar to improve survival and growth rates in community nurseries	2.1. Improved horticultural protocols developed and available to local users by year 2 2.2. Seedling establishment and survival rates increased throughout life of the project	Nursery trials designed and set up at Bedgebury Pinetum, UK, to be replicated at 10 community nurseries. Baseline survival and growth rates being measured at all nurseries. **Evidence –** Log books maintained by each nursery **Appropriateness of indicators** – Good
Activity 2.1. Nursery trials designed and implemented by international experts within first 6 months of the project, investigating optimal media, watering regimes, light, temperature etc.		**In progress** – (Note: This is separate from the *ex situ* trials mentioned above_. Nursery trials have been designed by Dan Luscombe (Bedgebury Pinetum, UK) and Richard Jinks (Forestry Commission, UK) and set up at Bedgebury Pinetum. The trials aim to determine the effects of using different pots, different growing media, different seed sowing techniques, etc., on growth and survival rates. **Next steps –** Trials to be replicated at the 10 community nurseries in Malawi.
2.2. Seedling establishment, survival and growth baselines measured and monitored in nursery trials throughout the project		**In progress** – The 10 community nurseries have all planted cedar seed and have log books for monitoring survival and growth rates. **Next steps** – Trials to be replicated at the 10 community nurseries in Malawi.
2.3. Optimal horticultural protocols published and available in local languages to		**Activity not yet started –** Collate results of trials and publish optimal horticultural

users by beginning of year 3.		protocols by beginning of year 3.
Output 3. Cedar propagation in community nurseries generates income for local households	3.1. 10 tree nurseries established in Mulanje and Phalombe Districts by the end of the third quarter of year 1 3.2. 150 people (60% women) from 10 different communities trained in nursery techniques, cedar propagation, and basic business skills by the end of the third quarter of year 1. 3.3. 10 community nursery managers appointed and trained in business skills by the end of year 1 3.4. 10 kg of cedar seed, and 15 kg of other tree species seed collected and sown in 2016, 2017, 2018 3.5. 10 nurseries produce a minimum aggregate total of 500,000 cedar seedlings and 50,000 other tree seedlings per annum in years 2 and 3 (assumes 60% cedar seedling survival). 3.6. 500,000 cedar seedlings sold at end of years 2 and 3 at a minimum cost of US$0.10 each to support the Mulanje cedar restoration programme (creates a 10% profit margin for each nursery). At least 25,000 other tree seedlings sold. 3.7. 150 local people earn >US$250 per annum each, directly from seedling sales, by the end of year 2.	10 nurseries established and fully equipped. 150 nursery workers (more than 60% women) received training and are receiving payments for nursery work, based on performance. Business skills consultant appointed and training to be complete by 6th May. 7.2kg of seed distributed to nurseries so far and remainder will be distributed before end of planting season. Good survival rates so far and pricking out is underway. **Evidence** – Photos of nurseries available here: http://www.bgci.org/where-we-work/malawi/ Log books maintained at each nursery (copy available on request) Payment schedule (Annex 4.5) Baseline socio-economic study report (Annex 4.3) Baseline ecological survey (Annex 4.2) **Appropriateness of indicators** – Good so far
Activity 3.1. 10 nurseries established and fully equipped with shade netting, grow bags and other consumables by the end of year 1.		**Complete -** 10 nurseries have been set up, all with seed sowing troughs, poles and wire frames, and terracing and taps where necessary. Dan Luscombe (Bedgebury Pinetum) visited all nurseries in November 2016 and recommendations were made for nursery improvements. All recommendations have been taken on board. **Next steps** – Dan Luscombe will revisit all nurseries on his next visit and suggest improvements where necessary.

3.2. 10 experienced nursery staff recruited to establish nurseries and act as mentors. These staff will be drawn from existing MMCT nurseries, prioritising women and people with a proven track record.	**Complete** - FRIM and District Forest Officers (DFOs) visited all nurseries to ensure at least 1 experienced person was appointed amongst the 15 people within each of the nursery groups. **Next steps** - Forestry extension workers continue to visit the sites regularly.
3.2. 10 x 1 week nursery techniques training course offered for up to 20 people each (priority given to cedar sawyer families). 140 staff recruited from people who complete the course successfully (at least 60% women).	**Complete** - Dan Luscombe delivered training to 10 staff from FRIM, MMCT, DFOs and forestry extension workers in November 2016. A training programme was developed and trained personnel then trained the nursery workers. Each nursery group received five days of training on nursery construction, soil mixes, pot filling, seed sowing, pricking out, etc. 150 people were recruited to work in the 10 nurseries. This includes 2 people who were previously logging on the mountain, but it has been difficult to recruit more people who admit to being involved in logging. More than 60% of the nursery workers are women. **Next steps** - Forestry extension workers and MMCT continue to visit the sites regularly to provide guidance and identify training needs. Dan Luscombe will revisit all nurseries to provide additional support.
3.3. Nursery management and business skills training given to 10 individuals assessed by the Business skills consultant as having the necessary skills to manage production, nurture markets and make sales (end of year 1).	**In progress** – Business skills consultant appointed and training materials developed. 10 individuals to receive training have been identified. Training scheduled for early May. **Next steps** – Deliver training and write report.
3.4. At least 10 kg of cedar seed collected and sown by the 10 nurseries in the fourth quarter of each year (equivalent to 900,000 seedlings).	**In progress** – 10kg of cedar seed collected was collected, and 7.2kg has been given to nursery groups so far for sowing. The remaining seed will be distributed before the end of the current sowing season. Survival and growth rates are being monitored in all nurseries. Germination rates so far are between 80-90%. Seedlings are being pricked out and transferred to pots. **Next steps** – Continue to plant and prick out seedlings.
3.4. Seed collected and sown from at least five other useful tree species in local demand, equivalent to at least a further 10,000 seedlings.	**In progress** – MMCT has gathered information on which additional species each nursery is interested in growing (including *Khaya anthoteca, Pinus patula, Albizia lebbeck, Faidherbia albida, Eucalyptus spp., Acacia spp.*). Some groups are uncertain as to whether it will be possible to find a market to sell the seedlings. The business skills training in early May will help address these concerns. Most of these species (excluding *Khaya anthoteca*) have fast growth rates, so seed sowing would need to take place later in the year to be ready for the December 2017 – January 2018 planting season. **Next steps** – Finalise species selection and distribute seeds to nurseries for sowing.

3.6. Based on survey carried out in 1.2. MMCT and FRIM identify suitable sites for reintroduction of cedar by end of year 1.	**In progress** – The ecological baseline survey (activity 1.2) helped identify appropriate sites for reintroduction. **Next steps** - Site selection will be refined based on the following factors; • Results of genetic analysis • Success of previous plantings • Where protection from fire or malicious activity is possible • Where hydropower benefits will also be realised • Enthusiasm of planting groups and nurseries • Access • High profile sites, e.g. where high numbers of tourists visit Suitable sites will be determined by August 2017, so site preparation can commence in September 2017, ready for first plantings in December 2017 / January 2018.
3.6. 500,000 cedar seedlings sold at the end of years 2 and 3 to support the Mulanje cedar restoration programme. At least 25,000 other tree seedlings sold to local people.	**Activity not yet started** – BGCI and MMCT are identifying appropriate funders to enable purchase of 500,000 cedar seedlings for restoration.
3.7. Baseline socio-economic survey of recruited staff (disaggregated by gender) carried out by socio-economic consultant, assessing household income levels, income sources, use of natural resources and attitudes to cedar and natural resource conservation and management. Survey repeated in years 2 and 3.	**Complete –** The baseline socio-economic survey was carried out by Charles Jumbe. The survey assessed attitudes towards the new project, whether the 150 recruited people would readily change where their income is coming from, and identified current income streams. The consultant wanted to interview villages involved in the project and villages that aren't involved, but the funding was not sufficient to do this. The survey therefore measures change over time, rather than the difference between nursery workers and non-nursery workers. In addition, Clemmie Borgstein, an MSc student from the University of Wageningnen, is undertaking her dissertation which assesses livelihood opportunities as substitutes for natural resource use from Mulanje Mountain and people's perceptions of conservation, natural resource use and existing and potential livelihood opportunities. This study will complement the findings of the socio-economic baseline survey. *Findings of the baseline socio-economic survey* - People have an interest in managing natural resources but they are depleting resources because of poverty. If people are given the chance, they are very ready to be involved in restoration activities. This may be partly based on a lack of income options, which means they are willing to be involved in any activity that offers payment. *Findings of the MSc study* - People showed more responsibility towards the resources if they had a direct link, e.g. if people had planted trees themselves. People also want more empowerment to take better care of the environment. **Next steps** – The survey will be repeated in years 2 and 3 to measure impact of

		the project. Sawyers and sawyer family members will be employed to plant Mulanje Cedar seedlings to increase their sense of responsibility for natural resources.
Output 4. Local and national cedar stakeholders work together with international experts to identify cedar markets, develop mechanisms for tapping into those markets and promote the cedar.	4.1. Mulanje Cedar Growers and Planters Association formed from nursery staff, cedar planters and local community leaders in year 2 4.2. Forestry Department and Environmental Affairs Department works with local growers to promote cedar to farmers in appropriate areas nationwide by end of year 3. 4.3. Consultant works with Cedar Growers and Planters Association and EAD to develop licensing and benefit-sharing models for selling certified cedar stocks nationwide by end of year 2.	Majority of activities to come in years 2 and 3 of the project. Publicity campaign initiated early (in year 1) to raise awareness of the status of Mulanje Cedar, the need for the project and to generate support at local and national levels. **Evidence** – Project dissemination so far (Annex 4.6)
Activity 4.1. Mulanje Cedar Growers and Planters Association formed from nursery staff, cedar planters and local community leaders.		**Activity not yet started** – All nursery group members will be brought together at the start of year 2 of the project to introduce the idea of the Growers and Planters Association and highlight the aims, e.g. standard price per seedling for each nursery.
4.2. National cedar publicity campaign launched by FRIM and EAD with support from the Eden Project, targeted at areas of Malawi where the cedar will grow successfully as defined in Output 1.		**In progress** – Although this activity was not scheduled to start until year 2 of the project, it was clear from project initiation that raising awareness of the threatened status of Mulanje Cedar and support for the project was of utmost importance. A project logo was therefore designed, T-shirts with the logo were provided to project launch attendees, efforts have been made to engage with local and national press throughout the project and a partnership has been developed with Starfish Malawi, an NGO that links schools in the UK and Malawi, with educational activities planned in both countries. **Next steps** – MMCT's Environmental Education and Communications Officer has developed a draft plan and budget for future public outreach components of the project which will be circulated and discussed by the SC.
4.3. Consultant works with Cedar Growers and Planters Association and EAD to develop licensing and benefit-sharing models for selling certified cedar stocks nationwide.		**Activity not yet started** – Activity due to commence in year 2.
Output 5. Unsustainable exploitation and damage to natural stands of cedar significantly reduced as a result of	5.1. Mulanje Cedar Growers and Planters Association adopts the Cedar	Activities to come in years 2 and 3 of the project. Publicity campaign initiated early. See evidence above (Output 4).

local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje mountain	Management Plan by the end of year 2. 5.2.150 local people earn US$1.50 per day planting cedar on Mulanje Mountain in years 2 and 3. 5.3. Local cedar public awareness programme launched by end of year 2 5.4. In 2019, a >40% increase in positive responses are recorded in the socio-economic survey for both attitudes to, and benefits received from, the cedar compared to the 2016 baseline study. 5.5. Cutting and fires demonstrably reduced by end of year 3 against year 1 baseline.	
5.1. Cedar Management Plan discussed, modified as appropriate and adopted by Cedar Growers and Planters Association.		**Activity not yet started** – Activity due to commence in year 2.
5.2. At least 150 people employed at US$ 1.50 per day to plant 500,000 cedar seedlings per annum on Mulanje Mountain in years 2 and 3 as stipulated in the Cedar Management Plan (2014-2019).		**Activity not yet started** – Activity due to commence in year 2. BGCI and MMCT are identifying appropriate funders to enable purchase of 500,000 cedar seedlings for restoration
5.3. Mulanje Cedar Growers and Planters Association works with MMCT and FRIM to promote the Cedar Management Plan, and the value of the cedar to local communities.		**Activity not yet started** – Activity due to commence in year 3.
5.4. Socio-economic survey outlined in 3.7 re-assesses attitudes to and benefits received from cedar amongst growers and planters		**Activity not yet started** – Activity due to commence in year 3.
5.5. Ecological survey of remaining cedar populations' exploitation and damage by fire repeated on Mulanje Mountain at end of year 3, and compared to baseline (Output 1.2)		**Activity not yet started** – Activity due to commence in year 3.

Annex 2: Project's full current logframe as presented in the application form (unless changes have been agreed)

Project summary	Measurable Indicators	Means of verification	Important Assumptions
Impact: The Mulanje cedar is a sustainably managed commercial product, generating income for local households and the Malawian economy, and no longer threatened in the wild. (Max 30 words)			
Outcome: Income from Mulanje cedar propagation supports Malawian households currently dependent on unsustainable harvesting of the cedar, and prospects of the cedar becoming a sustainable forest product are improved. (Max 30 words)	0.1. Optimal growing conditions for the Mulanje cedar characterised, enabling broader use of this tree in the Malawian domestic market by the end of year 3. 0.2. Improved horticultural protocols developed for establishment and propagation of the Mulanje cedar in nurseries by the end of year 2 0.3. Cedar propagation in community nurseries generates income for local households. 150 local people (at least 60% women) trained and earn >US$250 per annum each, directly from seedling sales, by the end of year 2 and 150 local people earn US$1.50 per day planting cedar on Mulanje Mountain in years 2 and 3. 0.4. Local and national markets are established for the Mulanje cedar based on the sale of 500,000 seedlings per annum for reforestation of Mulanje Mountain (years 2 and 3) and promotion and licensing of the cedar on the national market (year 3). 0.5. Unsustainable exploitation and damage to natural stands of cedar reduced by at least 50% against the	0.1. Scientific papers & reports 0.2. Protocols published. Seedling production records 0.3. Nursery records and accounts. Training course attendance figures and attainment certificates. Socio-economic survey report against project inception baseline. MMCT Annual Report and accounts. 0.4. MMCT Annual Reports and accounts (reforestation). Publicity materials, radio broadcasts, policy documents etc. (cedar promotion). 0.5. Meeting minutes and records. Posters and leaflets produced. Socio-economic survey report. Cedar ecological survey, satellite imagery fire study, scientific papers.	• Technical challenges can be overcome. • Full participation of local communities. • Local politics and ethnic differences not inimical to creating a cohesive and representative Cedar Growers and Planters Association • Income obtained from selling and planting cedar seedlings replaces income from the exploitation of cedar timber and is regarded as an alternative, not an additional activity.

	year 1 baseline by the end of March 2019 as a result of local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje mountain		
Outputs: 1. Optimal cedar growing conditions characterised to improve reforestation success on Mulanje Mountain and to define areas suitable for cedar cultivation elsewhere in Malawi.	1.1. Project infrastructure established, including project management, employment of experts, full stakeholder engagement, acquiring Prior Informed Consent and Monitoring and Evaluation. 1.2. Genetic diversity and provenance of remaining cedar seed stocks characterised by end of year 1, and cedar pathology and symbiont biology understood by end of year 2 1.3. Optimal abiotic (soil, climate) requirements for growing cedar elucidated and areas of Malawi suitable for cedar cultivation mapped and published by end of year 3.	1.1. Employment contracts, Workshop minutes, Steering Committee minutes, consultant contracts, permits, M & E reports. 1.2. Scientific papers & reports 1.3. Trial plot records, scientific reports and papers, maps.	• Expertise is available to solve the technical challenges
2. Improved horticultural protocols developed for the Mulanje cedar to improve survival and growth rates in community nurseries	2.1. Improved horticultural protocols developed and available to local users by year 2 2.2. Seedling establishment and survival rates increased throughout life of the project	2.1. Propagation leaflets 2.2. Nursery seedling production figures	• Expertise is available to optimise propagation
3. Cedar propagation in community nurseries generates income for local households	3.1. 10 tree nurseries established in Mulanje and Phalombe Districts by the end of the third quarter of year 1 3.2. 150 people (60% women) from 10 different communities trained in nursery techniques, cedar	3.1. Infrastructures and consumables in place 3.2. Staff records. Training course attendance figures and attainment certificates	• New communities are receptive to nursery establishment • Suitable nursery managers can be recruited from trainees

	propagation, and basic business skills by the end of the third quarter of year 1. 3.3. 10 community nursery managers appointed and trained in business skills by the end of year 1 3.4. 10 kg of cedar seed, and 15 kg of other tree species seed collected and sown in 2016, 2017, 2018 3.5. 10 nurseries produce a minimum aggregate total of 500,000 cedar seedlings and 50,000 other tree seedlings per annum in years 2 and 3 (assumes 60% cedar seedling survival). 3.6. 500,000 cedar seedlings sold at end of years 2 and 3 at a minimum cost of US$0.10 each to support the Mulanje cedar restoration programme (creates a 10% profit margin for each nursery). At least 25,000 other tree seedlings sold. 3.7. 150 local people earn >US$250 per annum each, directly from seedling sales, by the end of year 2.	3.3. Staff records. Training course attendance figures and attainment scores 3.4. Nursery records 3.5. Nursery records 3.6. Nursery accounts and records 3.7. Socio-economic research results (disaggregated by gender). 3.7. MMCT Annual Report and accounts	
4. Local and national cedar stakeholders work together with international experts to identify cedar markets, develop mechanisms for tapping into those markets and promote the cedar.	4.1. Mulanje Cedar Growers and Planters Association formed from nursery staff, cedar planters and local community leaders in year 2 4.2. Forestry Department and Environmental Affairs Department works with local growers to promote cedar to farmers in appropriate areas nationwide by end of year 3. 4.3. Consultant works with Cedar Growers and Planters Association and EAD to develop licensing and benefit-	4.1. Association registered as an entity, meeting minutes 4.2. Publicity materials, radio broadcasts, policy documents etc. 4.3. Report, certification scheme.	• Local politics and ethnic differences not inimical to creating a cohesive and representative Cedar Growers and Planters Association

	sharing models for selling certified cedar stocks nationwide by end of year 2.		
5. Unsustainable exploitation and damage to natural stands of cedar significantly reduced as a result of local communities working with the authorities to protect, restore and sustainably manage the remaining natural stands of cedar on Mulanje mountain	5.1. Mulanje Cedar Growers and Planters Association adopts the Cedar Management Plan by the end of year 2. 5.2.150 local people earn US$1.50 per day planting cedar on Mulanje Mountain in years 2 and 3. 5.3. Local cedar public awareness programme launched by end of year 2 5.4. In 2019, a >40% increase in positive responses are recorded in the socio-economic survey for both attitudes to, and benefits received from, the cedar compared to the 2016 baseline study. 5.5. Cutting and fires demonstrably reduced by end of year 3 against year 1 baseline.	5.1. Meeting minutes and records. 5.2. Cedar seedlings planted on Mulanje 5.3. Posters and leaflets produced 5.4. Socio-economic research report 5.5. Cedar ecological survey results, satellite imagery fire study, scientific papers.	• Income obtained from selling and planting cedar seedlings replaces income from the exploitation of cedar timber and is regarded as an alternative, not an additional activity.

Activities (each activity is numbered according to the output that it will contribute towards, for example 1.1, 1.2 and 1.3 are contributing to Output 1)

1.1. Inaugural Project Workshop held with all stakeholders present. Project plan communicated, refined and all necessary mechanisms for acquiring permits and Prior Informed Consent defined and implemented.

1.1. Project Steering Committee established, including all existing stakeholders (national and local authorities, communities, NGOs, academics etc.).

1.1. Detailed briefs written for external consultants

1.1. Monitoring and evaluation methodology defined and implemented.

1.2. Ecological survey of cedar populations (remnant and restored), measuring numbers of trees, size classes, genetic provenance, climate, soils and exploitation, carried out on Mulanje Mountain in year 1 and repeated in year 3.

1.2. International study carried out on microbial associations and pathology of cedar in years 1 and 2. Results published by end of year 2.

1.3. Edaphic and climatic conditions measured for *in situ* populations of cedar on Mulanje Mountain and *ex situ* stands in Malawi and in botanic gardens around the world

1.3. Cedar trial plots designed and planted (using existing seedling stocks) in 10 edaphically and climatically diverse sites across Malawi by end of year 1.

1.3. Cedar growth rates monitored in all trial sites (years 2 and 3), and optimal requirements for cedar growth determined by end of year 3.

1.3. Areas of Malawi suitable for cedar cultivation mapped and published by end of year 3.

2.1. Nursery trials designed and implemented by international experts within first 6 months of the project, investigating optimal media, watering regimes, light, temperature etc.
2.2. Seedling establishment, survival and growth baselines measured and monitored in nursery trials throughout the project
2.3. Optimal horticultural protocols published and available in local languages to users by beginning of year 3.

3.1. 10 nurseries established and fully equipped with shade netting, grow bags and other consumables by the end of year 1.
3.2. 10 experienced nursery staff recruited to establish nurseries and act as mentors. These staff will be drawn from existing MMCT nurseries, prioritising women and people with a proven track record.
3.2. 10 x 1 week nursery techniques training course offered for up to 20 people each (priority given to cedar sawyer families). 140 staff recruited from people who complete the course successfully (at least 60% women).
3.3. Nursery management and business skills training given to 10 individuals assessed by the Business skills consultant as having the necessary skills to manage production, nurture markets and make sales (end of year 1).
3.4. At least 10 kg of cedar seed collected and sown by the 10 nurseries in the fourth quarter of each year (equivalent to 900,000 seedlings).
3.4. Seed collected and sown from at least five other useful tree species in local demand, equivalent to at least a further 10,000 seedlings.
3.5. At least 500,000 cedar seedlings and 10,000 seedlings of other species produced by the 10 nurseries per annum in years 2 and 3.
3.6. Based on survey carried out in 1.2. MMCT and FRIM identify suitable sites for reintroduction of cedar by end of year 1.
3.6. 500,000 cedar seedlings sold at the end of years 2 and 3 to support the Mulanje cedar restoration programme. At least 25,000 other tree seedlings sold to local people.
3.7. Baseline socio-economic survey of recruited staff (disaggregated by gender) carried out by socio-economic consultant, assessing household income levels, income sources, use of natural resources and attitudes to cedar and natural resource conservation and management. Survey repeated in years 2 and 3.

4.1. Mulanje Cedar Growers and Planters Association formed from nursery staff, cedar planters and local community leaders.
4.2. National cedar publicity campaign launched by FRIM and EAD with support from the Eden Project, targeted at areas of Malawi where the cedar will grow successfully as defined in Output 1.
4.3. Consultant works with Cedar Growers and Planters Association and EAD to develop licensing and benefit-sharing models for selling certified cedar stocks nationwide.

5.1. Cedar Management Plan discussed, modified as appropriate and adopted by Cedar Growers and Planters Association.
5.2. At least 150 people employed at US$ 1.50 per day to plant 500,000 cedar seedlings per annum on Mulanje Mountain in years 2 and 3 as stipulated in the Cedar Management Plan (2014-2019).
5.3. Mulanje Cedar Growers and Planters Association works with MMCT and FRIM to promote the Cedar Management Plan, and the value of the cedar to local communities.
5.4. Socio-economic survey outlined in 3.7 re-assesses attitudes to and benefits received from cedar amongst growers and planters
5.5. Ecological survey of remaining cedar populations' exploitation and damage by fire repeated on Mulanje Mountain at end of year 3, and compared to baseline (Output 1.2)

Annex 3: Standard Measures

Table 1 Project Standard Output Measures

Code No.	Description	Gender of people (if relevant)	Nationality of people (if relevant)	Year 1 Total	Year 2 Total	Year 3 Total	Total to date	Total planned during the project
6A 6B	*Training courses* – *Nursery training* - Provided to 10 trainers from FRIM, MMCT & forestry extension workers. Disseminated to 150 nursery workers *Business skills training* - Provided to chairperson from each nursery (10 people) *Training in planting techniques* To be delivered in year 2 *Length of training* – *Nursery training* - 1 week training of trainers 1 week training for community groups *Business skills training* - 3 days	60% nursery workers are women	Malawian	160			160	160
7	*Resources* – *Nursery resources* Print out guide for nursery managers Published horticultural protocols for growing cedar	60% nursery workers are women	Malawian	1			1	2
9	Cedar Management Plan to be updated by end of project							1
11A 11B	*Peer-reviewed papers to be submitted and published – 2 papers* Results of ecological baseline survey Results of genetic analyses							2
13A 13B	*Number of species reference collections established* – 8 *ex situ* trial plots that represent reference collections and provide *ex situ* conservation. Set up by Forestry Commission UK and FRIM. To be managed in the long-term by FRIM.			8				8

14A	*Number of conferences/seminars/ workshops to be organised –* Project launch to present project plan (year 1) Workshop with all nursery workers to discuss and establish the Cedar Growers and Users Association (year 2) Workshop to improve forest management and forest policy in Malawi (year 2 / 3, matched funding required) Workshop to identify next steps for project when Darwin funding comes to an end (year 3)		Malawian	1				4
14B	*Number of conferences/seminars/ workshops attended –* UNESCO Man & Biosphere World Conference, Lima, Peru June 2016 IUCN World Conservation Congress, Hawaii, September 2016 Ecological Restoration Alliance of Botanic Gardens Annual Conference, Mexico, December 2016 BGCI's Global botanic Garden Congress, Geneva, June 2017 Society for Ecological Restoration World Congress, Brazil, September 2017 Aim for at least 5 more over project timeframe			3				10
20	*Estimated value (£'s) of physical assets to be handed over to host country –* £16,000 nursery infrastructure			£10, 000				£16,000
22	*Number of permanent field plots and sites to be established* 8 trial plots for testing growth limits of Mulanje Cedar			10				10

23	*Value of resources raised from other sources* - Total £156,409			£30, 193 In-kind				£156,409

Table 2 Publications

Title	Type (e.g. journals, manual, CDs)	Detail (authors, year)	Gender of Lead Author	Nationality of Lead Author	Publishers (name, city)	Available from (e.g. weblink or publisher if not available online)
Save Our Cedar	Leaflet	Chamwala, K. 2016	Male	Malawian	MMCT	Printed

Annex 4 Onwards – supplementary material (optional but encouraged as evidence of project achievement)

Annex 4.1 Steering Committee meeting minutes

Accompanying presentations and excel versions of log frame with comments added in each meeting, available on request.

Domestication of Mulanje Cedar for Improved Livelihoods
Steering committee meeting - Minutes
8th June 2016, Hapuwani Village Lodge, Mulanje

1. Welcome, Carl Bruessow and Henry Chintauli, Mulanje Mountain Conservation Trust
2. Introductions

Tembo Chanyenga, Forestry Research Institute Malawi (FRIM)
Carl Bruessow, Mulanje Mountain Conservation Trust (MMCT)
Henry Chintuli, MMCT
Kirsty Shaw, Botanic Gardens Conservation International (BGCI)
Lemos Mlaviwa, District Forestry Officer (DFO) Mulanje
David Nangoma, African Parks
Wilbert Chitaukali, Chancellor College Biology
& MMCT Research Committee

Steering Committee members unable to attend this meeting:
Suzgo Gondwe, District Environmental Officer (EDO) Mulanje
Zachary Magombo, National Herbarium & Botanic Garden (NHBG)
Richard Jinks, Forestry Commission, UK
Paul Smith, BGCI

3. Presentation from Kirsty Shaw, BGCI, on the proposed role of the Steering Committee

Key points:

- The Project Steering Committee will be primarily responsible for monitoring and evaluationthroughout the project.
- The Project Steering Committee will further develop the indicatorsidentified in the project logframeand ‘performance standards’ for each output will be identified.
- The Steering Committee will review progress at six-monthly meetings.
- During the meetings the following will be reviewed;
    - Progress against the project implementation timetable. If delays have occurred, steps will be identified to ensure such delays do not occur again and activities re-scheduled accordingly within the overall project framework

    - Comparison of ongoing and completed activities against ‘performance standards’. If standards are not being met, the reasons for this will be investigated and remedial action taken.
    - Expenditure against project budget. If there is an under-or over-spend against the project budget, the reasons for this will be understood and if necessary steps taken to address the issues.
    - Identification of new potential risks and mitigating measures.
- During each meeting, comments will be recorded against the project log frame on progress so far, next steps, potential risks and mitigating measures.

4. Aims for this meeting

- Look at the project activities for the next 6 months
- Expand indicators and set performance standards to be reviewed in the next meeting (recorded in excel version of log frame)
- Outline project budget and Darwin Initiative obligation
- Identify potential risks and mitigating measures (recorded in excel version of log frame)

5. Questions and comments

- All members signed up to their commitments as Steering Committee members.
- All members understand their role in project evaluation and guidance.
- It was noted that all documents from the project launch and Steering Committee meeting should be shared with absent Steering Committee members.
- It was noted that the Traditional Authorities should be represented on the Steering Committee. The best option is Senior Chief Chikumba, as other TAs do not have a good understanding of English. Senior Chief Chikumba and MMCT will then share information with other TAs following meetings.

6. Actions

- Upload all documents from project launch and Steering Committee meeting to Dropbox and share with absent (and present) Steering Committee members. Kirsty Shaw.
- Invite Senior Chief Chikumba to join the Steering Committee. MMCT.

7. Date of next meeting

A suitable date will be identified six months from now.

Domestication of Mulanje Cedar for Improved Livelihoods
Steering committee meeting - Minutes & priority actions
8th February 2017, Mulanje Mountain Conservation Trust office, Mulanje

1. Welcome, Paul Smith, Botanic Gardens Conservation International (BGCI)
2. Introductions and apologies for absence

Carl Bruessow, Mulanje Mountain Conservation Trust (MMCT)
Wilbert Chitaukali, Chancellor College
David Nangoma, African Parks
Zacharia Magombo, National Herbarium & Botanic Garden of Malawi
Henry Chintauli, MMCT
Paul Smith, BGCI
Kirsty Shaw, BGCI
Senior Chief Chikumbu
Clemmie Borgstein, MSc student at Waginen University
Lemos Mlaviwa, District Forest Officer, Mulanje
Jeffrey Juwawo, MMCT
Apologies from Tembo Chanyenga, Forestry Research Institute of Malawi, who is hosting a visit of the US Forest Service

3. Project objectives, Paul Smith

This is the second meeting of the project Steering Committee. The inaugural meeting was held alongside the project launch in June 2016.
Livelihoods is a central component of this project. The project funding comes from UK Government Department for International Development (DfID) and it is a pre-requisite of DfID funding that livelihoods are at the centre of the project. Local people need to derive benefits from cedar but those benefits need to be sustainable. Current practices are clearly unsustainable. *Widdringtonia whytei* is Malawi's national tree, so this project is of significance for the whole country. The project aims to make it in the interest of local communities to grow and conserve cedar. We aim to determine how we can better manage and conserve the cedar, including by looking at horticulture, ecology and genetics. In this meeting, we need to consider how we set up ways for local communities to benefit from Mulanje Cedar, i.e. the domestication component of the project. If Mulanje Cedar will grow more widely across Malawi, there is an opportunity for local nurseries to sell seedlings to farmers in appropriate areas across Malawi. Trials are in place already to test the growing limits of Mulanje Cedar. We need to consider and discuss local community ownership of cedar businesses, for timber and restoration. The restoration component of this project will be helped by an improved understanding of the horticultural and ecological needs of Mulanje Cedar and will lead to increased success.

4. Update on progress since the last meeting, Henry and video from Tembo

The presentation from Henry is saved in the Steering Committee Dropbox folder.

Comments from Dr Magombo:

- The success of project is dependent on local leadership engagement, if we can achieve this then we will have success. Can we find a way of sensitizing the chiefs? Their involvement will be essential.
- Capacity building is also an essential part of project, as it will leave a good legacy beyond the project.
- We need to think about performance based payments and help local communities to learn to invest for future generations. Reasoning along these lines will also bring project success, but communities may need help to understand the long-term benefits.
- Appointment of a replacement Biodiversity Conservation Officer is also essential for project success.

5. Review of progress in relation to project indicators

See accompanying excel spreadsheet for progress and actions for each activity.

6. Key activities for year 2 of the project

See accompanying excel spreadsheet.

7. Identifying risks to project success & solutions

A replacement Biodiversity Conservation Officer has not yet been appointed at MMCT –
The appointment process has involved more than 150 phone calls with people around the country to try to find an appropriate person. The position needs to be filled by someone with biodiversity skills that are focused on vegetation specifically, and someone who is able to climb the mountain. The MMCT Board was nominated at the last Board meeting to identify someone. The struggle to find an appropriate person highlights that, as a country, Malawi is not investing enough in biodiversity conservation training.
The group discussed whether someone at MSc level, or a project manager without technical skills would be appropriate? Carl will ask the Board about this. That would be additional cost to MMCT, as they will still need to recruit a Biodiversity Conservation Officer, but it could work in the interim period. The next MMCT Board meeting will be held in early / mid March. MMCT Board will be encouraged to renew their efforts to find someone.
As an immediate measure, an MMCT Project Management Plan will be developed, outlining which existing staff will do what over next few months.
What do we do for law enforcement for remaining trees?
The Forest Department needs to make a plan for protecting remnants and natural regeneration of Mulanje Cedar. The Steering Committee will ask the Forestry Department to do this. It is the Forest Department mandate. Even though only remnants are remaining, they still need to be protected.
Project implementation schedule
A reminder to the whole group that we do not want to fall behind schedule. The list of actions developed as a result of this meeting will have accompanying deadlines. Kirsty will prepare this, including detail of who will do what at MMCT.

8. Date of next meeting & closing comments

The group recommended that the Steering Committee meets every 3 - 4 months, rather than 6 months. A date for the next meeting will be selected in May.

The project expenditure reports are not yet up to date. Henry will chase the MMCT admin team to ensure everything has been entered into the accounts system in good time before the first annual report is due (end of March).
Before the end of February, i.e. 2 weeks from now, BGCI needs to know about any budget changes.
It was agreed that Henry has done a great interim job at project management, in the absence of the Biodiversity Conservation Officer. The project team were congratulated on overall project progress.
The Steering Committee group thanked the Senior Chief for her attendance and support to the project, this will be important as we move forwards.
Project progress and next steps will be communicated to other Traditional Authorities soon. Henry will arrange a date for a meeting.
Final thanks to everyone, including MMCT team, FRIM and Steering Committee, and a reminder that we are all responsibly for making this project a success.
Close of meeting.

Annex 4.2 Ecological Baseline Survey – summary of findings & GIS report

Full report and journal article in preparation

Mulanje Mountain Ecological Baseline Survey, January – February 2017
Summary of findings

A team of staff from Botanic Gardens Conservation International (BGCI), Mulanje Mountain Conservation Trust (MMCT), the Forestry Research Institute of Malawi (FRIM), the United States Forest Service (USFS) and Phalombe and Mulanje District Forest Offices conducted an ecological survey on Mulanje Mountain from 27th January – 7th February 2017. The aim of the survey was to locate and record individuals of *Widdringtonia whytei* (Mulanje Cedar) to establish a baseline for the project *Domestication of Mulanje Cedar for Improved Rural Livelihoods,* which aims to restore populations of Mulanje Cedar on Mulanje Mountain.

Results:

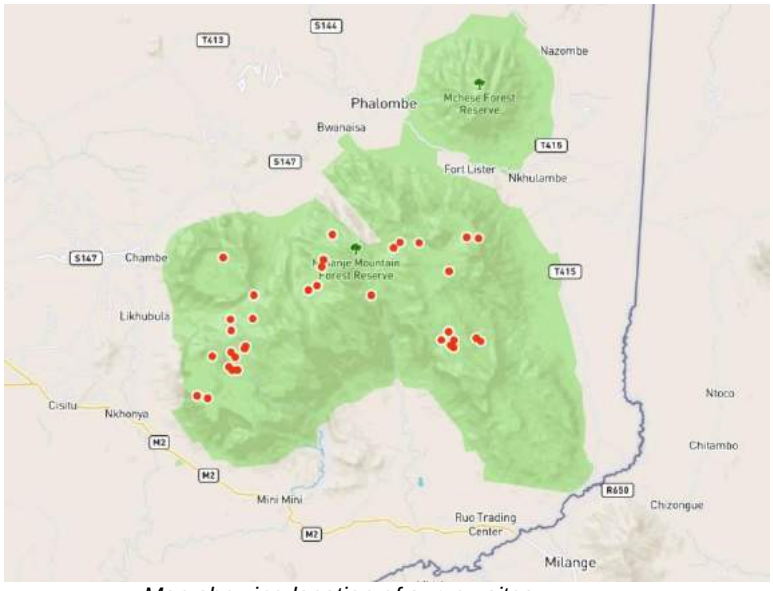
- All surveyed sites were subject to logging of Mulanje Cedar.
- Only 7 mature individual trees were seen during the two-week survey period; these were located at Madzeka Valley and were inaccessible: A tree close to these individuals had been cut and fallen in a gulley where it could not be retrieved. This is likely why the remaining individuals have not been harvested yet.
- People were seen removing planks from Lichenya, where logging continues but the vast majority of trees have gone. The survey team saw no sizeable standing trees in the areas surveyed at Lichenya.
- People were also seen scavenging cedar remnants from other sites, including Madzeka and Sombani.
- 25 out of 34 sites surveyed (most were 20m x 20m square plots) had fewer than 20 alive individuals, and 8 of those 25 sites surveyed had no alive individuals at all. Most alive individuals found were seedlings, recently planted by MMCT and the Forestry Department.
- Natural regeneration was only seen in plots at Lichenya. Cutting at Lichenya has happened very recently so the cleared areas have not been burnt. Burning usually follows cutting, so loggers can find planks that have been left behind. Burning kills natural regeneration of Mulanje Cedar and most of the other tree species in the forest areas. This results in a loss of the whole forest, not just the cedar.
- Samples were collected from survey plots across the mountain for genetic analysis by USFS. This will help us to understand whether the remaining live specimens on the mountain are genetically viable. It will also help determine where material from *ex situ* stands (e.g. Zomba) should be reintroduced on the mountain.

Key lessons:

- Mulanje Cedar is considered to be practically extinct on Mulanje Mountain.
- It is very likely that the small number of sizeable standing individuals that remain will be gone before the end of 2017.
- The Mulanje Cedar can be used as an indicator of overall health of the mountain.
- The severity of forest clearance on Mulanje Mountain is demonstrated by fast floods downstream from Lichenya and Thuchila. As a result of watershed degradation in Thuchila, more than 2000 smallholders have been impacted. 18 people have been killed in flash floods on the Lichenya side.
- The Mulanje Cedar, Malawi's National Tree, can act as a flagship species to highlight the importance of conservation to a broad audience, and to improve the overall health of Mulanje Mountain.

Priority actions required to prevent the extinction of Mulanje Cedar:

- Seed needs to be collected from all remaining mature individuals on Mulanje Mountain as an immediate priority.
- The Mulanje Cedar stands on Zomba Mountain now represent the best source of seed for recovery of this species, and must therefore be protected.
- The next generation of Mulanje Cedar on Mulanje Mountain must be protected. This includes protection of planted seedlings, and natural regeneration at Lichenya, from fire and malicious activities.
- This project will launch a public awareness raising campaign to highlight the status of Mulanje Cedar and promote its conservation and restoration. This project has established ten community nurseries around the base of Mulanje Mountain to grow a supply of seedlings for restoration. Senior Chiefs and Traditional Authorities have been consulted and are involved in project implementation. Support will also be required from government officials, including at the highest level, to secure a future for Malawi's National Tree.



Map showing location of survey sites

Cut tree stumps at Sombani

Natural regeneration of Mulanje Cedar was only found at Lichenya

Domestication of the Mulanje Cedar for Improved Livelihoods: GIS Interim report

20 March 2017

Summary

Spatial data and equipment

- All GIS data collated, but of very varying quality, with unknown providence
- Field forms setup on phones and working in the field, 34 full field data forms collected, all with high accuracy (5 metres or better), data is available in the cloud and other accessible formats
- Forms uploaded to the cloud (ONA) were working well, but very large files (3 movie files), failed to load
- Phones, forms and Locus pro performed extremely well in the field
- Reporting from the electronically collected field data forms, in the cloud worked very well
- Waterproof phones and covers worked very well in real world situation, even a dunking in a river.
- The addition of power packs of 15000 mAh, allowed phone to work for two week of data collection

Data collected

- Summary of results show the rapid decline of the Mulanje Cedar. With only a few mature trees observed on inaccessible cliffs areas.
- All areas surveyed for Pine were disturbed, with wood cutting and fire being the highest impacts
- Areas where pine was observed or at least recorded in the past were:
    - Generally, south facing
    - On steep or occasionally moderate slopes
    - Substrate ranked: Loam, Sand, Clay, Humus

Recommendations

- Many areas were visited, but there are a few remote areas, in particular Mount Mchese shows some forest and good predicted niche, but anecdotal reports suggest this area is also heavily impacted
- High resolution multispectral satellite imagery would help identify and target any of the remaining cedar areas.
- The historic change of the cedar area needs to be put into context, this would be achieved utilising and updating the results from the report “Mount Mulanje Land Cover Time Series Analysis” (Bouvier 2006)
- To augment the above it would be extremely useful to collect any historic data/ aerial photography of the mountain which is likely to have been produced in the 1950’s
- Species should be urgently re-assessed and flagged as almost extinct in the wild, this species has seen one of the most rapid declines of almost any tree.
- The decline in cedar is very rapid, but it is difficult to see this from the early data collections, it would seem prudent to collate more information from earlier surveys on the mountains, while many of the project staff are still available.
- We now have an up to date collection of localities, it would be very useful to look at a species distribution models with this data in comparison to historic distribution.

Contents

Purpose/Headlines

- GIS work in support of Darwin funding project.
- Work to be starting from November 2016, with an initial deadline for January 2017 fieldwork campaign. Final deadline end of March 2017
- Activities:
    - Compile all available data from previous surveys of *Widdringtonia whytei* on Mulanje Mountain and other sources as appropriate (e.g. satellite data)
    - Based on this information, make recommendations of sites to be visited and sampled during the baseline survey
    - Recommend appropriate hand-held equipment for the survey team to use to record GPS, number of trees, size classes, climate, soils, exploitation, etc.
    - Upload all data to hand-held devices and provide guidance on use of devices in the field.
    - Following the baseline survey (February – March 2017);
        - Work with the survey team to map all data gathered
        - Provide all mapped data to BGCI as GIS files.

Background Information

Overview

BGCI has been awarded a grant by the UK government's Darwin initiative to implement a project entitled "Domestication of the Mulanje Cedar for Improved Livelihoods". This project will be implemented in Malawi. It is a joint project between BGCI, the Mulanje Mountain Conservation Trust (MMCT) and the Forestry Research Institute of Malawi (FRIM). The project will work closely with communities living around Mount Mulanje. Technical components of the project will be supported by international experts from the BGCI network.

Background

Mulanje Cedar (scientific name: *Widdringtonia whytei*) is endemic to Mulanje Mountain in Malawi. This unique tree produces valuable timber that is durable, termite-proof and used for construction and wood-carving. Its value has led to overexploitation and very few Mulanje Cedar trees remain standing on the mountain. This has resulted in a loss of income for communities living around the mountain, increased soil erosion and floods due to rapid water run-off from the mountain during rainy seasons.

This project will generate new knowledge about Mulanje Cedar, deliver biodiversity benefits and livelihood benefits. Key objectives of the project are to:

- Generate alternative sustainable income sources for local people through the establishment of nurseries and sale and planting of cedar seedlings
- Determine the optimal growing conditions for Mulanje Cedar, and improve horticultural protocols for cedar restoration on Mulanje Mountain and for wider cultivation in Malawi
- Significantly reduce unsustainable exploitation and habitat loss of natural stands of cedar.

Spatial Data, Details

Mapping and mapping dataset projections

There are four different mapping projections used in Malawi and the various projects on Mount Mulanje.

1. UTM zone 36 North, Datum WGS 84
2. UTM Zone 36 North, Datum ARC 1950
3. Geographic coordinates (latitude and longitude), datum WGS 84
4. Geographic coordinates (latitude and longitude), datum ARC 1950

Distinguishing between UTM and geographic coordinates is very easy, but we cannot always be certain which datum was used for historic surveys without metadata for the data. If the datum is incorrect, data will be shifted by 300-400 metres, generally in a north to south direction. This should be taken into consideration when using the points data

Mapping data for Mount Malanje

Much data has been collated for the mountain. Details are in the table below:

Dataset	**Type**	**Notes**
Elevation model (DEM)	Raster	60 m resolution elevation model for the site
Specimen data	Text	Various quality citing and specimen data for the target species (detailed below)
Landsat imagery 2016	Raster	30m resolution image from November 2016 (detailed blow)
Landsat imagery 2010	Raster	Landsat imagery for the whole region, used for background
Google imagery	Raster tiles	High resolution (up to 0.5m) imagery for the region
ESRI terrain	Raster tiles	High resolution imagery (~2m) with contours and paths
Huts	Points	The huts on the mountain
Tracks	Lines	Tracks on the mountain
Cedar Areas	Polygons	Polygons of Cedar areas, origin is presently not known, but most likely from Chapman 1994
Hanson GFW forest cover	Raster	Forest cover data and deforestation data from 2010 to 2016 at 30 metres resolution

Widdringtonia whytei Data collations and Observations

Source	**Dates**	**Notes**
Cedar gp	2005 (date	Origin is unknown and much data exists, but it looks like tracklogs.

	on file)	We are not sure on quality of this data
Kew specimens	2004 (date on file)	Data for all species across the regions. Quality of the data was very poor, degrade ~ 5 km. This data was supersede by the GBIF data below
GBIF and Flickr data	~1890 - 2010	Specimen data with locations downloaded from GBIF and flickr using GeoCAT Georeferencing quality will be very variable, but generally ~ 1.5km.
Tembo data	200?	Data from Tembo Chanyenga**,** quality should be good and to the nearest 10m, but the notes (above) on datum need to be considered
Mchese points	2009	Two localities from GPS from the Kew/Darwin Mchese report 2009

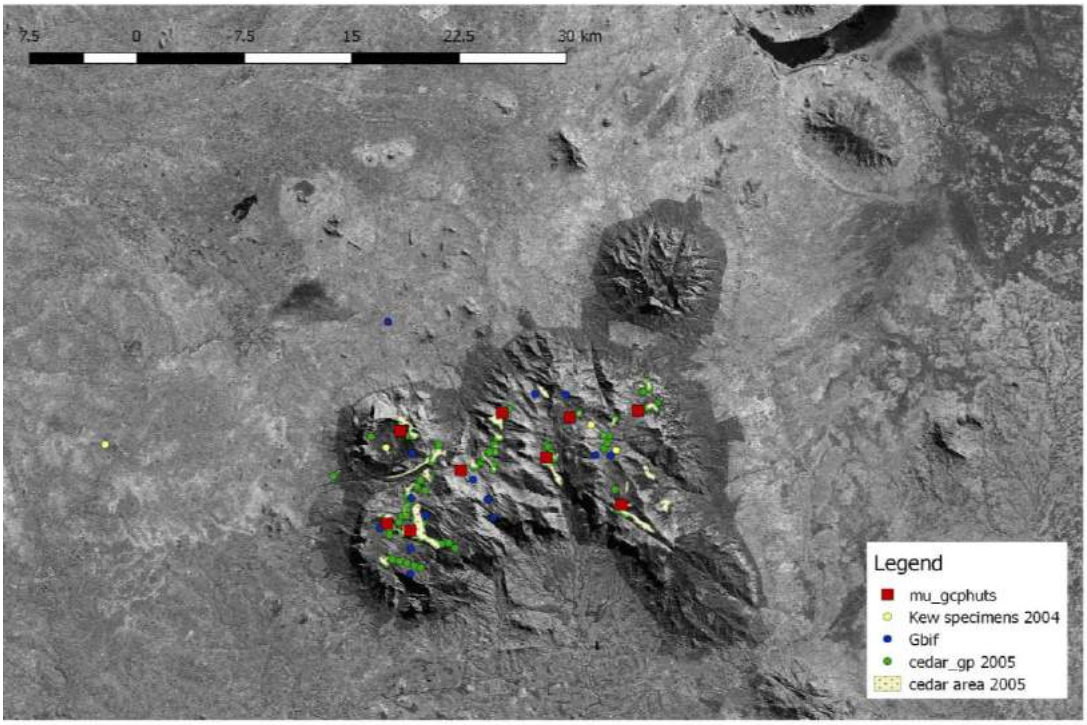


Figure 1.Map of observation and specimen data (NB data from Tembo Chanyenga and Kew/Darwin Mchese project collate at a later data and not shown)

Details of the data provided is in appendix III

Areas to target for collection

The historic specimen data is of very variable quality and should not be relied upon. The cedar area, seems to represent historic locations, but the date and quality of these is unknown. Using the species data and proxies for climate we have produced a prediction of the species across the region, but again as the localities are driving this prediction, we can only get a general impression of the potential range of the species. We used, elevation, slope, aspect and landscape roughness for a prediction (results are shown in Appendix II). Elevation was a major driver for the prediction (94%), with roughness of the landscape a very low second (5.5%), slope and aspect did not contribute to the model. To get good results from slope and aspect you generally need very good geo-referencing, so it is not surprising that elevation was on the only useful predictor. We overlaid this model with forest cover from Global Forest Watch (to represent the intactness of the forest and landscape). Presently we would suggest areas to targeted for collection where forest cover

and prediction model overlay (areas in dark blue and green in the map below and available on the phones).

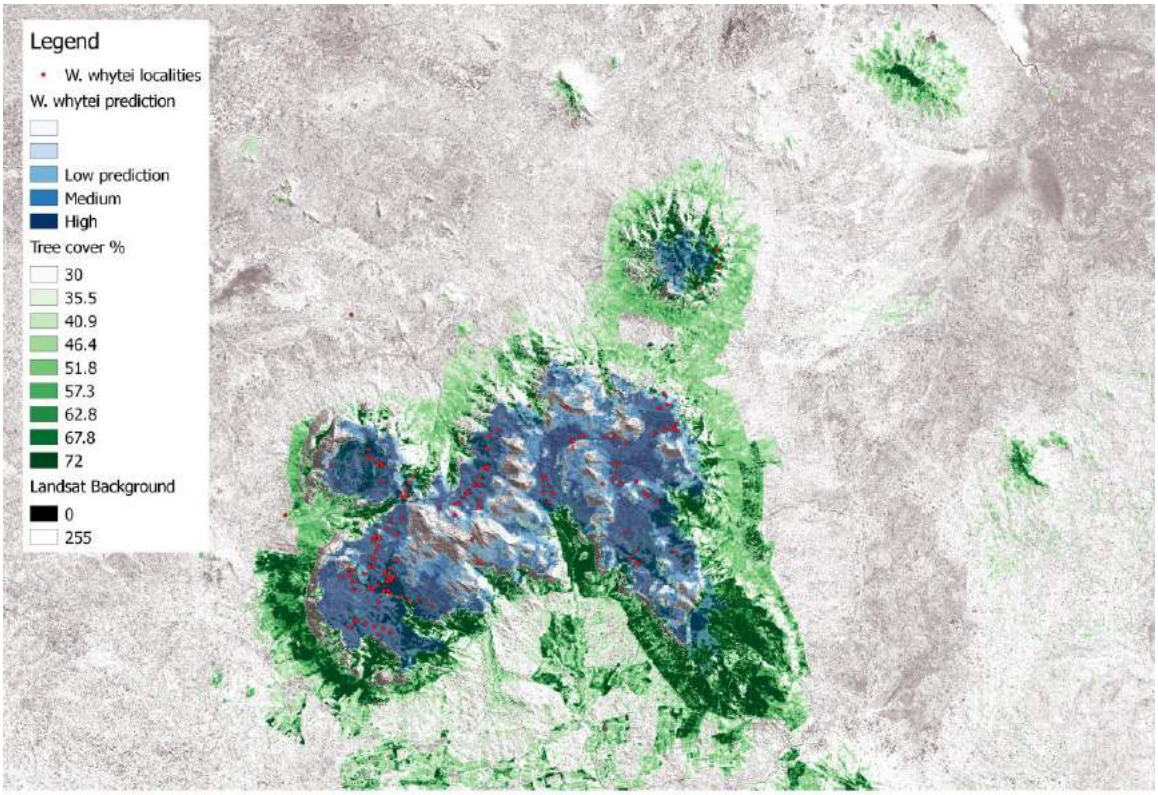


Figure 2. Widdrington whytei prediction: This is a prediction map of Widdrington whytei. Darker Blues = better potential for the species to grow. Darker green = forest cover (>30% cover). Areas expected to have higher number of W. whytei, will probably overlap with both dataset.

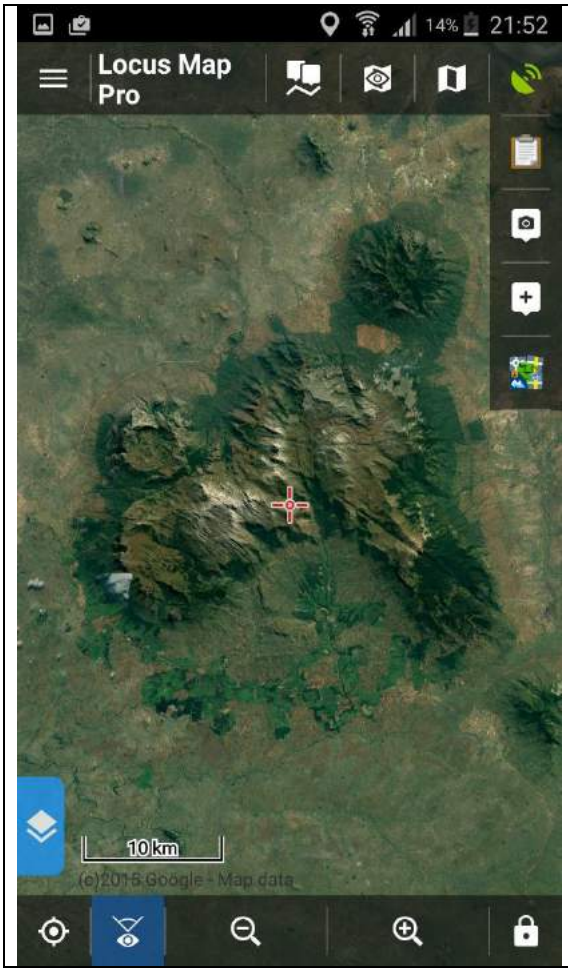
Field Forms

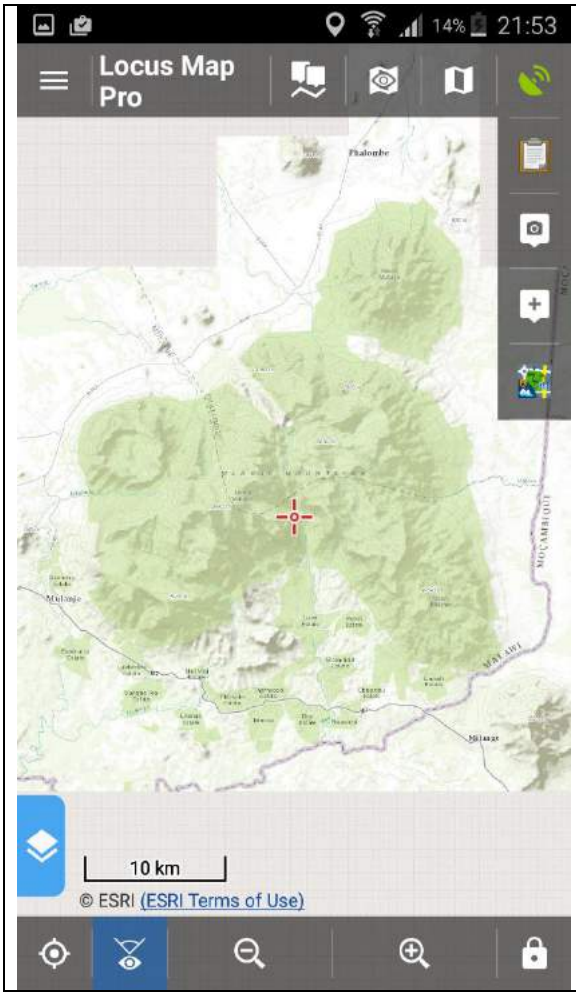
E forms are on all phones and can be viewed and updated available on Ona https://ona.io/bgci_gis. Paper forms are available in the attached word document. We would suggest that some of these are printed in case of phone failure or for user preference. Details for on using the forms are on the phones as PDF manuals.

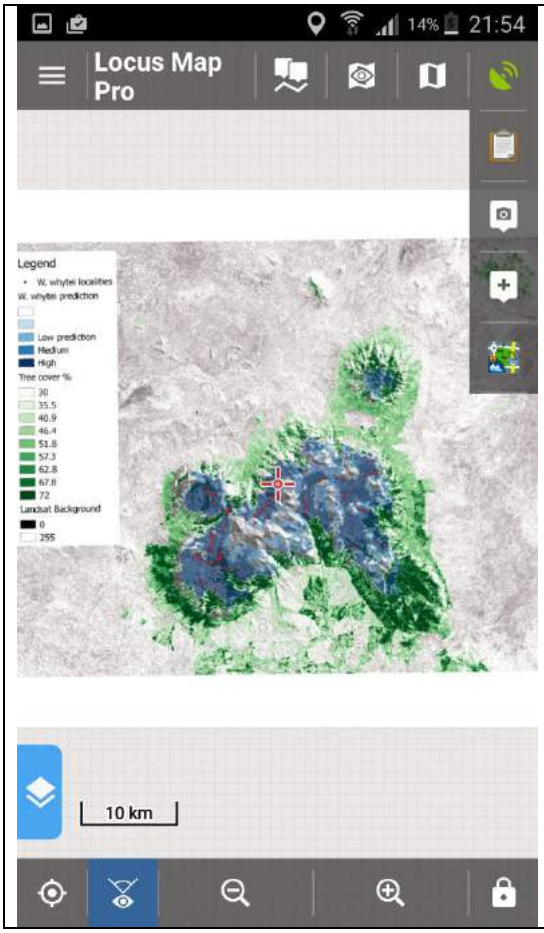
Mapping data, available on Phones

All the mapping data from above is available on the phones in the app Locus pro, details for the image data are below. Also, manuals and specific documentation is on the phones as pdfs.

		**Landsat image:** This is a false colour image to enhance vegetation on the mountain. Healthy vegetation is shown as brighter red. This is useful for review of the landscapes main habitats types. Resolution is not detailed (30m)

		**Mulanje GE**: This is detailed google earth imagery for the region. We have cached as much detail as we can, concentrating around the main cedar areas. If no image is available just zoom out a couple of steps. Resolution is highly detailed in some areas (0.5m)

	**Mulanje Terrain:** This a topographic map of the region, which also shows the main paths and roads (they are very pale), useful for walking and route planning. Resolution is highly detailed in some areas (~2 m)

	***Widdrington whytei* prediction:** This is a prediction map of cedar. Darker Blues = better potential for the species to exist. Darker green = forest cover (30 + %). Areas expected to have high number of W. whytei, will probably overlap with both datasets (i.e. dark green and blue)

Equipment

We recommended the following equipment for electronic field data collection and mapping.

- Samsung Galaxy S5, these are relatively cheap phones (several generations old), but reliable, with good GPS, with some water/dust protection
- Cases for above, to provide extra resilience and full waterproofing
- Micro SD card for extra on-phone storage
- Power bank 15000 mAh which should give 5-6 full charges, allowing the phones to last one to two weeks for general use.

This equipment performed extremely well in the field, surviving full water emersion and lasting the full two weeks of field survey with the power bands. Guidance was provided in separate pdfs (see appendix III) on the phones, for user guidance.

Review of data analysis

34 full field data forms were collected, all with high accuracy locations (5 metres or better), data is available on the cloud as well as an excel sheet (see appendix III) in the spatial data. A summary, and the graphs showing the results of this data collection, are below:

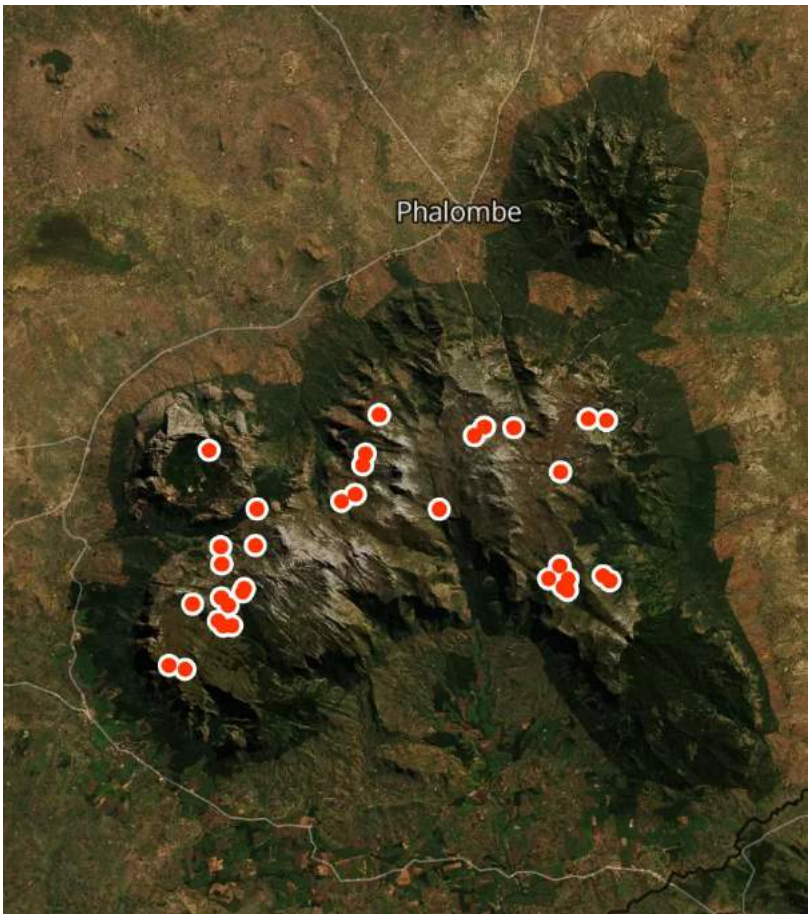


Figure 3. Map of data collections made

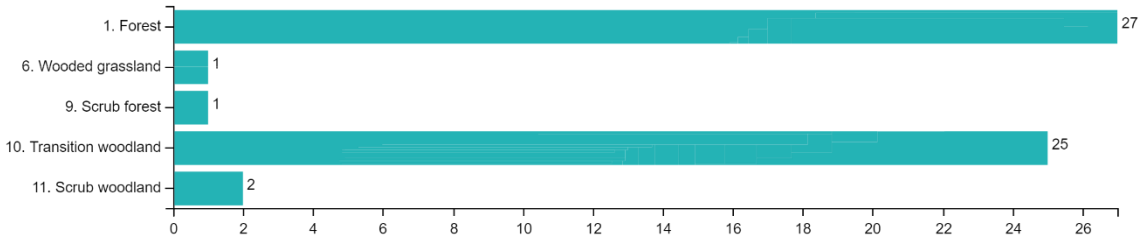


Figure 4. Vegetation type. Cedar site observations (multiple per site)

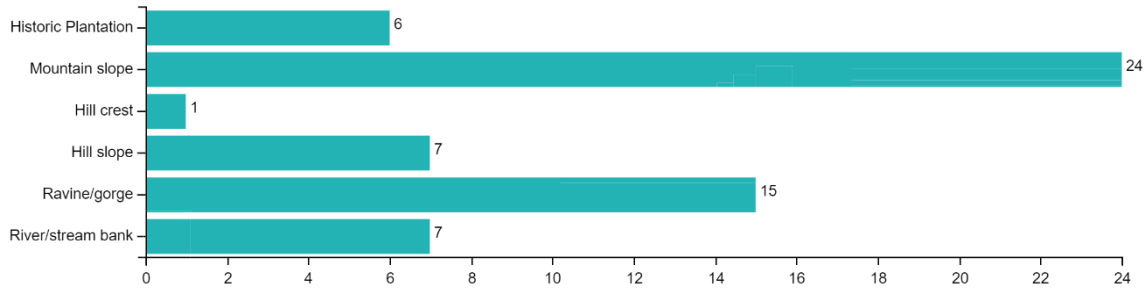


Figure 5. Locality type. Cedar site observations (multiple per site)

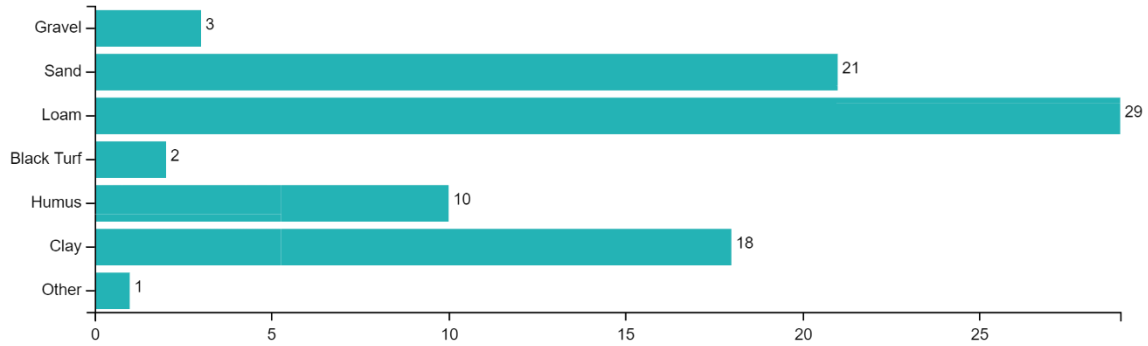


Figure 6. Soil type. Cedar site observations (multiple per site)

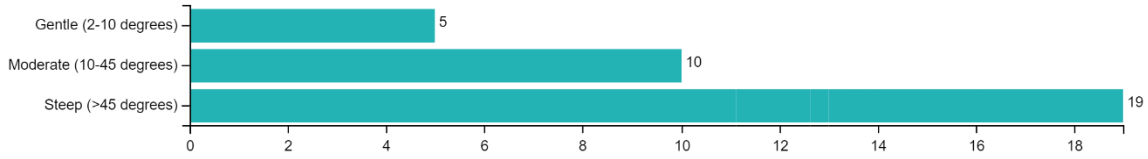


Figure 7. Slope. Cedar site observations (per site)

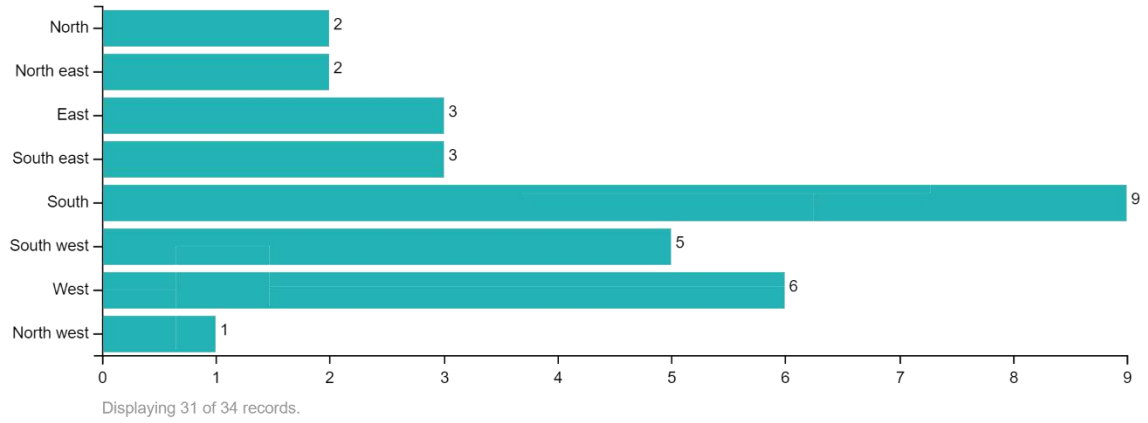


Figure 8. Aspect. Cedar site observations (per site)

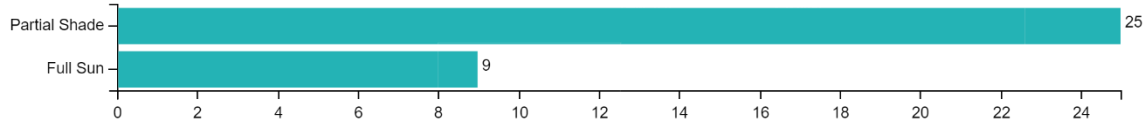


Figure 9. Exposure . Cedar site observations (per site)

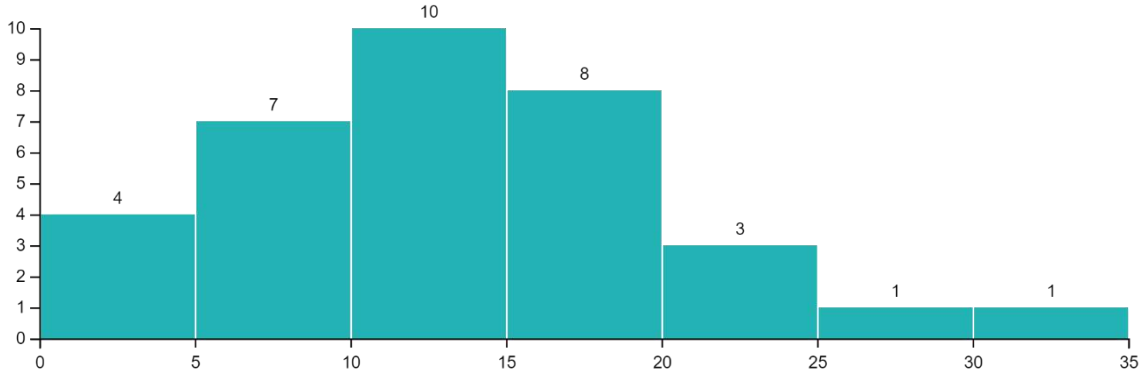


Figure 10. Dead Individual count. X axis number of dead individuals per site, Y axis = number of sites

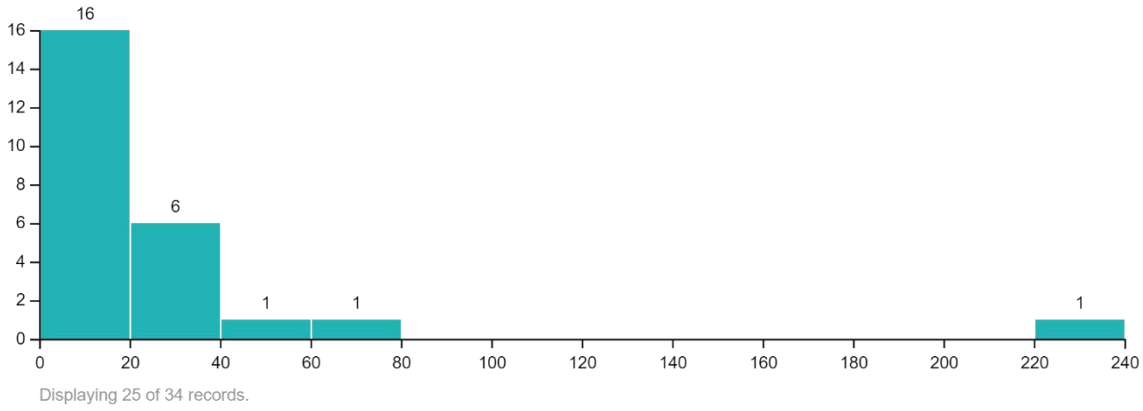


Figure 11. Alive Individual count. X axis number of alive individuals per site, Y axis = number of sites

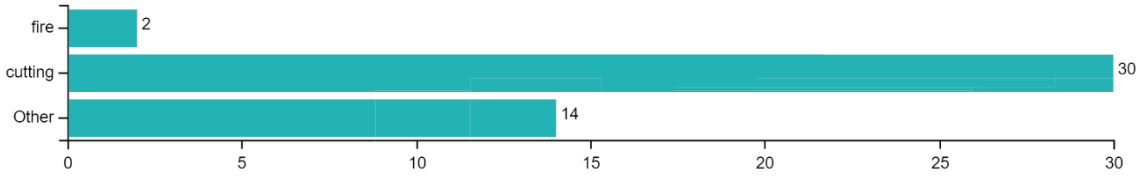
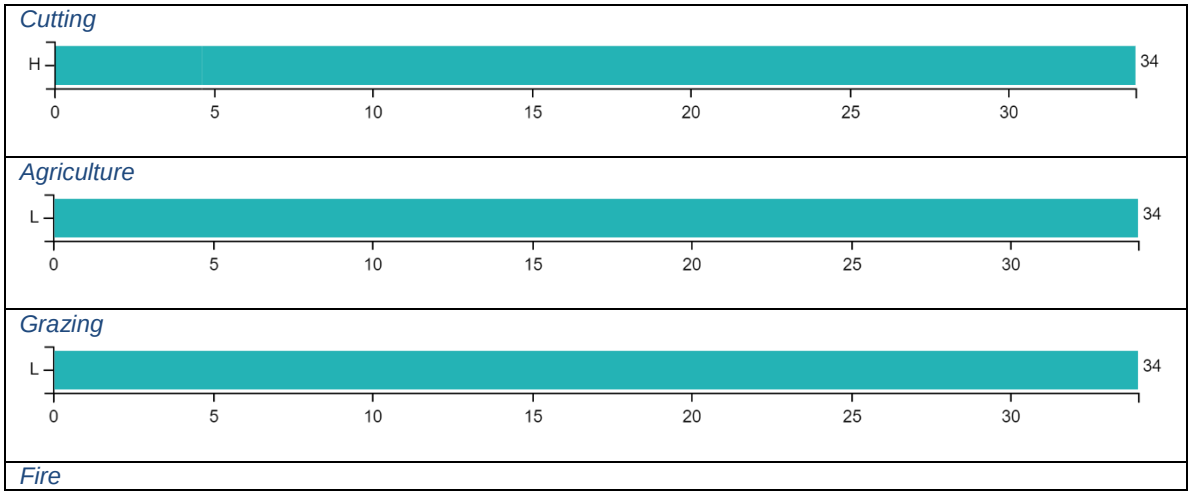


Figure 12. Cause of Death. Cedar site observations (multiple per site)



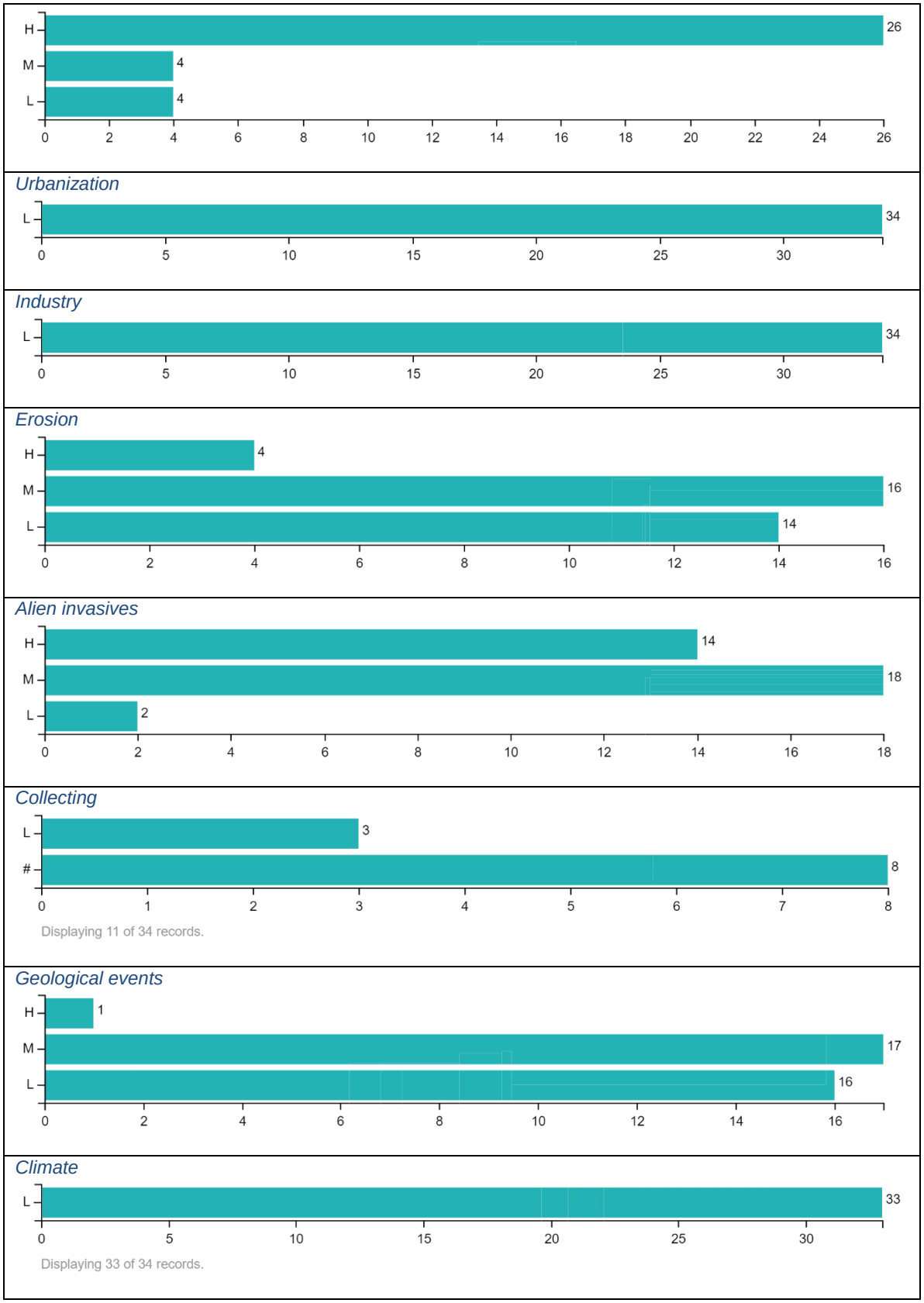


Figure 13. Impacts on sites. Cedar site observations (per site)

Annex 4.3 Socio-Economic Baseline Study

Socio-Economic Baseline Study on Domestication of the Mulanje Cedar for Improved Livelihoods

A Study Report

Submitted to

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List of Acronyms

BGCI	: Botanic Gardens Conservation International
DFO	: District Forestry Office
DMCIL	: Domestication of the Mulanje Cedar for Improved Livelihoods
ENRM	: Environment and Natural Resource Management
FGD	: Focus Group Discussions
FRIM	: Forestry Research Institute of Malawi
KAP	: Knowledge, Attitude and Practices
M&E	: Monitoring and Evaluation
MMCT	: Mulanje Mountain Conservation Trust
MMFR	: Mulanje Mountain Forest Reserve
SPSS	: Statistical Package for Social Scientists
TA	: Traditional Authority
VNRMC	: Village Natural Resources Management Committee
ICRAF	: International Centre for Research in Agroforestry currently, World Agroforestry Centre

Acknowledgements

This report on socio-economic baseline assessment of the five TAs around Mount Mulanje in Mulanje and Phalombe districts is a culmination of diverse gracious efforts of different stakeholders including Mulanje Mountain Conservation Trust and its partner institutions, traditional leaders and households in the villages in the target areas. In this respect, special recognition goes to the leadership of MMCT for tirelessly providing the much needed technical and logistical support without which this study would not have taken place.

Sincere and profound appreciation goes to the 150 *households* from 10 villages in the 5 TAs that graciously provided the data which formed the basis of this study report. Without such data, the study report would have been void. In addition, thanks to the field research team for effectively administering the household survey questionnaires and conducting interviews with some public officials particularly the frontline Forestry Assistants under the Department of Forestry. Certainly, these officers that deserve special recognition for their gracious time with the study team.

To the four research assistants and a field supervisor who collected the data from the households in the 5 TAs under a tight schedule, we wish to say that we are proud of your dedication to duty. Certainly, one day you will walk tall as your efforts translate into practical actions by MMCT and partners, resulting into tangible improvement of the lives of over 28,000 people from the concerned TAs around the magnificent Mulanje Mountain in the next three years.

Notwithstanding the invaluable contributions of different stakeholders to this study output, the authors are responsible for all the errors and omissions in the report.

Executive Summary

The socio-economic baseline study of communities around Mulanje Mountain sought to generate a wide range of district and traditional authority level social, economic, livelihood and vulnerability information that would inform MMCT and its partners such as Forestry Research Institute of Malawi (FRIM) and the Botanic Gardens Conservation International (BGCI) to develop long-term programmes to improve lives and people's wellbeing in the affected areas. The study was commissioned by MMCT with financial and technical assessment from the Department for International Development (DFID). Specifically, the study aimed at conducting an in-depth and gendered lens socio-economic assessment for the target areas on issues such as household farm and non- farm income sources; household expenditure behavior; asset ownership; land ownership and use; food security nutrition status; household woodlot ownership, use and ecosystem management practices; access to ENRM services, amongst others.

The study field work was undertaken during the period 3-9th October 2016 using different data collection approaches and tools, namely literature review of national and district policy documents and data sets, stakeholder consultations at district level, focus group discussions and household interviews in the sampled villages from the 5 traditional authorities in Mulanje and Phalombe districts.

Main Findings

The study findings show that the Domestication of Mulanje Cedar for Improved Livelihood (DMCIL) project had targeted an economically active age group to participate in the Mulanje Cedar nursery management. The members' age ranged from 27 years to 49 years.

Analysis of education levels of the DCMIL project beneficiaries show that most of them attained primary education level especially female headed households. The results also indicate that more female household heads had dropped school at primary level as compared to their male counterparts except in TAs Nkhulambe and Mabuka where low percentage of women reported to have dropped out of primary school. Interestingly, in TAs such as Nkhulambe, Njema and Mkhumba, over 33 percent of the male headed households reported to have attained some secondary level.

An inquiry into the marital status the DMCIL project beneficiaries show that most of the household heads are married to one spouse. Only 3 percent of male household heads reported to have been divorced, while 5 percent of male household heads were polygamous. The relative stability in the marital status of the selected beneficiaries means that they have minimal marital related disturbances that could affect their participation in the planned village nurseries. It would also be important to monitor whether the expected increased incomes earnings from the DMCIL will actually strengthen or destabilize the marriages.

In terms of household head occupation, results indicate that most of the people in the project areas are peasant farmers as their main occupation. With respect to patterns of household expenditures, most households reported to spend most of their incomes on groceries, church/mosque donations, health and food. Most female headed households in both Mulanje and Phalombe reported spending almost all their incomes on food, which is characteristic of poverty conditions of such households.

In terms of livestock ownership, the results also showed that majority of livestock owned in the project area are goats and local chicken. On other asset ownership, study findings show that most of the asset owned by the households are basic productive assets such as hoe, axe, and panga knife, amongst others. High value assets such as motorcycle, bicycle, radio and household furniture are mostly owned by male headed households.

Analysis of incomes earned from different sources revealed that much as crop production activities dominate household economic activities, in terms of household reliance on income sources, livestock and non-farm economic activities provided the larger share of household incomes. For instance, the analysis shows that households derive 30 percent of their incomes come from selling livestock like pigs, goats, cattle, and poultry; followed by 29 percent from non-farm income activities. Other sources such as forest resources such as charcoal, firewood, mushroom, wild fruits, and timber constituted 23 percent of household income, and 19 percent from crop sales.

Crop sales constitute the largest household incomes, as most (59% of households) reported to have sold their harvested crops including maize. Of all the crops, our sample data shows that tea is a major income earner, with average annual revenue from tea sales ranging fromMK38,000 to MK160,000. In any case, the findings show that households have significant interactions with the market.

The sampled households obtain their production inputs such as crop seeds and fertilizer from ADMARC and private traders. The major transport modality used for transporting farm inputs is hired bicycles, while a good number use their head.

With respect to food consumption, nsima is the most eaten food followed by sweet potatoes though the consumption rates vary by geographical location. Most households eat one to two times a day with few households reporting to be taking three meals a day.

Investigations into household coping strategies showed that the major coping strategies, with over 75 percent of the responses for both gender groups in all the 5 TAs invariably include: reducing frequency of meals per day, reducing size of food eaten, and going to bed on empty stomach, and undertaking piece works at other peoples farms. Surprisingly, few responses pointed to exploitation of environment and natural resources such as cutting wood and making charcoal as adopted coping strategies. This could be due to the sensitivity of tress cutting and charcoal making businesses which are deemed to be illegal activities.

Household access to the credit is a challenge for most households which would be DMCIL project beneficiaries, and situation is more acute for male headed households than their female counterparts. The relatively improved credit access conditions by female- headed households could be due to the village bank services which are largely patronized by females.

On crop sales, the study established that 59 percent reported to have sold their harvested crops including maize, and inquiries on the household source of income to buy food when run out has shown that they mostly get the money from *ganyu* work followed by income from crop sales.

The study results also show that most inputs used in crop production are seeds and fertilizer bought from ADMARC and private traders as well as local people mostly transported by using hired bicycles and on head.

On farming activities, the findings show that most of the land used by households for farming is low in fertility which is mostly accessed through inheritance from wife's parents. Very few of the households had bought or rented land demonstrating the limited land markets in the target areas.

The crop that are mostly grown in the two districts is maize in both Mulanje and Phalombe districts. Pigeon peas is the second most important crop in the two districts. The study also established that most households do have access to agricultural extension services in all areas except for TA Njema where 60 percent of the female-headed households indicated to have had no access to agricultural extension services compared to the 40 percent who responded to have such access. This has implications on

adoption of high value technologies as well as technolgies that can help sustainable use of environment and natural resources.

Inquiries into the household ownership of woodlot practices showed that most (78%) of the sampled households do not own their own woodlot. This means that much as household rely on fuel wood energy for household energy needs, they have to look elsewhere such as natural forests for their energy needs. For the few households that do own woodlots, most of such woodlots are on a 0.2 ha of land. The limited ownership of woodlots means that the DMCIL project should endeavor to promote woodlot ownership besides the planned Mulanje Cedar.

For the households that own woodlots, their major reported seedling sources are own collections and Forestry Department. Very few households indicated non- governmental organizations or private nurseries as sources of seedlings for the households that own woodlots. The limited seedling supply sources means that DMCIL project beneficiaries stand a good chance of selling their seedlings to those households with interest in wood lot ownership.

There is heavy dependence on Mulanje Mountain Forest Reserve (MMFR) as a source of natural resource products as most households responded to rely on the natural forests for the natural product needs. This is likely to continue considering that most of the households are 3 km from the forest reserve, and there are few reliable community or private woodlots that can reliably provide for the household forest product needs. The specific forest products being obtained from Mulanje Forest include firewood, thatch grass, fruits and mushrooms. Interestingly, minimal dependence on forests for charcoal in all the Traditional Authorities.

Most households utilize the natural resources obtained from the forests for domestic needs with few engaging in commercial sales of the forest products as evidenced by the fact 84 percent of the responses indicated as not engaging in natural wood sales. For the few households that do sale the forest products, women were found to take an active part in the trading of wood and wood products. However, many of such businesses are at micro or small scale level as the trading takes place within the village or given locality.

Households reported having knowledge about to management of natural resources attributed to the extension services provided by the Forestry Department and other NGOs in the two districts. However, this does not deter them from depending upon the Forest Reserve for their energy and livelihoods. Not surprisingly, therefore, household participation in natural resources management committees is very high. In addition, most households demonstrate willingness to work together as a community in managing these natural resources from Mulanje Mountain.

Poverty was reported as a major driver of households' engagement in forest depletion activities despite having knowledge of the negative consequences of such actions. This notwithstanding, most households are keen to conserve Mulanje Mountain Forest Reserve since it acts as their livelihood source in many respects.

Recommendations

The DMCIL to establish a strong monitoring, evaluation and learning system that would effectively report on the changes in household socio-economic status as well as production and consumption behaviour during the project period. For instance, the said Monitoring and Evaluation (M&E) system should be able to establish differences in occupational status, income levels and structures, school participation, expenditures levels and structures, food consumption, participation in ENRM activities, woodlot ownership, between the project beneficiaries and non- beneficiaries. The evaluation aspect

should seek to establish in precise terms, the extent to which the DMCIL is contributing to the attainment of the changes in the indicators.

In view of the differences in educational levels of the identified DMCIL project participants, there is need for the project management to take into the diverse capacity levels in appreciating the project by designing tailor made training sessions to the different beneficiary groups.

The project to intensify forestry extension services that would stimulate a sustained demand for tree seedlings that would benefit the DMCIL participants who will be trained and have great opportunities to produce and sell the demanded seedlings;

There is need for examining ways of developing and strengthening collaboration with other NGOs in the two districts and their impact areas on how they can support the DMCIL project activities.

In view of the fact that poverty has been identified as one of the drivers of household engagement in natural forest resource depletion activities, the project should consider establishing short to medium term poverty reduction measures to accompany the designed project interventions. If this cannot be done by MMCT, then the management could consider this as one of the issues on which to collaborate with other NGOs operating in the two districts.

1.0 INTRODUCTION

1.1 Background

Mulanje Mountain Forest Reserve (MMFR) and the surrounding area is a habitant to a lot of important biodiversity including Mulanje Cedar (*Widdringtonia whytei*) which is one of the endemic tree species of Mount Mulanje Forest Reserve. The cedar is native to Malawi, where it is endemic to the Mulanje Mountain at altitudes of 1,830-2,550 m above sea level.

Unlike the *Widdringtonia nodiflora* species commonly in South Africa and Zimbabwe that is largely dwarf and bushy stature, the Mulanje Cedar is a large evergreen tree that grows to 40–50 m tall. The Mulanje Cedar is a much sought after tree of economic importance by local communities and the general construction industry in Malawi and worldwide because its pale red, and pleasantly fragrant/ aromatic timber is extremely durable, resistant to termites, wood boring insects and fungi, thus making it vulnerable to exploitation. The Mulanje Cedar constitutes an important livelihood source for many rural communities around the reserve, especially wood carvers and timber sawyers and merchants. Besides its socio-economic importance, the Mulanje cedar has biodiversity significance to the Mulanje Mountain Forest Reserve (MMFR). Many of the species endemic to the Mount Mulanje Forest Reserve are dependent on the cedar forest habitats.

However, the forests have seen a steady decline over the past decades owing to the continuous reduced capacities by the government management authority to address conservation threats which include wildfire, illegal logging, invasive alien plant species and climate change (http://www.sospecies.org/content/mulanje-cedar-ecological-restoration-project).

1.2 Domestication of Mulanje Cedar for Improved Livelihoods Project

Notwithstanding the overexploitation of the Mulanje cedar, natural regeneration of cedar in the wild is difficult hence the need for human interventions. In this regard, stakeholders such as Mulanje Mountain Conservation Trust (MMCT), Forest Research Institute of Malawi (FRIM), Botanic Gardens Conservation International (BGCI), conceptualized a project known as "Domestication of the Mulanje Cedar for Improved livelihoods (DMCIL)'' in liaison with the local district authorities and chiefs from Mulanje and Phalombe districts surrounding the mountain.

The DMCIL seeks to generate new knowledge to enable the cedar to be grown and sold by local people thereby generating alternative sustainable incomes to the local people. This is expected lead to increased awareness of the cedar's importance, and appreciate the need for conservation of the Cedar. The intervention is expected to deliver biodiversity and livelihoods benefits such as (a) defining optimal growing conditions and improving horticultural protocols for cedar restoration on Mulanje and for wider cultivation in Malawi, (b) generate alternative sustainable income sources for poor people through sale and planting of cedar seedlings and (c) significantly reduce unsustainable exploitation and habitat loss of natural stands of cedar.

1.3 Objectives of the DMCIL Project

The overall objective of the project is to generate new knowledge to enable the cedar to be grown and sold by local people for better livelihood outcomes and biodiversity conservation of Mount Mulanje. The specific objectives include:

a) To categorize best cedar growing conditions to improve reforestation on Mulanje Mountain and define areas suitable for cedar cultivation elsewhere in Malawi;
b) To develop improved horticultural protocols to improve cedar survival and growth rates in community nurseries.
c) To propagate cedar in community nurseries and generate income for local households
d) To identify cedar markets and promote the cedar and access to those markets by local and national cedar stakeholders working with experts.
e) To significantly reduce unsustainable exploitation and damage to natural stands of cedar as a result of local communities working with the authorities to protect and restore the cedar on Mulanje Mountain.

These project objectives define the key expected outputs against which the success of the project is to be measured.

1.4 The DMCIL Project Activities

The major activities of the Project activities include:

a) Mobilizing top international research expertise in cedar conservation, propagation and public engagement from botanic gardens in its network. So far, BGCI partner institutions that have expressed interest in participating in this project include RBG Kew, RBG Edinburgh, Bedgebury Pinetum, Forest Research UK, the Eden Project and the World Agroforestry Centre (ICRAF).
b) Identification of the project sites and intended beneficiaries, design interventions, and conduct prefeasibility studies. MMCT and FRIM have liaised with the local District authorities and chiefs from Mulanje and Phalombe, through a Stakeholders' meeting held on 8th April, 2016 to get their buy-in to the project. A total of 10 villages were selected for project implementation based on the following criteria: i) proximity to where cedar will be planted on the mountain (within the buffer area of 2 to 7kms from forest reserve boundary); ii) selected community cedar nursery sites such that each nursery will have 15 persons who will be responsible for nursery management, with 60 percent women representation (amount of seedlings to be raised determined number of nurseries within an area); iii) conducive environment for nursery establishment (water, space / land, community willingness, presence of cedar clusters to be restored on the Mountain).
c) Management of the DMICL Project activities by MMCT, an environmental endowment institution, with 14 years' experience in carrying out habitat restoration on Mulanje Mountain, to be principally responsible for replanting and restocking Mulanje Cedar forests and day to day management of the project in Malawi. MMCT shall also be responsible for nursery establishment, capacity building including recruitment, training and conducting outreach activities such as workshops and public awareness.

1.5 Objectives of the Baseline Survey

The overall purpose of the baseline survey is to gather information on household incomes, social and economic drivers of cedar exploitation, and receptiveness to new approaches. Specifically, the baseline study seeks to:

(i) Establish baseline values of log frame indicators against which future measurements of changes related to the project objectives can be made;

(ii) Gather information from local villagers, including staff recruited to work in community nurseries, on current household incomes, income sources, use of cedar and other natural resources, current attitudes to cedar and natural resource conservation and management;
(iii) Identify social and economic drivers of cedar exploitation;
(iv) Assess receptiveness to new approaches to promote cedar exploitation and restoration;
(v) Identify community priority needs and expectations of external support;
(vi) Identify existing community structures and decentralized government structures, their functionality and linkages;
(vii) Identify specific groups within the project area where cedar exploitation is very high and natural resources management is particularly low in order to guide the targeting of project activities;
(viii) Provide an analysis of collected data, including key constraints affecting cedar conservation and community livelihoods, to enable, if appropriate, project activities, and the log frame to be refined;
(ix) Data should be segregated by gender and marginalized/disadvantaged groups/ caste as appropriate;
(x) Summarize the findings and analyze strength, weaknesses, opportunities and threats of current socio-economic (including tourism and culture) situation to the management/development planning;
(xi) Specifically point out issues to be addressed and recommend potentialities to be harnessed by the implementation plan of the project.

1.6 Challenges

The study encountered a number of challenges relating to the implementation process. These include limited time frame and resources to include a reference sample of non-project beneficiaries which would be needed during mid-term or end of project impact assessment. In addition, in some villages, some project beneficiaries were not available for interviews despite undertaking repeated visits to such villages. Data management and analysis was severely affected by the prolonged power outages that delayed the timely completion of the report. Notwithstanding these challenges, the study was able to collect detailed and reliable data hence guaranteeing the dependability of the baseline study output.

1.7 Organization of the Report

This report is organized as follows: After this Chapter, Chapter two discusses the study methodology including sampling techniques and data management activities, while third chapter discusses the household demographic characteristics. The fourth chapter presents the household agricultural production, marketing and consumption practices, while the fifth chapter interrogates the household forest product utilization patterns. The sixth chapter discusses the current household roles in conservation of Mulanje Mountain, with the seventh chapter concluding the study findings with implications for policy as derived from study insights.

2.0 STUDY APPROACH

The baseline study employed a combination of different approaches and tools to collect data and information to adequately address the objectives of this Baseline study. These include: a review of policy literature from government and MMCT itself, and primary data collection and analysis from households in the sampled villages in TAs around Mount Mulanje. The details of the specific methods are discussed in the proceeding sections:

2.1 Literature Review

Literature review process involved mobilization and analysis of the relevant, national and district level policy literature relevant to the DMCIL project objectives, scope and activities. The national and district policy and strategic frameworks were reviewed to demonstrate the extent to which the planned project scope responds to or support the national policy context. The reviewed frameworks include: the Malawi Constitution, the Vision 2020, Malawi Growth and Development strategy (MGDS II), National Forest Policy, the National Environmental Management Policy, the National Land Policy, the National Land Resources Management Policy and Strategy, the Energy Policy, amongst others.

2.2 Primary Data Collection

This report is based on primary data collected through stakeholder consultations at district level, focus group discussions (FGDs) and household survey. Primary data collection was undertaken during the period 3rd – 9th October, 2016. The following sections describe the various sources of data collected from this baseline.

2.2.1 Household Sampling

The main source of data for the baseline study was through a household survey conducted in 5 Traditional Authorities (TA) within the vicinity of Mulanje Mountain. From Mulanje District, three TAs, namely Mabuka, Mkanda and Njema were selected while TAs Nkhulambe and Mkhumba were selected from Phalombe District. In Mulanje, two villages each were selected from each of the TAs while in Phalombe, three villages were selected from TA Mkhumba and one village from TA Nkhulambe. This makes a total of 10 villages. At design stage, a **fixed- size sampling procedure** was to be adopted where 15 households were pre-determined to be interviewed in each of the sampled village as these were already identified by MMCT as potential beneficiaries of the project. However, during the survey, there were instances where more households were sampled from one village than the predetermined 15 and in other instances, less than 15 households were sampled. The range was 11 households in Nankhonyo village and 23 from Nnesa. This was done to achieve greater representation of the sample.

2.2.2 Household Interviews

In total, a sample of 148 households were interviewed from both districts, 61 percent from Mulanje District and 39 percent from Phalombe district. Of the 148 households were sampled for household interviews 61 percent were male headed households and 39 percent female headed households. About 66 percent of the households interviewed in Mulanje were males and 34 percent were females. In Phalombe, 53 percent of the households interviewed were males and the remainder (47%) were females.

The key issues on which data were collected from the household interviews cover almost all the livelihoods and environment and natural management (ENRM) dimensions, namely livelihood and

income sources, non-farm livelihood sources, household expenditure, livestock ownership and control, access to credit, land acquisition and quality, crop production and marketing activities, farm inputs uptake and markets, nutrition and food security, woodlot ownership, forest resource use, the socio-economic characteristics, livestock ownership and marketing of woodlot products, food security and nutrition, natural resource access and management, access to agriculture & natural resource management extension services, provision of ecosystem services from Mulanje Mountain forest reserve, knowledge attitude and practice (KAP) towards Mulanje cedar restoration and conservation.

2.2.3 Focus Group Discussions

Focus group discussions (FGDs) were held in four of the ten (10) sampled villages, largely involving Village Natural Resources Management Committees (VNRMCs). The four villages include: Kazembe, Kazembe, Lomoliwa, Kadewere and Nnesa. The FGDs were held for mixed groups of men and women while in other villages, it was separately for male and female groups of about 10 members. Through FDGs, the study was able to collect in depth information on the livelihood practices and community perspectives towards Mulanje Cedar restoration efforts. The information from the FGDs was triangulated with the one obtained from the household interviews as a way of establishing the validity of the household information.

2.2.4 Stakeholder Consultations

Stakeholder consultations involved discussions with key implementation partners for MMCT including the government departments such as the District Forestry Office, the District Environmental Office and FRIM. The consultations sought to appreciate the extent to which the relationship between the different departments and MMCT (including how the different institutions are involved in MMCT activities), and specific areas where MMCT need to improve on in the design and implementation of the DMCIL Project, amongst others.

2.2.5 Data Entry, Cleaning and Analysis

Upon completion of field work, the structured private sector questionnaire was entered into Statistical Package for Social Scientists (SPSS) by data entry clerks during the period 7th – 12nd November, 2016. Data entry followed by data cleaning and analysis. The time taken to finalize the data entry took longer than anticipated due to the problems of frequent power outages. Data analysis comprised descriptive statistics relating different variables of interests.

2.2.6 Report Writing

The study report writing process, as stated earlier commenced with literature review, followed by household data analysis and synthesis of insights from the FGDs. This was done during the period 24th October through 24th November, 2016.

3.0 MAIN FINDINGS

In this chapter, we present results of the household survey for the baseline survey. The first section presents a general overview of the household demographic characteristics by looking at: age of the household head, education level of the household head, marital status of the household head and main occupation of the household head. Thereafter, the analysis presents household socio-economic characteristics by looking at: household incomes from crop sales, incomes from livestock sales and fish, incomes from sale of forest based resources, incomes from non-forest based resources, distance to the main household income sources, household expenditure patterns, household livestock ownership and household asset endowment.

3.1 Household Demographic Characteristics

3.1.1 Sample Distribution by Age of Household Head.

The study enquired on the age of the household head considering the influence age has on decision making and uptake of new innovations. Overall results from the full sample in Figure 3.1 show indicate little significant age difference between male and female headed households. However, results indicate that older people were found in TA Njema with average age of 46 years with male headed households being significantly older with average age of 47 years and 44 years for female headed households. On the other hand, the TA Nkhulambe has a youthful population with an average age of 31 years with males being significantly older with the average of 34 years compared to 27 years for female headed households. In TA Mkanda there is an average 6 year gap between male headed households and female headed households with male headed households being older. There are no age differences between males and females in TAs Mabuka and Mkhumba though female headed households are relatively order than their male counterparts in TA Mkhumba.

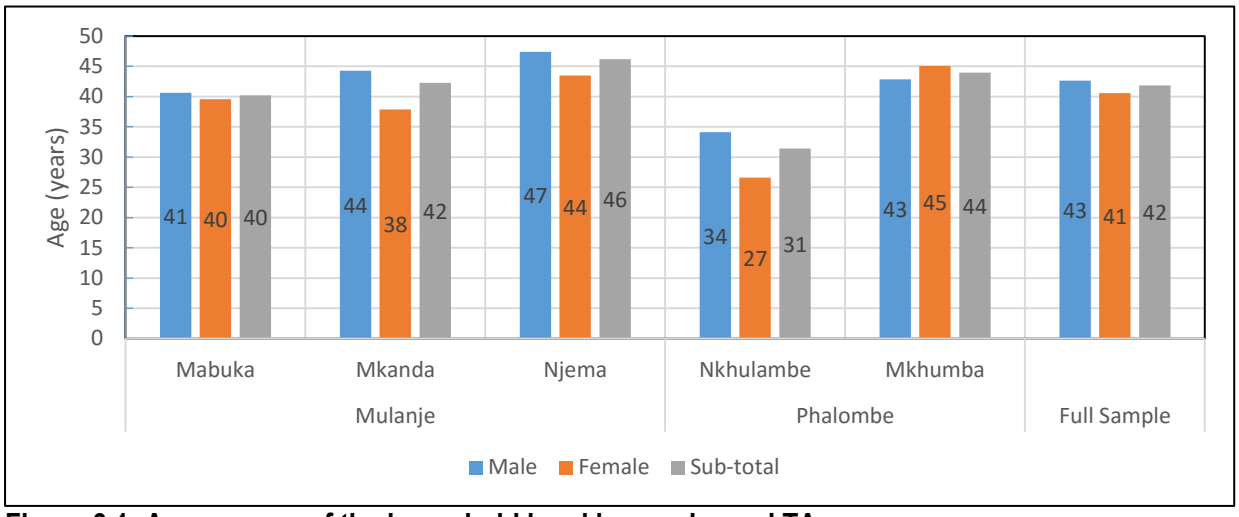
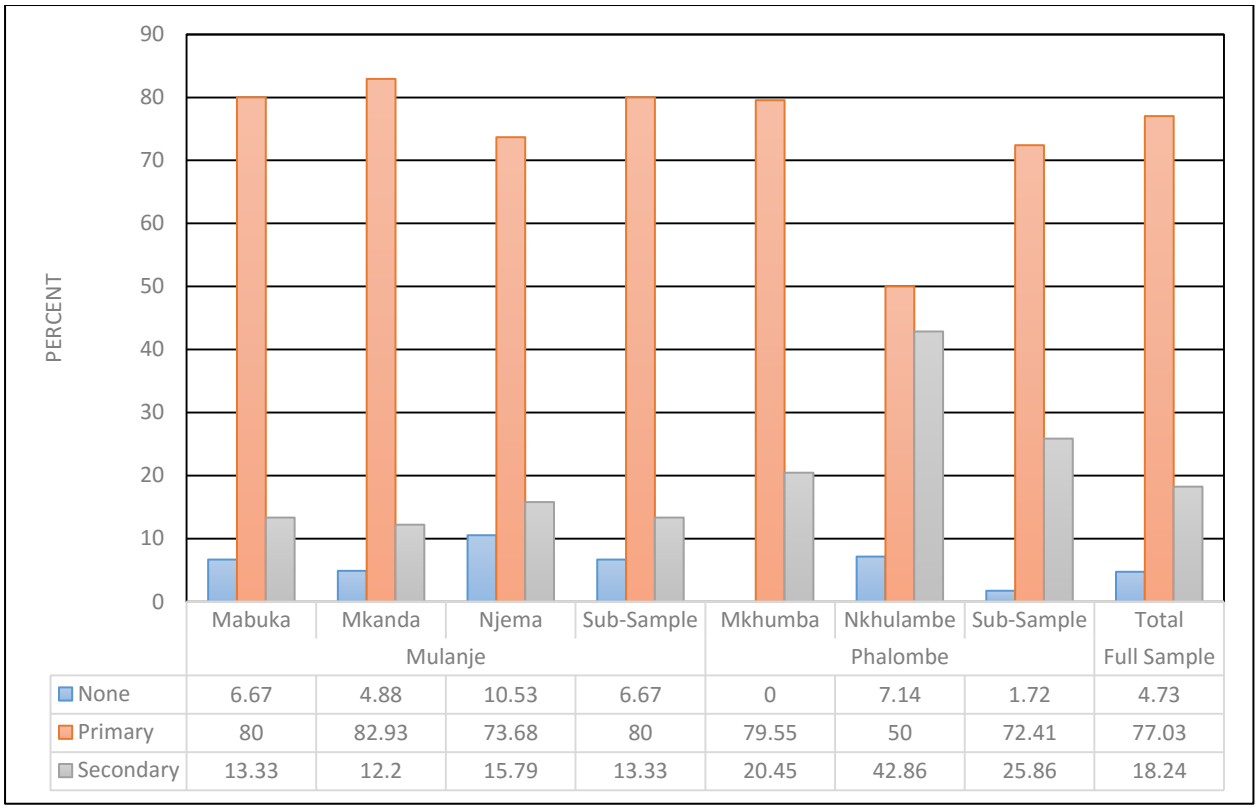


Figure 3.1: Average age of the household head by gender and TA.

The results, however, show that the people in all areas both male and female headed households are in active stage, thus should be able to actively participate in nursery management and all other developmental activities.

3.1.2 Sample Distribution by Education Level of Household head

The study also established statistics on the education level of the household head. The results are indicated in Figure 3.2 below.



	Mulanje				Phalombe			
	Mabuka	Mkanda	Njema	Sub-Sample	Mkhumba	Nkhulambe	Sub-Sample	Total Full Sample
None	6.67	4.88	10.53	6.67	0	7.14	1.72	4.73
Primary	80	82.93	73.68	80	79.55	50	72.41	77.03
Secondary	13.33	12.2	15.79	13.33	20.45	42.86	25.86	18.24

Figure 3.2: Education level of the household head

The general overview of the results indicate that overall, only a small proportion of the sample (4.7%) had not attended any school. More than 75 percent of the sample had attended primary school and nearly 20 percent of the households had attended secondary education. In Mulanje District, 80 percent of the households attended primary school compared to 72 percent in Phalombe District. Interestingly, TA Nkhulambe has the highest proportion (42.9%) of household head that had attended secondary education, seconded by TA Mkhumba in the same district (20%) while TA Mkanda has the least proportion of household (12%) with secondary education.

A gender dissagregated analysis at TA level shows that Phalombe District has the highest proportion of female headed households (85%) that attended secondary school compared to 77 percent in Mulanje District. This could be attributed to the fact that most females get involved in unskilled labour in tea estates as a recult they either drop out of school or get married early compared to Phalombe where economic opportunities may be scarce[1].

[1] Further analysis at TA level did not produce impressive results due to small sample sizes for each category

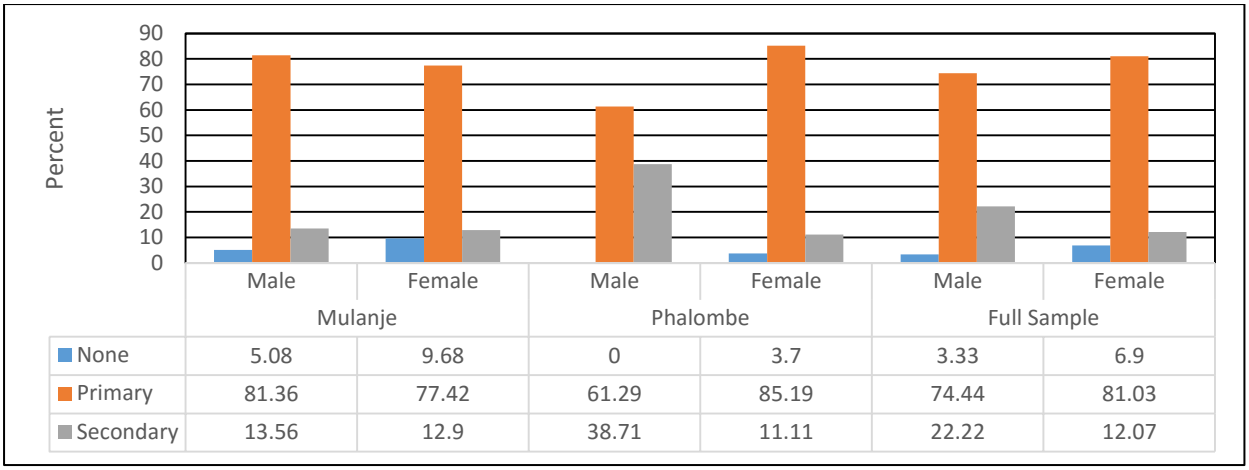


Figure 3.3: Education Level by Sex of the Household Head

3.1.3 Sample Distribution by Marital Status of Household head.

Furthermore, the baseline study also sought to investigate on the marital status of the household head which could also influence dependence on the resources. The results are shown below. Table 3.1 showing marital status of the household head by gender and geographical location.

Table 3.1: Marital Status of Household head

Marital status	Mulanje District						Phalombe District			
	Mkanda		Mkhumba		Njema		Nkhulambe		Mabuka	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
Single	0.0	4.8	0.0	0.0	14.3	0.0	0.0	16.7	5.9	8.3
Divorced	2.6	19.0	0.0	66.7	0.0	15.4	0.0	16.7	0.0	58.3
Married (Monogamy)	92.1	52.4	90.9	0.0	78.6	38.5	100.0	66.7	94.1	16.7
Married (polygamy)	5.3	0.0	9.1	0.0	7.1	0.0	0.0	0.0	0.0	0.0
Separated	0.0	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.3
Widowed	0.0	9.5	0.0	33.3	0.0	46.2	0.0	0.0	0.0	8.3

The results indicate that most of the household heads are married to one spouse as evidenced by: 92 percent and 52 percent of male and female headed households in TA Mkanda 3 percent of male household heads were divorced and 5 percent of male household heads were married to more than one spouse in the same area.

The analysis results also indicate that no male household head was seperated or widowed, especially in TA Nkhulambe where no household head was either widowed or separated. It was also observed that there was no male household in all TAs except Mkanda, was divorced but the problem of divorce was most prominent for female headed households in TA Njema and Mabuka where 67 percent and 58 percent of the households were divorced.

3.1.4 Sample Distribution by Main Occupation of Household Head

Following analysis of marital status of the household head, the study also sought to establish statistics on the main occupation of the household head. Results shown in the Figure 3.4 below.

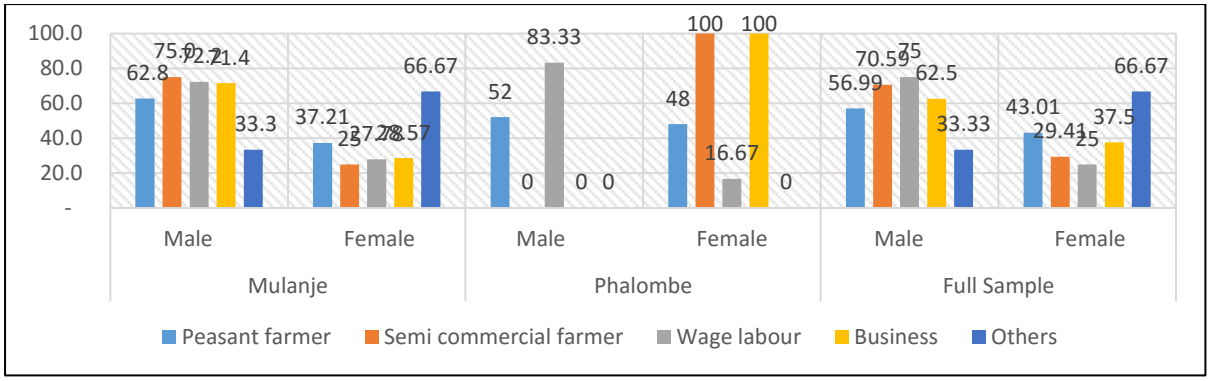


Figure 3.4: Main Occupation of the Household Head

The results in Figure 3.4 are multiple resonse results for the main occupation of the household head defined as the activity that a household undertakes to earn some income. Our sample shows that some households have more than one occupation. Specifically, the results indicate that both males and female households in Mulanje have a more diversified income earning opportunities than households in Phalombe. Within Phalombe, female-headed households have diversified occupation than their male counterparts who rely only on farming and wage employment. In Mulanje, semi commercial farming is the primary occuption among men (75%) while other types of businesses occupy female headed households. In addition, male headed households (70%) earn their living from businesses as well. The main occupation among men in Phalombe are wage employment (75%) and businnesses (70%). Female headed households in Phalombe derive their livelihood from businnesses and semi-commercial farming. This mainly involves vegetable farming targeting the markets within.

3.2 Household Socio-Economic Characteristics

As indicated earlier, the study also enquired on socio-economic characteristics of the household by looking at: household incomes from crop sales, incomes from livestock sales and fish, incomes from sale of forest based resources, incomes from non-forest based resources, distance to the main household income sources, household expenditure patterns, household livestock ownership and household asset endowment.

3.2.1 Household Incomes Sources

The study analysed the importance of various sources of income such as crop, livestock, forest based income and other sources such as businesses. Figure 3.5 below shows that the major source of income amomg household in our sample is non farm imcome such as small businesses and remittances accounting for 40 percent of the total household income followed by forest-based income (26%) while crop and livestock income account for 23 percent and 11 percent, respectively.

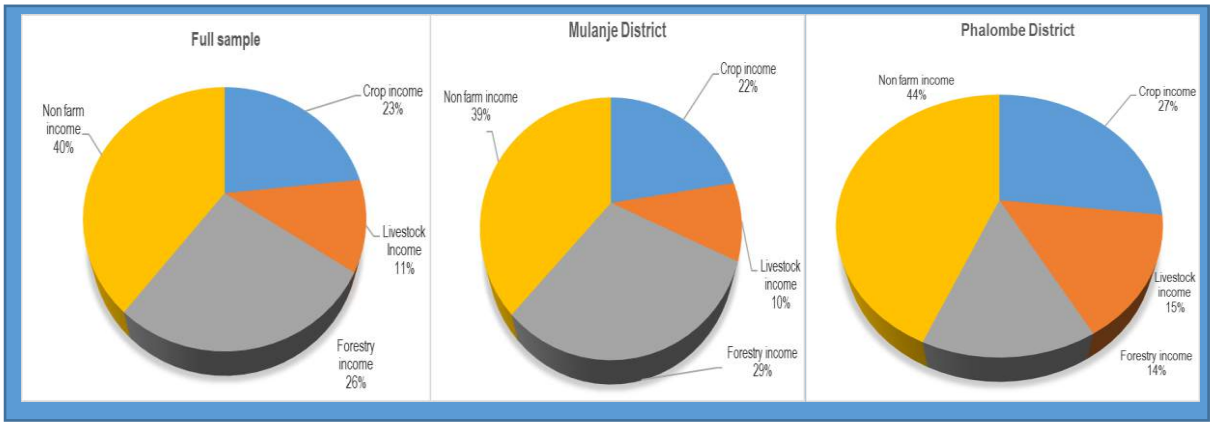


Figure 3.5: Share of Income Sources to Total Household Income

Further analysis shows that non-farm income account for 44 oercent of household income in Phalombe district compared to 39 percent in Mulanje District. It worth noting that there is a higher dependence on forest rsources as an important source of income among households in Mulanje District than in Phalombe District. Forest income is the second most important source of income among households in Mulanje accounting for a third of the total household income compared to only 14 percent in Phalombe District. This could be explained by the fact that markets for forest-based products are well developed in Mulanje than in Phalombe. Apart from selling fuelwood (firewood and charcoal), there are a number of forest-based enterprises such as bee-keeping that are more relevant in Mulanje than in Phalombe District.

In Phalombe district, crop income is the second most important source of income accounting for 27 percent of the total household income. In Mulanje, crop income account for 22 percent of the total household income and is the third most important source of income. Livestock income accounts for 15 percent of the total household income in Phalombe district while in Mulanje, livestock income accounts for 10 percent of the total household income.

A gender dissagregated analysis reveal interesting findings regarding the role of forest income to total household income. Figure 3.6 shows that non-farm income such as businesses and remittances is the main source of income accounting for 41 percent of the total income followed by forest income which account for 28 percent of the total household income. However, among female-headed households, forest income is the main source of income accounting for 38 percent of the total income followed by other non-farm income which account for 29 percent of the total income.

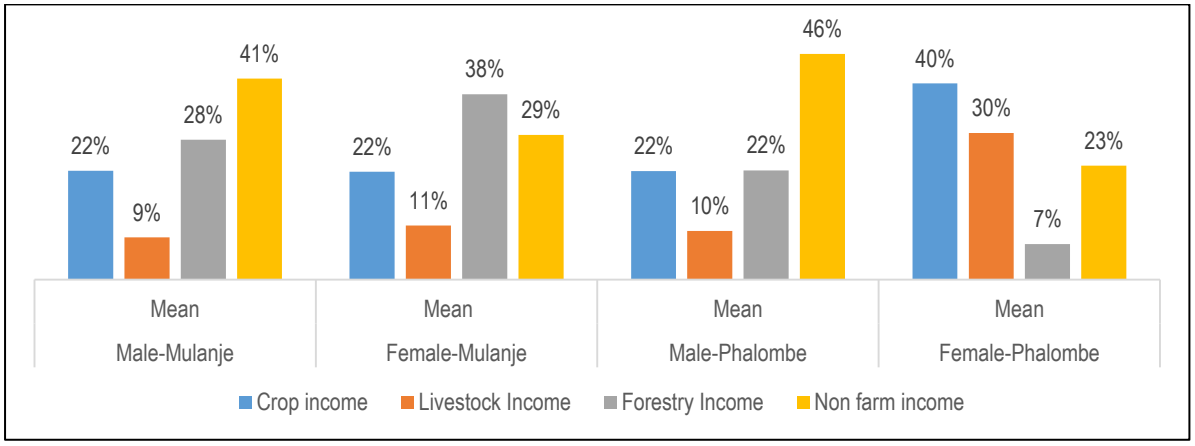


Figure 3.6: Share of Income Sources to Total Household Income by District and Sex

In Phalombe, non-farm income account for 4 percent of the total household income followed by crop and forest income which both income sources account for 22 percent of the total household income. Among female headed households, crop income is the most important source of income followed by livestock income (30%). Forest income accounts for only 7 percent of the households. These results suggest that forest-based income constitute an important source of income among female-headed households in Mulanje District but not in Phalombe District.

3.2.2 Total Household Incomes by Source

The study estimate average incomes people got from various sources such as crop, livestock, forest based income and other sources such as businesses. Table 3.2 below presents the average household incomes amounts earned from different sources.

Table 3.2: Average Income by District and Gender

District	Male headed households (MK)	Female headed households (MK)	Total Income (MK)
Mulanje	162,041.79 (225,334.59)	64,475.65 (90,739.714)	127,330.76 (193,950.03)
Phalombe	173,317.39 (174,782.05)	62,312.5 (40,959.94)	121,687.21 (141,064.58)
Total	164,923.33 212,672.78	63,716.649 76,572.842	125,679.93 (179,635.23)
Sample	**90**	**57**	**147**

The figures in brackets are standard deviations.

Results in Table 3.2 shows that the average annual income for households in the sample is MK125, 679. There is no statistical difference in total household income between Mulanje and Phalombe District. Average income for households in Mulanje and Phalombe are MK127,330.76 and MK121,687.21, respectively. However, gender dissagregated analysis shows that while there are no statistical difference between female headed households in Mulanje and Phalombe district (i.e, MK64,500 in Mulanje versus MK62,300 in Phalombe), total income for female headed households is only 40 percent that for their male-headed counterparts. This suggest that that male headed households are more previleged than female headed households.

Table 3.3: Average income by District and Income Source

Source of income	Mulanje		Phalombe		Full Sample	
	Mean (MK)	Std Dev (MK)	Mean (MK)	Std Dev (MK)	Mean (MK)	Std Dev (MK)
Crop income	58,352.24	102,848.30	55,626.56	73,515.27	57,471.21	93,994.85
Livestock Income	24,976.14	33,978.53	31,392.31	36,596.37	27,429.38	34,594.13
Forestry Income	76,571.43	159,333.90	30,000.00	50,517.32	64,315.79	139,091.00
Non-farm income	100,471.40	165,126.10	90,450.00	152,950.70	97,529.36	161,008.00

Results in Table 3.3 shows that shows that households derive much of their income from non-farm sources across the two districts with average annual incomes of MK100,500 and MK90,450 for Mulanje and Phalombe, respectively and for the full sample, the average annual income is MK97,500. Another source with highest average income in Mulanje is forest-based income with average income of

MK76,600 while in Phalombe the source with second highest source is crop income with an average of MK55,600. Livestock income is the source with the least average income with an average of MK24,600 in Mulanje District while forest-based income source has the least average income in Phalombe averaging MK30,000.00.

3.2.3 Distance to the Main Livelihood Sources.

Further to the analysis of the income sources and the average amount that the household was able to realize, the study investigated on average distances that people travelled to the income source. The results are presented in Figure 3.7 below.

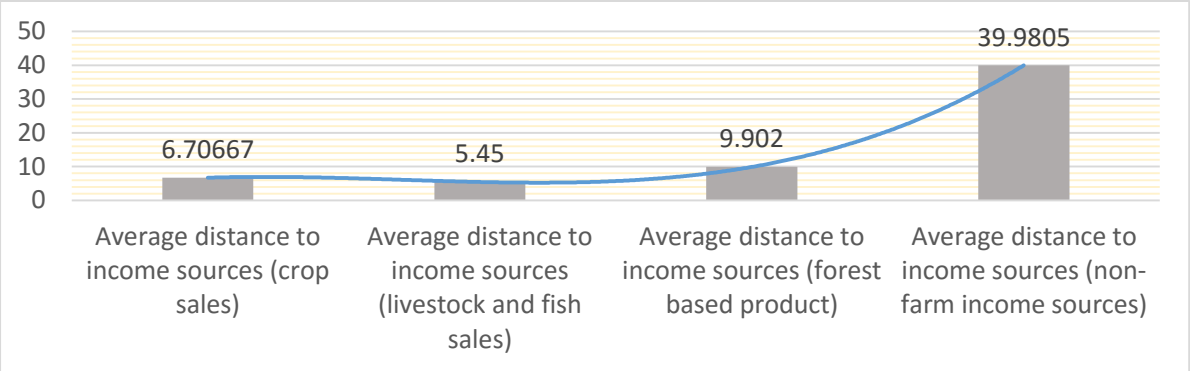


Figure 3.7: Average Distance to Different Income Sources (km)

The results in the Figure 3.7 above show that the longest distance that people could travel to their income sources that include small scale businesses, formal employment, piece works, is 40 km. The least distance covered is about 6km, and this is to income sources such as livestock and fish sales, either to a well established livestock market or local traders in the district. Others reported distances to income sources include 7km and 10km where to sell crops and sell forest based products respectively.

3.2.4 Household Expenditures Patterns

The study also sought to establish household expenditure patterns. Analysis results are in Table 3.3 below.

Table 3.4: Household expenditure patterns

Expenditure item	Mulanje		Phalombe	
	Male (%)	Female (%)	Male (%)	Female (%)
Grocery	98.4	100.0	95.2	100.0
Health	35.5	42.5	42.9	42.9
Church/Mosque	88.7	92.5	100.0	85.7
Diesel	0.0	2.5	0.0	0.0
Petrol	4.8	0.0	0.0	0.0
Water	4.8	22.5	0.0	50.0
Village contributions	40.3	55.0	47.6	78.6
Ceremonies	30.6	45.0	23.8	64.3
Gifts	16.1	42.5	23.8	35.7
Beer	4.8	10.0	4.8	14.3
Furniture	14.5	10.0	14.3	35.7
Firewood/Charcoal	24.2	12.5	4.8	28.6

Food	66.1	85.0	42.9	85.7
Clothing/Uniform	25.8	25.0	38.1	64.3
School fees	9.7	15.0	14.3	21.4
Renting land	6.5	10.0	14.3	21.4
Buying seeds	8.1	2.5	9.5	0.0
Buying fertilizer	4.8	7.5	14.3	0.0
Hired labor	1.6	5.0	9.5	0.0
Energy for lighting	37.1	30.0	42.9	7.1
Phone charging	16.1	17.5	38.1	7.1
Others	1.6	0.0	0.0	0.0

The results in Table 3.4 above indicate that significant households expenditures are on groceries followed by church or mosque and health.Depending on the geographical location, some expenditures are made on ceremonies and village contributions. The results also invariably show that households also spend good proportions of their incomes on food though the degree of expenditure vary based on gender and the location. A gender disaggragation of household food expenditure shows equal proportions of female headed households in both Phalombe and Mulanje (about 85%) spending on food, whereas in the case of male heded households, the analysis results show that male headed in Phalombe district tend less on food (43%) compared to their counterparts in Mulanje (66%).

There is some variation across gender whereby more expenditures on food in both areas are made by female headed households as compared to their male counterparts. The results also indicate that more expenditures on village contribution and ceremonies are made by female headed households than male household heads especially in Phalombe as compared to Mulanje.

3.2.5 Household Livestock Ownership.

Further to the investigation of household expenditure, the study furthermore sought to enquire on household livestock ownership. The results of the analysis are presented in the Table below.

Table 3.5: Type of Livestock Owned by the Household

Livestock	Mulanje		Phalombe	
	Male (%)	Female (%)	Male (%)	Female (%)
Cattle	0.0	0.0	5.6	0.0
Goats	52.6	55.0	50.0	64.3
Local chicken	63.2	80.0	77.8	57.1
Sheep	2.6	0.0	0.0	0.0
Pigs	2.6	15.0	0.0	14.3
Broiler chicken	2.6	0.0	0.0	0.0
Layers chicken	0.0	0.0	0.0	7.1
Ducks	5.3	0.0	0.0	0.0
Rabbits	7.9	0.0	0.0	0.0
Guinea fowls	0.0	5.0	0.0	0.0
Other livestock	2.6	0.0	5.6	0.0

The results in Table 3.5 above show that common available livestock in the Mulanje and Phalombe districts are goats and local chicken as evidenced by 53 percent and 55 percent of male and female headed households in Mulanje owning goats, and 63 percent and 80 percent of male and female headed households in Phalombe having local chicken. Another notable finding is that cattle was only

found in Phalombe at a male headed households (6% of the responses) while sheep (3% responses) were found in Mulanje by male headed households.

3.2.6 Asset Endowment

As part of household socio-economic assessment, the study also enquired on the household asset endowment by looking at the type of assets possessed by the household, estimated values of the assets and the control. Table 3.6 below presents analysis results on the type of assets owned by the households in the two districts.

Table 3.6: Type of asset owned by households

Assets	Mulanje		Phalombe	
	Male (%)	Female (%)	Male (%)	Female (%)
Vehicle	0.0	4.9	0.0	0.0
Motorcycle	7.8	0.0	4.0	0.0
Ox-cart	0.0	0.0	0.0	0.0
Bicycle	51.6	34.1	80.0	52.9
TV	12.5	0.0	8.0	11.8
Radio	45.3	19.5	52.0	29.4
Furniture (Bed, Dining set, Sofa)	25.0	17.	56.0	29.4
Sewing machine	3.1	0.0	8.0	5.9
Panga knife	57.8	46.3	48.0	41.2
Hand saw	9.4	0.0	4.0	0.0
Sprayer	3.1	0.0	0.0	0.0
Traditional beehive	3.1	2.4	4.0	5.9
Modern beehive	0.0	4.9	4.0	5.9
Fishing nets	0.0	2.4	0.0	0.0
Plough/Ridge	0.0	4.9	4.0	0.0
Hoe	90.6	87.8	96.0	100.0
Axe	46.9	56.1	60.0	52.9
Phone	15.6	4.9	16.0	0.0
Other assets	4.7	0.0	0.0	0.0

Analysis results in the Table 3.6 above indicate that the major household asset owned are: hoe, axe, panga knife, bicycle, radio and household furniture. The study findings also show that gender biases in some asset ownerships, namely cell phones, as 16 percent of male responses indicated cellphone ownership in both districts compared only 5 percent in Mulanje and none on Phalombe. However, for some productive assets such as hoes, equality of ownership was reported among the two gender groups in both districts. Interestingly, it was only male headed households who owned motorcycles in both districts, just as vehicle ownership responses (5%) was from female headed households in Mulanje district. The study went further to establish the estimated values of the assets as presented in Figure 3.8 below.

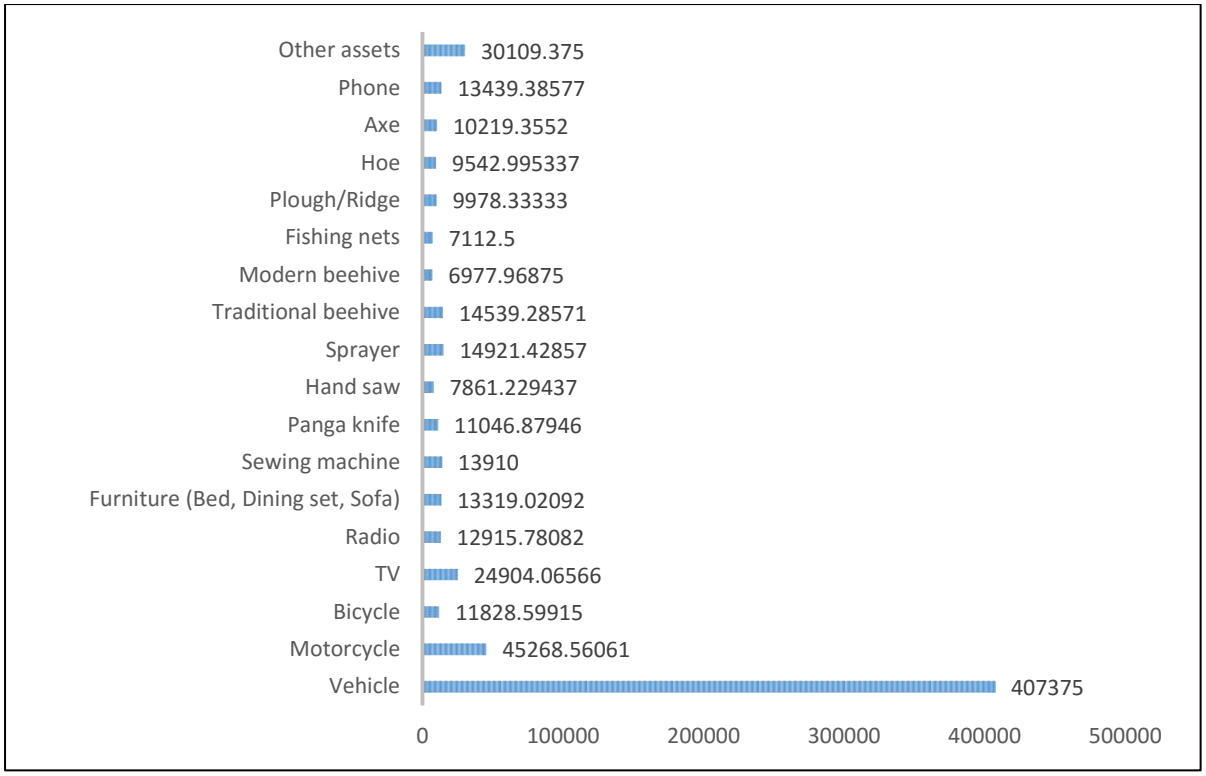


Figure 3.8: Household estimated values from the assets.

The results indicate that the household had an average of total estimated asset value of K665,300 from all assets that the household has.

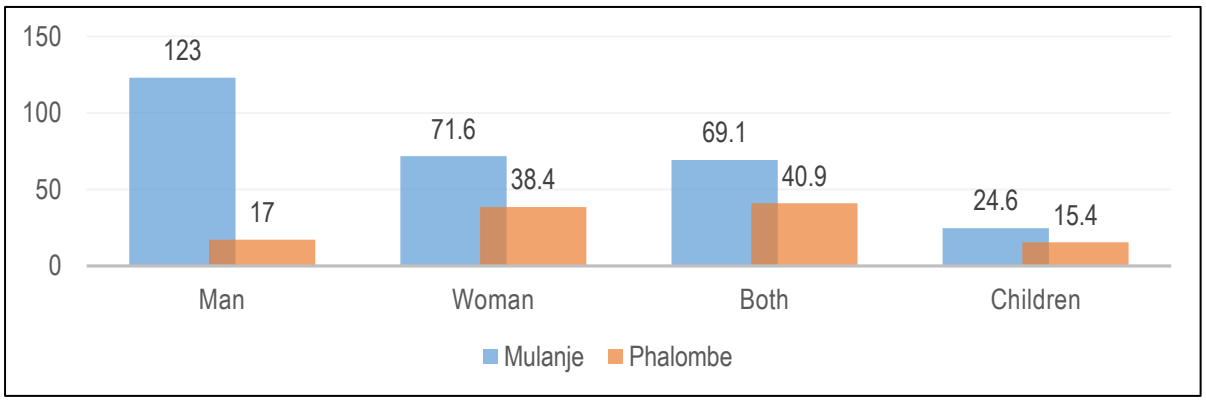


Figure 3.9: Household asset control by district.

The results in Figure 3.9 above indicate that majority of the assets in Mulanje are controlled by men followed by women, and those that are jointly controlled by both men and women. Of the two districts, Mulanje had the highest reported cases of assets being jointly controlled by both men and women. Surprisingly, there are few households in Phalombe dsitrcit where assets are controlled by men as compared to Mulanje district.

3.3 Summary of the Chapter

In summary, the socio-economic baseline study results show that the sampled household heads who are set to participate in the DMCIL project are in the productive age group, with a maximum age of 49 years and minimum age of 27 years. This means that the sampled household heads have the potential to actively participate in the nursery management under the DMCIL project. Analysis of the education level of the household heads shows that most of the household heads attained primary education. The results also indicate that more female headed households droped school at primary level as compared to their male counterparts except in TAs Nkhulambe and Mabuka where low percentage of women droped school at primary level.

On marital status, the results indicate that most of the household heads are married to one spouse with 3 percent of male household heads being divorced, while 5 percent of male household heads were in polygamous relationships. In terms of occupation, the results indicate that most of the people in the area are peasant farmers as their main accupation as evidenced by 48 percent of male headed households in Mulanje were peasant farmers, 59 percent of female headed households in Mulanje. Most households make most of their expenditures on groceries, church/mosque donations, health and food, with female headed households spending most (85 percent of more) of their incomes on food. The results also revealed that majority of livestock owned in the area are goats and local chicken. On asset ownership, the results indicated that most of the asset owned by the households are basic assets that includes: hoe, axe, panga knife, bicycle, radio and household furniture. Control over household assets is largely by men, though joint control situations were also reported.

4.0 AGRICULTURAL PRODUCTION AND MARKETING

Socio-economic assessment baseline study for the domestication of Mulanje Cedar besides analysis on household demographic characteristics and socio-economic assessment of the household, the study also sought to explore more on the agricultural production and marketing by looking at: land acquisition and quality, household crop production, production costs, crop profitability and household food security and nutrition.

4.1 Land Acquisition and Quality

The baseline study established statistics on land acquistion and quality by looking at; how household acquired the plots, distance to the plots, household perspectives on land quality, household prospectives on land availability for farming, and household land marketing transactions. The majority of households have one piece of land but others have four pieces of land. Table below shows that land sizes:

Table 4.1: Distribution of Land Size in Hectares by District and Gender

District	Male	Female	Total
Mulanje	1.73 (1.36)	2.07 (1.14)	1.79 (1.30)
Phalombe	1.02 (0.35)	0.99 (0.29)	1.01 (0.29)
Total	1.60 (1.26)	1.53 (0.95)	1.58 (1.17)

figures in brackets are standard deviations

Results show that the average land size for both districts is 1.58 hectares while the average land sizes for Mulanje and Phalombe are 1.79 ha and 1.0 ha, respectively. Households in the sampled villages in Mulanje have significantly larger land sizes (1.79 ha) than their counterparts in Phalombe (1 ha) at 10 percent level of significance. It is interesting to note from the analysis that female headed households in Mulanje have slightly larger land sizes compared to male-headed households although the difference is not statistically significant while there is no statitical difference in land sizes between male and female headed households in Phalombe.

4.1.1 Household Plots Acquisition

The study revealed that most of the people in the area of the households acquire their land through inheritance from wife's parents as represented by 77 percent followed by 11 percent acquiring their plots from husband's parents. There was only 7 percent of the households who rented the land they cultivate and 4 percent who purchased their land. Details are in Table 4.2 below.

Table 4.2: Percent Distribution of Mode of Land Acquisition

Land Acquisition	Mulanje			Phalombe			Full Sample		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Inherited from parents	81.03	75.86	79.31	68.97	77.78	73.21	77.01	76.79	76.92
Inherited from husband	13.79	3.45	10.34	17.24	3.7	10.71	14.94	3.57	10.49
Purchased	3.45	3.45	3.45	6.9	3.7	5.36	4.6	3.57	4.2
Allocated by the government	1.72	0	1.15	3.45	0	1.79	2.3	0	1.4
Rent	0	17.24	5.75	3.45	14.81	8.93	1.15	16.07	6.99
Total (%)	**99.99**	**100**	**100**	**100.01**	**99.99**	**100**	**100**	**100**	**100**
Sample	**58**	**29**	**87**	**29**	**27**	**56**	**87**	**56**	**143**

Furthermore, the results indicate that there is a discrepancy across the districts whereby there was higher percentage of households in Mulanje districts who inherited land from wife's parents represented by 79 percent as compared to their counterparts in Phalombe district which was represented by 73 percent. Land acquisition through rent indicated some variations across the districts whereby 9 percent of households in Phalombe acquired land through purchasing while only 3 percent in Mulanje which indicate a level of land segmentation across the districts. However, there was not much difference in terms of the land acquired through purchase where it indicated 4 percent in all districts such that land marketing is still underdeveloped in both districts. Only one percent of the households acquired their land through government allocation.

Gender dissagregated analyses shows that in general a greater proportion of male-headed households acquired their land from wife's parents than female headed households across the districts. It is interesting to note that slightly more than 3 percent of the female-headed households acquired their land from husband in both districts. Another interesting result is that in both districts, the proportion of female-headed households that rent in land is significantly higher than their male counterpart. More than 17 percent of female households in Mulanje rent in land and none of the males in the sample rented in land. In Phalombe, about 15 percent of the female households rented in land compared to only 3.5 percent among males. Perhaps this suggests that female-headed households are the main food producers in both districts. On the same note, there was very low percentage of land acquired by purchasing which was estimated at 4 percent across the districts.

4.1.2 Distance to the Plots

In terms of the distance to the plot, the study results indicate that people across all the districts travel an average of 2km to their plots. Details are in Table 4.3 below.

Table 4.3: Average distance to the plots

N	Minimum	Maximum	Mean	Std. Deviation
143	0.0575	14		2.2520
Mulanje		**Phalombe**		
Average distance		**Average distance**		
2.389		0.7023	1.5684	

Analysis results in Table 4.3 show variations in distances covered by households to their farm plots across the disticts. In Mulanje households could travel as far as 2km to their plots which was high as compared to their counterparts in Phalombe who could travel only 1km to their farm plots.

4.1.3 Perceptions on Quality of Plots

The study also investigated on the perception the people had about quality of their land. The results indicate that soil in Mulanje is good represented by 52 percent but the rest are poor soils with only 12 percent are very fertile. This indicates that on average, the soil is good for crop cultivation. The results for Phalombe district indicate that the soil is good as well as represented by 61 percent and 28 percent of the household have plots with poor soils. Strangely, No household in Phalombe district reported to have a plot with very fertile soils. See Table 4.4 below.

Table 4.4: Household Perception on Quality of their Plots.

District	Perception of Quality of Plot	Sex of household head		Total
		Male	Female	
Mulanje	Poor	54 (35.5)	27 (36.5)	81 (35.8)
	Good	83 (54.6)	34 (45.9)	117 (51.8)
	Very Fertile	15 (9.9)	13 (17.6)	28 (12.4)
	Total	**152 (67.3)**	**74 (32.7)**	**226 (100.0)**
Phalombe	Poor	14 (28.0)	9 (29.0)	23 (28.4)
	Good	33 (66.0)	16 (51.6)	49 (60.5)
	Very Fertile	3 (6.0)	6 (19.4)	9 (11.1)
	Total	**50 (61.7)**	**31 (38.3)**	**81 (100.0)**

Study results In Table 4.4 above indicate variations in terms of soil fertility levels between two districts of Mulanje and Phalombe. The results indicate that Mulanje district has got fertile soils as compared to Phalombe as indicated by 12 percent of very fertile soils in Mulanje but Non reported to have very fertile soil on their plot in Phalombe district. Based on gender, the results indicate that 46 percent of female headed households reported to have good soils and 18 percent had very fertile soils on their plots.

On the other hand, 55 percent of male headed household perceived to have plots with good soils and 10 percent had very fertile soils which is lower as compared to their female counterparts. However, it can also be observed from Table 4.3 that good soils contributed 52 percent in Mulanje while in Phalombe 61 percent reported to have good soils. The study went further to investigate on the household prospective of land availability for farming. Table 4.5 below has the details.

Table 4.5: Household perspective of land availability for farming.

Any more land for farming	Mulanje		Phalombe	
	Sex of household head		Sex of household head	
	Male	Female	Male	Female
Yes	11 (17.2)	4 (10.5)	3 (12.5)	2 (11.8)
No	53 (82.8)	34 (89.5)	21 (87.5)	15 (88.2)
Total	**64 (100.0)**	**38(100.0)**	**24 (100.0)**	**17(100.0)**

The results indicate that prospective of future availability of land for farming is very low in all the districts as indicated by higher percentages of those reported not to have future land for farming across gender and geographical location. However, the problem vary across the districts whereby Mulanje is better than Phalombe. The variation was also observed across gender whereby in Mulanje more male headed households were able to have future land for cultivation represented by 17 percent as compared to their female counterparts who reported 11 percent.

However, minimal variations were reported in the case of Phalombe, where 13 percent and 12 percent of land availability responses were, respectively, reported by male and female headed households, respectively. Generally, the prospective of availability of land for future farming show very low, as evidenced by the fact that only 5 percent of the households in Mulanje district reported to have uncultivated land for future farming, while for Phalombe, it was 4 percent who reported to have uncultivated land for future farming. See Table 4.6 below for details.

Table 4.6: Availability of uncultivated land by gender and district.

District	Uncultivated land	Sex of household head?		Total
		Male	Female	
Mulanje	Yes	3 (5.0)	0 (0.0)	3 (3.1)
	No	57 (95.0)	37 (100.0)	94 96.9)
	Total	**60 (100.0)**	**37 (100.0)**	**97 (100.0)**
Phalombe	Yes	3 (3.6)	0 (0.0)	3 (2.2)
	No	80 (96.4)	54 (100.0)	134 (97.8)
	Total	**83 (100.0)**	**54 (100.0)**	**137 (100.0)**

Analysis results also indicate low percentage of 3 percent of households who had some uncultivated land in Mulanje and 97 percent had no uncultivated land. On the other hand, 2 percent reported to have a piece of uncultivated land and 98 percent had no uncultivated land. Clear disparity was also observed across gender whereby no female headed household in all districts reported to have some uncultivated land as compared to their male counterparts who reported 5 percent for Mulanje and 4 percent for Phalombe districts. Following the analysis of the household land availability, the study also enquired on the land marketing transactions by looking at possibilities of land expansion, rent in, rent out and sold.

4.1.4 Household Land Market Transactions

The results of the analysis indicate that 1 percent of the households expanded their land, 2 percent bought in some land, 12 percent rented in some land but no household reported to rent out and sell some land (Table 7).

Table 4.7: Land Market Transactions.

Response	Expansion	Bought in	Rented in	Rented out	Sold
Yes	1(0.8)	2 (1.5)	16 (11.9)	0(0.0)	0 (0.0)
No	130 (99.2)	135 (98.5)	119 (88.1)	132 (100.0	133 (100.0)
Total	131 (100.0)	137 (100.0)	135 (100.0)	132 (100.0)	133 (100.0)

Table 4.7 results show that the land market system is not well developed and at the same time this reveals the level of demand and availability of land in these two districts. However, further analysis show certain level of discrepancy of land problems based on geographical location. Details are in Table 4.8 below.

Table 4.8: Land Market Transactions by District

Mulanje						Phalombe					
Expanded %		Bought in %		Rented in %		Expanded %		Bought in %		Rented in	
Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1.1	98.9	1.0	99.0	8.3	91.7	0.0	100.0	2.5	97.5	20.5	79.5

Study results in Table 4.8 show that no household in both districts reported to have sold or rented out the land. Other statistics reported from the study were 1 percent of households in Mulanje reported to have expanded their land, and 99 percent said no to the question. 1 percent of households bought in some land and 8 percent rented in some land this simply show underdevelopment of land market in Mulanje district While in Phalombe, no household expanded their land, 3 percent bought in and 21 percent rented in which indicate that the market is more developed as compared to those from Mulanje district.

4.2 Household Crops Production

Further to the investigation on the land access and land market systems in the area, the study also enquired on the crop production by looking at crops grown and the amount of harvest. The results of the analysis in the Table below show that maize is the main food crop that is grown in Mulanje district as shown by 45 percent of all food crops grown in the area followed by pigeon pea represented by 18 percent which is grown as a main food crop in the area. See Figure 4.1 below for details.

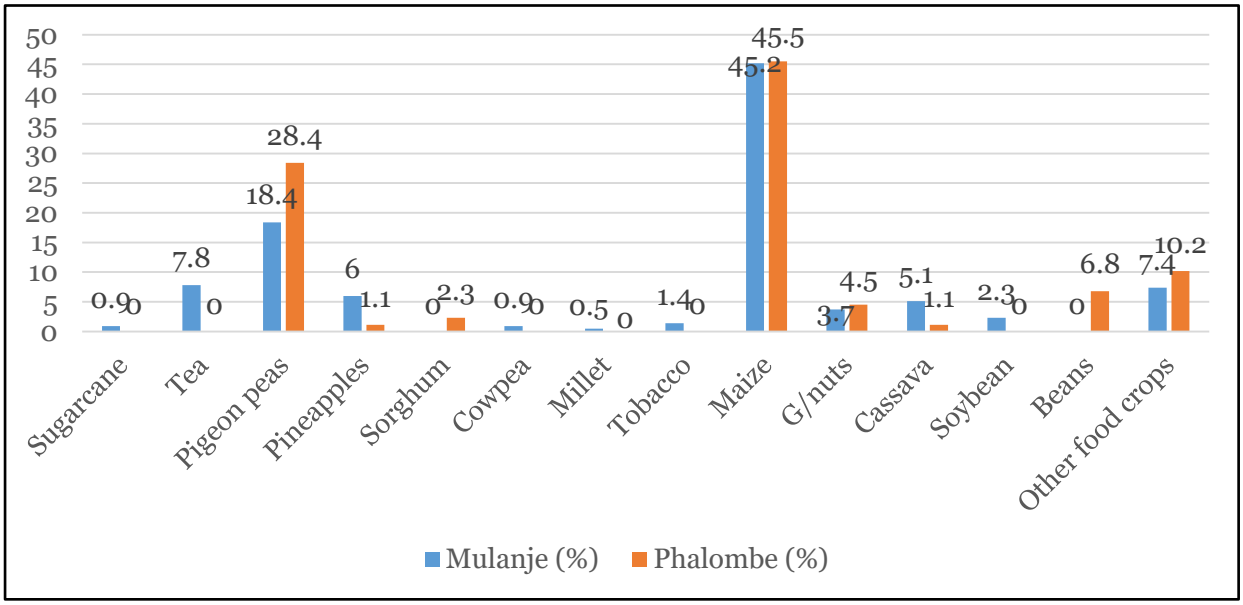


Figure 4.1: Type of main food crops grown by the households.

Other crops grown in the area as shown in the **Figure 4.1** above were; Tea (8%), tobacco (2%), Pineapples (6%), sugarcane, cowpea and millet all at 1 percent and also g/nuts (4%), cassava (5%) soybean (2%) and other crops not specified in the study however, beans and sorghum are not grown in Mulanje district. On the other hand, the most grown food crop in Phalombe district was maize which contributes 46 percent to the total percentage of food crops grown in the area. The other mostly grown food crop was pigeon pea with 28 percent responses. Other food crops in Phalombe are beans (7%), g/nuts (5%), cassava (1%).

There is not a much difference in terms of dependence on maize as main food crop in these two areas as indicated by 45 percent and 46 percent for Mulanje and Phalombe respectively though there were some differences in terms of other crops that are grown and does well in a particular locality. There are some crops that are grown in large quantities one area than the other area. For example, pigeon pea is grown much in Phalombe than Mulanje while Tea is not grown in Phalombe but not in Phalombe. The study went further by looking at the average quantity of each food crop that was grown by the households. See Table 4.9 below.

Table 4.9: Average quantity of food crops grown by the household.

Type of crop	Mulanje		Phalombe	
	Male	Female	Male	Female
Sugarcane	125.5	43.75	0	0
Tea	346.4	264.11	0	0
Pigeon peas	182.16	49.52	257.92	188.85
Pineapples	346.20	546.88	0	250
Sorghum	0	0	100	100
Cowpea	123.33	0	0	0
Millet	225	0	0	0
Tobacco	131.5	0	0	0
Maize	254.49	174.00	256.50	194.81
G/nuts	102.42	110.58	133.75	166.67
Cassava	213.61	680.00	137.5	0
Soybean	107.13	274.94	0	0
Beans	0	0	663. 89	208.06
Other food crops	316.25	84.38	193.86	226.25

The results in the Table 4.9 above indicates that in Mulanje the crop that is harvested in largest quantity is tea and followed by pineapples with an average amount of 346kgs for female headed households and 264kgs for tea; and 547kgs for female headed households. Such findings indicate that the amount of the crop harvest vary across gender groups within a district, whereby female headed households reported to be harvesting large quantities of pineapples compared to their male counterparts. In addition, male headed households reported harvesting larger quantities of tea compared to their female counterparts.

On the other hand, people in Phalombe the crop harvested in large quantities are beans with average amount of 664kgs followed by pigeon peas amounting to 258kgs and then maize with an average quantity of 256kgs for male headed households. Female headed households harvest average amount of 208kgs of beans followed by 195kgs of maize, and 189kgs of pigeon peas which is harvested in large quantities as well. The variation was observed in terms of quantities of harvests for the crops. Male headed households harvesting more quantities of each crop as compared to female headed households.

Further to enquiry on the crops harvested by the households and the amount of harvests, the baseline study also investigated on the household access to extension services on farming practices, see analysis results in Table 4.10 below for details.

Table 4.10Access to Extension Services.

Access to Extension Services	Mkanda		Mkhumba		Nkhulambe		Njema		Mabuka	
	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %	Male %	Female %
Yes	83.3	71.4	76.9	91.7	100.0	100.0	62.5	40.0	66.7	75.0
No	16.7	28.6	23.1	8.3	0.0	0.0	37.5	60.0	33.3	25.0

The results in the Table 4.10 above show that on average, male headed households in all areas have more access to extension services on farming practices as indicated by higher percentage of positve male household responses compared to their female counterparts. Disaggregating the results by TA show that most households in the target areas generally have good access to the extension services on farming practices except TA Njema where 60 percent of the femaled headed households indicated to have had no access to agricultural extension services compared to the 40 percent who responded to have had extension service access.

4.3 Household Access to Credit

Besides the enquiry on the household access to the extension services, the study further wanted to establish statistics on the household access to the credit. See Figure 4.2 below for details.

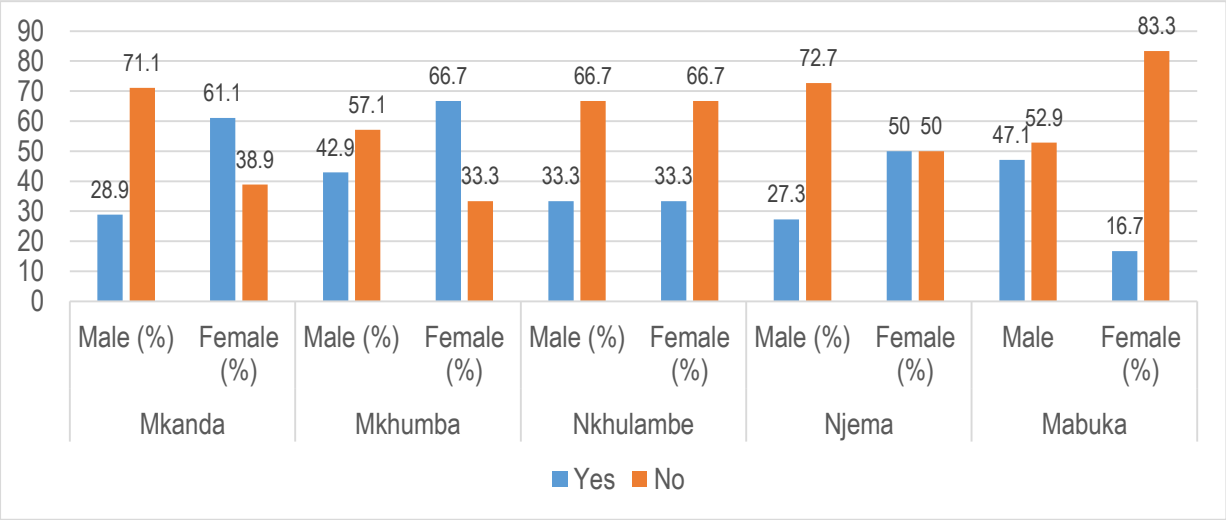


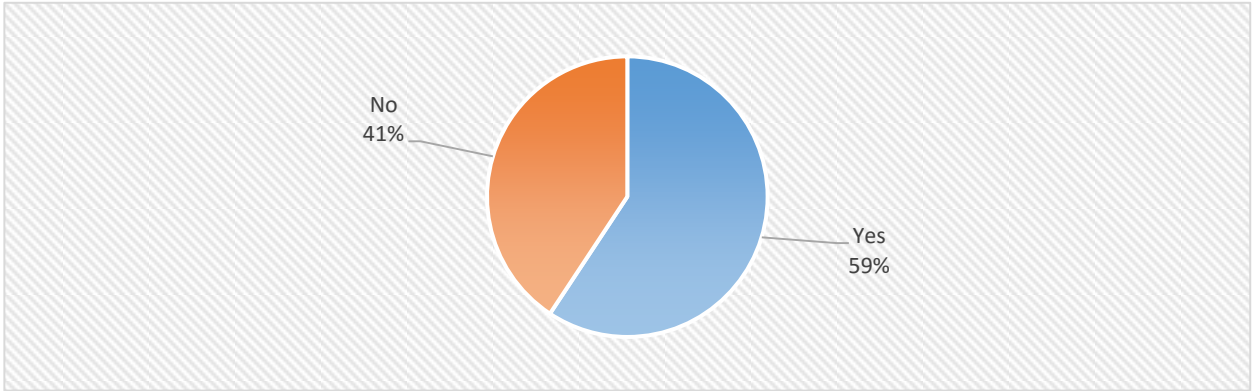
Figure 4.2: Household access to credit.

The results in the Figure 4.2 above show that more male headed households have access to credit as compared to their female counterparts as indicated by 54 percent and 46 percent for male and female headed households respectively. The results also have shown that there is low access to credit particularly in TAs Mkanda, Mabuka and Njema as indicated by 71 percent and 83 percent of responses, respectively. The variation has also been observed between male and females whereby only in TA Mabuka females have lower access to the credit as compared to their male counterparts while in all other places, male headed households have low access to the credit.

4.4 Maize Market Conditions

The socio-economic baseline study also analyzed on the maize marketing conditions by looking at: volumes of major crops sold, maize market prices, distance to the maize market, income sources for maize/food purchases and household coping mechanisms.

Respondents were asked whether they sold their crops or not and the results indicate that 59 percent of



the households sold their harvests and 41 percent never sold their crops which means that most of the household sold their crops after harvesting see **Figure 4.3** below.

Figure 4.3: Sample distribution by household crop sell.

The Figure 4.3 results indicate that 59 percent of the households sold some of their crops after harvesting and 41 percent did not sell their crops after they harvested. This means people realized something from their land to sell though the area was badly affected by climatic misfortunes. After an enquiry on whether the household sold some of their crop harvests, the baseline study also sought to establish statistics on the volumes of the major crops sold. (See Table 4.11).

4.4.1 Volumes of Major Crops Sold

The results from Table 4.11 below show that sweet potatoes were sold in largest quantities of 1240kgs as compared to other crops included in the study. The results further show that on average, households sold 176kgs of maize, 296kgs of tea, 270kgs of ground nuts, 161kgs of pineapples and 355kgs of other crops. This shows that people in the area depend mainly on sweet potato selling as a source of income followed by other crops such as maize, tea, pigeon pea, pineapples, vegetables, cassava and other crops not captured in this study.

Table 4.11: Quantity of Major Crops Sold

Type of crop		Mean (kg)	Maximum (kg)	Minimum (kg)	Standard Deviation
Maize		176.15	1000.00	1.00	283.92
Cassava		100.00	100.00	100.00	.
Tea		296.75	1495.00	20.00	366.27
Vegetables		52.75	150.00	1.00	66.76
Pineapples		161.25	500.00	20.00	196.37
Sweet potatoes		1240.00	2280.00	200.00	1470.78
Ground nuts		270.00	1000.00	50.00	408.66
Beans		31.71	50.00	1.00	20.34
Other crops		354.81	100.00	1.00	1533.94

4.4.2 Maize Market Prices

The study also enquired on the maize prices being one of the crops that was sold by the household after harvesting and the results indicate that maize was sold at an average price of MK281/kg across all areas. See Figure 4.4 below for details.

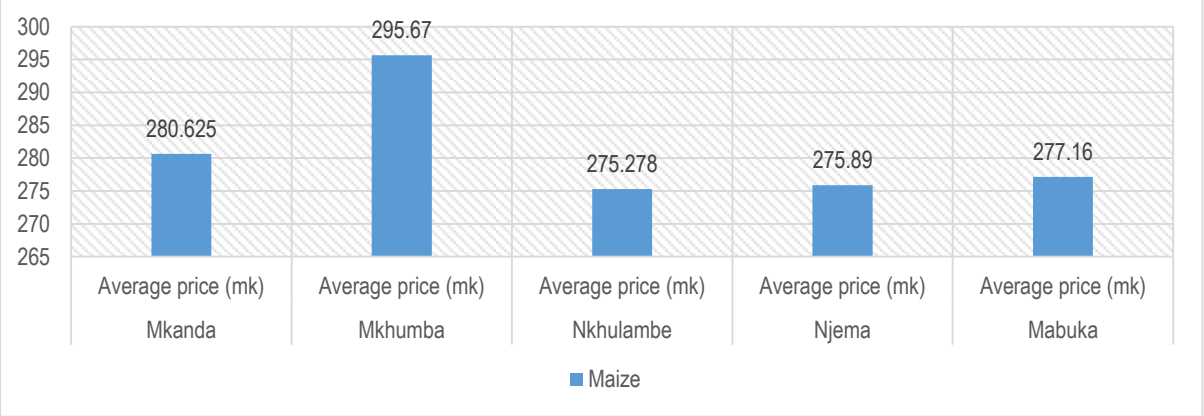


Figure 4.4: Maize average prices in different TAs

The study after establishing statistics on aggregate average prices of maize, disaggregation of the average maize prices was done based on TA whereby the results indicate that maize was very expensive in TA Mkhumba in Phalombe district with an average price of MK296 per kilogram followed by TA Mkanda in Mulanje district with an average maize price of MK281 per kilogram. It was established from the study that maize prices were cheaper in TA Nkhulambe Phalombe district with and average price of MK 275 per kilogram. Other price ranges were MK 276 and MK 277 for TAs Njema and Mabuka respectively.

4.4.3 Distance to Maize Markets

The study also sought to establish statistics on the average distance people could travel to maize market and the results have shown that the longest distance covered by people to the market was in TA Mkhumba in Phalombe district where they could cover the distance of about 4km to the maize market and in all other areas, people could travel an average of 1kg to the market. See **Table 4.12** below.

Table 4.12: Average distance to the maize market disaggregated by Traditional Authority

Crop market	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
	Average distance (km)	Average distance (km)	Average distance (km)	Average distance (km)	Average distance (km)
Maize market	1	3.6875	0.5	0.5	0

The results in the Table 4.12 above show zero distance to the maize market meaning they sold maize at the home where traders and vendors could find them at home and buy maize. It was also discovered from the study that people went out of food harvested this season some months back .

4.4.4 Sources of Income for Maize/ Food Purchases

The study probed on the food currently consumed at household where they get and it was revealed that they mostly buy which prompted enquiry on the sources of income for maize and other food purchases and the results are indicated in the **Table 4.13** below.

Table 4.13: Income Sources for Buying Food

Income source	Mulanje district			Phalombe district		
	Male	Female	Total	Male	Female	Total
Selling crops	14(30.4)	1 (3.7)	15 (20.5)	1 (9.1)	4 (36.4)	5 (22.7)
Piece works	24(52.2)	12 (44.4)	36(49.3)	10 (90.9)	4 (36.4)	14 (63.6)
Selling firewood/Charcoal	0 (0.0)	3 (11.1)	3 (4.1)	0 (0.0)	1 (9.1)	1 (4.5)
Wages	5 (10.9)	5 (18.5)	10 (13.7)	0 (0.0)	3 (27.3)	3 (13.6)
Remittances	1 (2.2)	2 (7.4)	3(4.1)	0 (0.0)	0 (0.0)	0 (0.0)
IGAs	0 (0.0)	2 (7.4)	2 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)
Other sources	4 (8.7)	3 (11.1)	7 (9.6)	0 (0.0)	0 (0.0)	0 (0.0)
Total	**46(63.0)**	**27 (37.0)**	**73(100.0)**	**11(50.0)**	**11 (50.0)**	**22(100.0)**

The results in the Table 4.13 above indicate that people from Mulanje district get 49 percent of income from the piece works, 21 percent from crop sales, 14 percent from wages and 10 percent from other sources. Other sources reported in the study are; 4 percent of income was earned selling charcoal and firewood and from remittances and 3 percent of income is earned from income generating activities (IGAs). The variation of income sources was also observed based on gender of the household head, whereby male headed households earned more income from piece works as compared to their female counterparts as indicated by 52 percent and 44 percent respectively. In addition, male households earn 30 percent of incomes from crop sales, compared to 4 percent for the female households. On the other hand, people in Phalombe district mostly earn their incomes from piece works and crop sales as shown by 63 percent and 24 percent respectively. They also earn some income from wages as represented by 14 percent. However, analysis results indicate that female households earn more income from piece works than their male counterparts in Phalombe district which is the different case in Mulanje district.

4.5 Crop Production Costs

Further to the analysis of the maize market conditions, the socio-economic baseline study also sought to establish statistics on the costs incurred by the households in agricultural production process by looking at inputs and amount spent on inputs, sources of farm inputs, distance to the input source markets and transportation modalities.

4.5.1 Inputs and Amounts Spent on Inputs.

The type of inputs used in crop production and the amount of the input was analyzed disaggregated by gender and the geographical location and the results are presented in the Table below.

Table 4.14: Type and Type of Input used in Maize Production

Type of crop and the input used in production	District			
	Mulanje		Phalombe	
	Male	Female	Male	Female
	Mean (kg)	Mean (Kg)	Mean (Kg)	Mean (Kg)
Maize Seeds	5.73	6.96	8.52	7.29
Maize fertilizer	66.30	64.06	79.50	74.31
Tea seed	2235.00	1166.67	.	.
Tea Fertilizer	81.22	425.00	.	.
Pineapple suckers	1120.00	10.00	.	.
Pineapple fertilizer	48.75	.	.	.
Beans seed	.	.	6.00	15.00
Pigeon pea seed	4.43	2.86	3.00	3.13
Pigeon pea fertilizer	10.00	18.00	37.50	75.50
G/nuts seeds	.	2.00	3.00	2.67
Cassava cuttings	52.00	.	180.00	.
Cassava hired labour	6.00	.	18.00	.

The results in Table 4.14 above indicates that seed and fertilizer were the widely used inputs in agricultural production for different crops grown by the households followed by hired labour which was also used in the production process and also in some crops they used cuttings and the suckers. There was no much difference in terms of input usage across the district and even based on gender perspective, there was no such notable difference.

4.5.2 Sources of Farm Inputs

The study further enquired on the sources of the inputs used in crop production. The results indicate that male headed households from Mulanje got seed mainly from local traders as indicated by 39 percent followed 32 percent who got seeds from ADMARC while female households mainly got seeds from ADMARC as indicated by 40 percent followed by those who got seeds from local traders represented by 37 percent. Other sources of seeds reported were; Own seeds, private traders, supermarkets, farm input dealers and others sources. See the **Table 4.15** below for details.

Table 4.15: Farm Inputs and their Sources

Crop type	Input source	District			
		Mulanje		Phalombe	
		Male (%	Female (%)	Male (%)	Female (%)
Maize seeds	Own Seed	7.3	0.0	0.0	0.0
	ADMARC	31.7	40.0	35.0	35.7
	Private traders	7.3	11.4	10.0	7.1
	Supermarkets	0.0	2.9	0.0	0.0
	Farm inputs dealers	14.6	5.7	30.0	14.3
	Local market	39.0	37.1	20.0	28.6
	Other input sources	0.0	2.9	5.0	14.3
Maize Fertilizer	Own Seed	2.4	0.0	0.0	0.0
	ADMARC	50.0	62.1	45.0	62.5
	Private traders	7.1	0.0	10.0	0.0
	Supermarkets	2.4	0.0	0.0	0.0
	Farm inputs dealers	16.7	6.9	30.0	18.8
	Local market	21.4	31.0	15.0	18.8
Tea seed	Own Seed	50.0	33.3	0.0	0.0
	Private traders	25.0	0.0	0.0	0.0
	Local market	0.0	66.7	0.0	0.0
	Other input sources	25.0	0.0	0.0	0.0
Tea fertilizer	Private traders	12.5	0.0	0.0	0.0
	Farm inputs dealers	25.0	0.0	0.0	0.0
	Local market	12.5	33.3	0.0	0.0
	Other input sources	50.0	0.0	0.0	0.0
Pineapple suckers?	Own suckers	33.3	100.0	0.0	0.0
	Private traders	33.3	0.0	0.0	0.0
	Local market	33.3	0.0	0.0	0.0
	Private traders	25.0	0.0	0.0	0.0
	Local market	75.0	100.0	0.0	0.0
Beans seeds	Farm inputs dealers	0.0	0.0	0.0	25.0
	Local market	0.0	0.0	100.0	75.0
Pigeon peas seeds	Own Seed	14.3	0.0	0.0	12.5
	ADMARC	14.3	0.0	20.0	12.5
	Private traders	14.3	20.0	20.0	12.5
Pigeon peas fertilizer	ADMARC	0.0	20.0	100.0	60.0
	Farm inputs dealers	0.0	0.0	0.0	20.0
	Local market	100.0	60.0	0.0	20.0
G/nuts seeds	Private traders	0.0	100.0	0.0	0.0
	Local market	0.0	0.0	100.0	100.0
Cassava cuttings	Private traders	50.0	0.0	100.0	0.0
	Local market	50.0	0.0	0.0	0.0

The results in Table 4.15 indicate that fertilizers are mainly accessed from ADMARC across all areas and across gender, followed by local market and others still got fertilizer from private traders. Analyses of the distance to the market source show that people in Phalome travel long distances to access maize seeds and fertilizer as far as 36km and 29km for female households to access maize seeds and maize fertilizer and 16km and 29 km for male households to access maize seeds and maize fertilizer. On the other hand, Mulanje households travel as far as 4km to access seeds and fertilizer for male headed households and 2km and 3km fo female households to access maize seeds and maize fertilizer.

4.5.3 Distance to Input Source Markets

Distance to the inputs sources was one of the issues investigated during the study. This was so because distance to input source represents the transaction costs that a farming households faces in its production endeavors, and hence it has bearing on the type and amount of farm inputs used in the agricultural production processes. Analysis details are in Table 4.16 below.

Table 4.16: Average distance to the Input Market Sources

Distance to the input sources market	Mulanje		Phalombe	
	Male	Female	Male	Female
Distance to maize seed source	4.25	2.31	15.86	35.51
Distance to maize Fertilizer source	3.88	2.72	28.58	29.26
Distance to tea seed source	8.60	2.50	.	.
Distance to tea fertilizer source	5.74	.50	.	.
Distance to pineapple suckers source	1.33	.	.	.
Distance to pineapple fertilizer source	2.13	3.00	.	.
Distance to beans seed source	.	.	7.00	4.30
Distance to beans hired labour	.	9.00	.	.
Distance to Pigeon peas seeds	1.71	.62	33.60	52.27
Distance to Pigeon peas fertilizer	1.00	1.63	27.00	3.28
Distance G/nuts seeds	.	1.00	.01	202.50
Distance to Cassava cuttings	.75	.	1.00	.
Cassava hired labour	.	.	1.00	.

(*the empty spaces refer to non-responses)*

Table 4.16 results show variations in the distances covered by district. Apparently in Phalombe district, most farming households to travel longer distances (of about 36 km) to access productive resources such as maize seed than their counterparts in Mulanje district (who usually cover at most 5 km). This shows that the farm input markets in Phalombe are less developed compared to Mulanje district.

4.5.4 Mode of Transport for Inputs Purchases.

Further to the analysis of the distance to the agriculturall inputs market for different crops, the study also enquired on transport modalities used by the households in different geographical locations, see Table 4.17 below.

Table 4.17: Mode of Transport used by the households to transport agricultural inputs.

Type of input	Transport mode	Mulanje		Phalombe	
		Male (%)	Female (%)	Male (%)	Female (%)
Maize seeds	On head	51.4	81.3	23.5	50.0
	Bicycle	37.8	18.8	70.6	50.0
	Hired vehicle	5.4	0.0	0.0	0.0
	Other transport mode	5.4	0.0	0.0	0.0
Maize fertilizer	On head	42.1	67.9	0.0	46.7
	Bicycle	50.0	32.1	100.0	40.0
	Hired vehicle	5.3	0.0	0.0	6.7
	Other transport mode	2.6	0.0	0.0	0.0
Tea seeds	On head	40.0	25.0	50.0	0.0
	Bicycle	40.0	75.0	50.0	100.0
Tea fertilizer	On head	30.0	100.0	50.0	50.0
	Bicycle	30.0	0.0	50.0	0.0
	Hired vehicle	10.0	0.0	0.0	0.0
	Other transport mode	10.0	0.0	0.0	0.0
Pineapples suckers	On head	66.7	0.0	100.0	100.0
	Bicycle	33.3	0.0	0.0	0.0
Pineapple fertilizer	On head	66.7	100.0	100.0	0.0
	Bicycle	33.3	0.0	0.0	0.0
Bean seeds	On head	0.0	0.0	0.0	75.0
	Bicycle	0.0	0.0	100.0	25.0
pigeon pea seeds	On head	85.7	85.7	71.4	66.7
	Bicycle	0.0	0.0	28.6	33.3
	Other transport mode	14.3	14.3	0.0	0.0
pigeon pea fertilizer	On head	0.0	50.0	100.0	50.0
	Bicycle	0.0	0.0	0.0	50.0
	Other transport mode	100.0	0.0	0.0	0.0
G/nuts seeds	On head	0.0	0.0	100.0	100.0
	Bicycle	0.0	100.0	0.0	0.0

The results in Table 4.17 indicate that the commonly used mode of transporting seeds is on head while using on head for fertilizer transportation especially female headed households with male headed households mostly using bicycle to transport fertilizer from the market. Other transport modalities though not commonly used were hired vehicle and other transport modes not specified in the study.

4.6 Crop Profitability.

Socio-economic baseline study, further to the analysis of the production costs by looking at the inputs used in the production, source markets and the transport modalities, the study further sought to establish statistics on the crop profitability by looking at the cost of agricultural marketing and gross margins for the crop produced and sold.

4.6.1 Cost of Agricultural Marketing

The baseline study analyzed the cost of crop marketing specifically by looking at the cost of transportation to the market. The results of the analysis are indicated in the Table below.

Table 4.18: Cost of marketing produced crops (MK).

Crop type	Mean	Maximum	Minimum	Standard Deviation
Maize	626.5	877.5	375.75	354.61
Tea	250	250	250	0
Vegetables	2007.38	4012.5	2.25	2835.67
Other crops	879.17	1500	12.5	773.62

The results in the **Table 4.18** confirm the existence of marketing transactions in terms of transport costs which household incur when selling their farm produce. For instance, for those households that sell maize, they reported to spend an average of MK627 as transport costs to market centres. An average of MK250 is spent on transporting tea, MK2007 is spent on transporting vegetables and MK879 is spent when transporting other crops to the market. These findings imply that vegetables have the highest marketing transaction costs compared to any other crop in the two districts. The study did not, however, establish the extent to which these reported transaction costs do impact on the retail markets prevailing in the destination market centres, as that was outside the scope of the study.

Further to marketing transaction costs, the study collected data on household incomes realized from various crop marketing activities. According to analysis results in Table 4.19 below, households got average of MK11,000 from maize sales, MK38,000 from selling tea, MK23,000 from selling pineapples, MK22,000 from selling beans and MK19,560 from selling other crops. This means that tea is highest income earning crop in the project target area. See **Table 4.19** below for details.

Table 4.19Incomes from Crop Sales

Name of crop	Mean Income (MK)	Minimum Income (MK	Maximum income (MK)	Standard Error of Mean (MK)
Maize	11092.93	100.00	40000.00	4773.0425
Cassava	3537.50	5037.50	5037.50	0
Tea	38139.64	6912.50	160575.00	13919.38
Vegetables	3130.50	437.50	7262.50	1525.88
Pineapples	23410.42	5412.50	54325.00	9459.595
Sweet potatoes	20625.00	15000.00	26250.00	5625
Ground nuts	12687.5	8875.00	16750	2580.8675
Beans	22240.475	12500.00	40500	6016.0925
Other crops	19559.3075	1937.50	146825	6281.2225

4.6.2 Gross Margins for the Main Crops Produced and Sold

Further to the analysis of the costs incurred by the households in marketing their produce and the total revenue realized from the crop sales, the study also derived statistics of the average gross incomes the households realize from the crop sales see Figure 4.5 below.

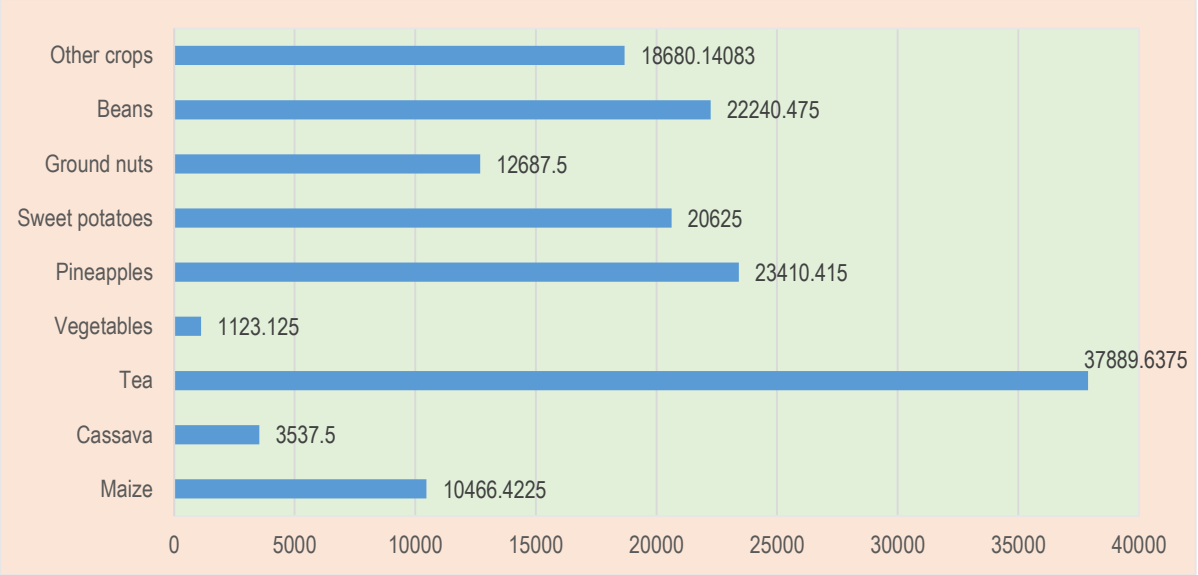


Figure 4.5: Gross Margins from Different Crops.

Gross margin analysis has shown that households on average realize maximum amount of MK38,000 from selling tea, followed by MK23,400 obtained from selling pineapples and MK22,200 is realized from selling maize. Other gross incomes were MK20, 600 realized from selling sweet potatoes, MK18, 680 obtained from selling other crops, MK12, 700 realized from selling ground nuts, MK3, 500 obtained from selling cassava and MK1, 120 obtained from selling vegetables. This means the most reliable source of income was selling tea which is mostly grown in Mulanje. On the other hand, the most reliable income source in Phalombe is selling pigeon peas and maize. The baseline study furthermore investigated on the household nutrition and food security.

4.7 Household Food Security and Nutrition

The study sought to established statistics on household food security, nutrition and consumption patterns by looking at household food consumption and food consumption patterns.

4.7.1 Household Food Consumption

The study investigated on household food consumption to determine household food security and nutrition. The results of the analysis have shown that the staple food frequently consumed by male headed households in TA Mkanda was rice which was consumed 14 times a week seconded by nsima which was eaten at a frequency of 13 times a week and lastly was sweet potato which was consumed at an average frequency of 12 times a week.

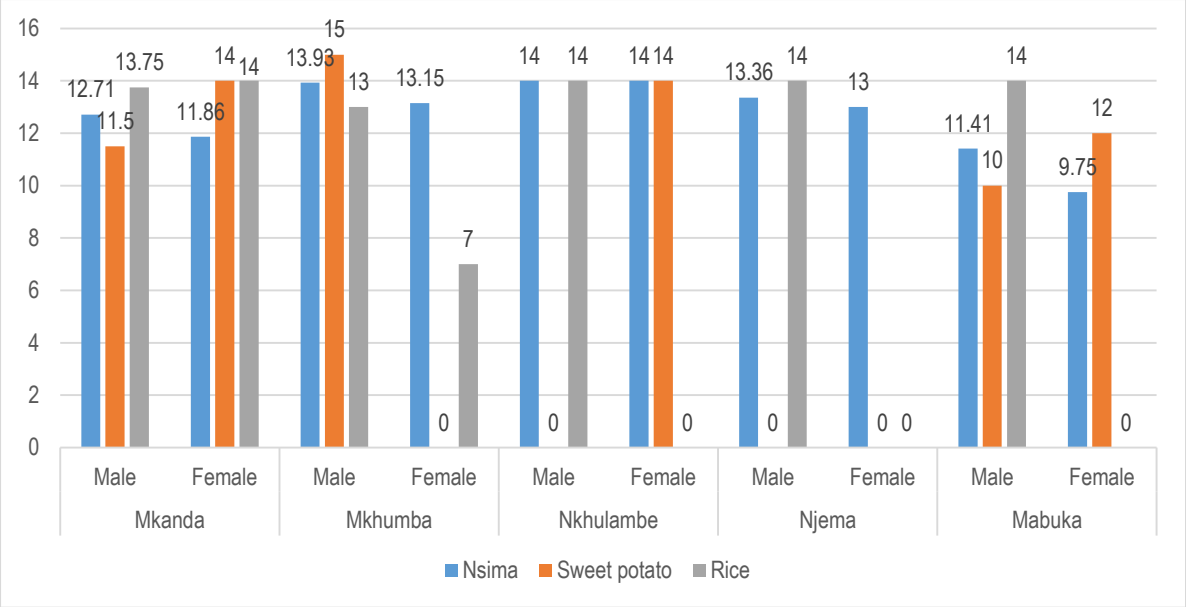


Figure 4.6: Main Staple Foods Consumed by Households.

Analysis results in Figure 4.6 also show that rice is also a dominant staple food consumed 14 times a week. However, sweet potato was eaten frequently in female headed households as compared to their male counterparts in the same area. In TA Mkhumba, sweet potato was the staple food for male headed households consumed 15 times a week followed by nsima which was consumed 14 times a week and rice was eaten 13 times a week, on the other hand, nsima was the only staple food for female headed households consumed 13 times a week and the other only food that could be consumed as staple food was rice which was consumed 7 times a week.

Interestingly, the study revealed that the only staple food for female headed households in TA Njema was nsima. In summary, the most dominant staple food in all areas was rice followed by nsima not forgetting sweetpotatoes though in selected areas and consumed in low frequency.

4.7.2 Food Consumption Patterns.

The study also sought to investigate on household food consumption patterns by looking at; number of meals taken by the under-five children in the household and number of meals taken by adults in the household. The results are presented below.

4.7.2.1 Meal Frequency by Under Five Children

Inquiries into household food consumption practices involved investigations into frequency of meals taken by under-five children in the homes, to gauge household food security and nutrition practices. Responses on the question are summarized in Table 4.20 disaggregated by gender and district.

Table 4.20: Frequency of children meals per day.

Under five eating frequency	Mkanda		Mkhumba		Nkhulambe		Njema		Mabuka	
	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)	Male (%)	Female (%)
One	15.8	25.0	9.1	42.9	0.0	50.0	45.5	0.0	20.0	54.5
Two	63.2	16.7	54.5	57.1	62.5	50.0	45.5	100.0	60.0	27.3
Three	21.1	58.3	36.4	0.0	37.5	0.0	9.1	0.0	20.0	9.1
Four	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Five	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1

The results in the Table 4.20 show that in most TAs, underfive children take 2 meals per day though there are variations within TAs and also be Sex of hosehold head. For instance, amongst male headed households in TA Mkanda, the under-five children take 2 meals/day evidenced 63 percent responses, while amongst female headed households, in the same TA, the highest meal frequency for the under-five children was 3 meals/day. In TA Mkhumba, mostly under-five children take 2 meals/day in both male and female headed households as indicated by 55 percent and 57 percent responses, respectively. In TA Mabuka and Njema the under-five children mostly take single meal per day with few houses where they can take two to three meals/day while in TAs of Mkanda, Mkhumba and Nkhulambe, the under-five children take up to three meals/day. The variations in the underfive meal frequency across the TAs and gender of households reflect the prevailing food security conditions.

Further to the under five meal frequency, the study inquired on the adult meal frequency conditions in the target areas. Analysis results are in Figure 4.7 below, and show that in most TAs, adults take two meals per day. However, there are variations in that a significant proportion of female headed households in TA Mkanda reported having 3 meals per day in contrast to their counterparts in TA Mabuka where a large proportion (45%) of fermale headed households (55%) reported having only one meal perday. Details of the analysis results are in Figure 4.7 below.

4.7.2.2 Adults meals per day

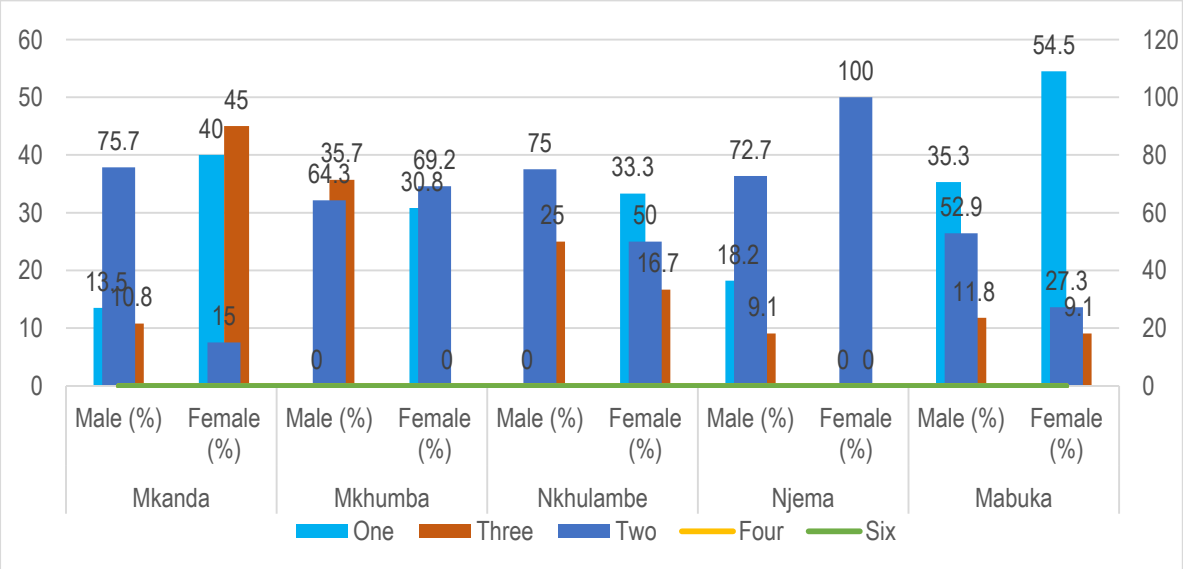


Figure 4.7: Adults meals per day

Figure 4.7 further shows that in TA Mkhumba, most adults in the female headed households take two meals per day two as indicated by 69 percent and the other 31 percent reported to take one meal per day. It can also also been observed from Figure 4.7 above that adults from all female households in TA Njema take two meals a day and on the other hand, 18 percent and 9 percent of male headed households, respectively, take one and three meals per day. Lastly, adults in TA Mabuka are apparently having food secuity challenges as evidenced by the reported statistics of 55 percent and 35 percent responses of single meal in a day for female and male headed households respectively. Across all gender perspectives, single meal per day is dominated by female heeaded households as compared to their male counterparts.

4.8 Household Food Insecurity Coping Strategies

The study also sought to establish the households coping strategies when they run out of the food, and the analysis results are reported in Figure 4.8 below.

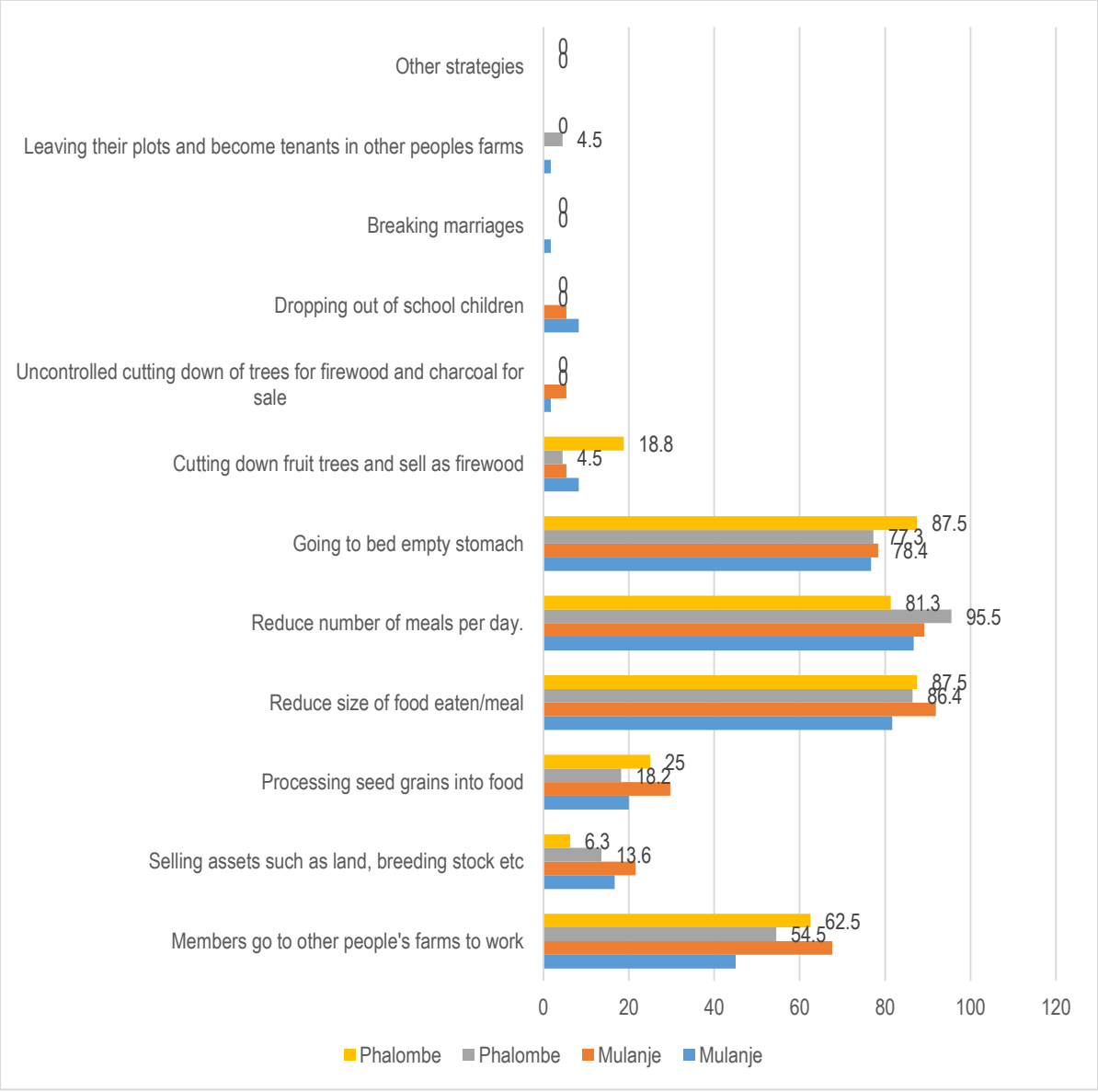


Figure 4.8: Household coping strategies when run out of food.

The results in the Figure 4.8 above show that the major coping strategies, with over 75 percent of the responses for both gender groups, in all the 5 TAs include: reducing frequency of meals per day, reducing size of food eaten, and going to bed on empty stomach, and undertaking piece works at other peoples farms. Interestingly, few responses were provided relating to exploitation of environment and natural resources as a coping strategy. In particular, less than 20 percent of responses indicated cutting dowm trees and selling firewood and selling land assets.

4.9 Summary of the Chapter

In summary, the socio-economic baseline study has revealed that most of the land used by households for farming is low in fertility and is mostly accessed through inheritance from wife's parents. Very few households had bought or rented land. The land inheretance patterns imply continued land segmentation in the two districts, and that land markets are not well developed. In terms of distance to farm land, the resuls show that most households are close to their gardens as evidenced by the fact that in Phalombe households cover about 2km to their farms, while in Mulanje its about 1 km. The crop that are mostly grown in the area is maize in both Mulanje and Phalombe. Pigeaon peas is the second most important crop of the two districts. The study also established that most farmers have access to the extension services in all areas except TA Njema where most households reported to have access to agrciultural extension services.

Access to the credit is a problem in many places, and being more acute for males compared to their female counterparts. The study also established that 59 percent reported to have sold their harvested crops, and maize was not exceptional in terms of being sold on the market. Enquiry on the household source of income to buy food when run out has shown that they mostly get the money from *ganyu* work followed by income from crop sales.

The study results also show that most inputs used in crop production are seeds and fertilizer bought from ADMARC and private traders as well as local people, and these are mostly transported by using hired bicycles and on head. Most crop sales income is from tea with an average ranging fromMK38,000 t MK160,000. In terms of household food consumption, the results show that Nsima is the most eaten food followed by sweet potatoes though the consumption rate vary by geographical location. Nsima is mostly eaten one to two times a day with few households who take food three times a day.

With respect to household coping strategies when they run out of the food, the findings show that people mostly reduce the amount of food size consumed per day and also reduce number of meals consumed per day. There also some households that go to bed empty stomarch and still others go to other people's farms to do casual labour (*ganyu*) .

5.0 FOREST RESOURCE UTILIZATION

Further to agricultural production marketing and consumption, the study inquired on forest resource utilization. Specifically, inquiries were made on woodlot ownership, household use of forest resources, wood products marketing and non-wood forest products marketing. Details of the analyses made on each of these variables are below:

5.1 Woodlot Ownership

Inquiries were made to find out who in the target areas own their own woodlot. Household heads were requested to state whether they own a woodlot or not. Analysis on woodlot ownership was done based on gender of the respondents as well as their geographical location. Table 5.1 below presents detailed results of the analysis on woodlot ownership:

Table 5.1: Household Woodlot ownership

Woodlot Ownership	Traditional Authority	Sex of household head		Total	Percent Response
		Male	Female		
Yes	Mkanda	11	4	15	22%
	Nkhulambe	4	4	8	
	Mabuka	5	3	8	
	Sub total	**20**	**11**	**31**	
No	Mkanda	26	17	43	78%
	Mkhumba	13	12	25	
	Nkhulambe	5	2	7	
	Njema	8	5	13	
	Mabuka	12	9	21	
	Sub total	**64**	**45**	**109**	
	Total	**84**	**56**	**140**	**100%**

According to Table 5.1, out of 140 respondents, 109 household heads in the area which accounts for (78%) of the total responses do not own there own woodlot as opposed to few household heads 31 (22% of the total responses) that own there own woodlot. The above analysis simply means that a large number of the natives of the study target area rely on natural forest for wood and wood products.

Table 5.1 further reveals that out of the 31 household heads that reported to have their own woodlots, 20 of them are males and 11 of them are females. This means there is male dominance in owning woodlots and deductively land in general. This could be a result of some mythical cultural values that encourage women to be submissive in everything to men in a society.

Detailed analysis of the results of the study was also done at Traditional Authority level and from Table 5.1 above, it is evident that out of the sampled household heads and from those respondents that

agreed to own their own woodlots in the study area, there are more households (15) in Mkanda Traditional Authority that own their own woodlots as compared to households in Nkhulambe and Mabuka TAs with 8 households each. TA Mkhumba and Njema did not register any household with own woodlot.

5.1.1 Size of the Woodlot Owned by Households

To complement on the information collected on woodlot ownership, further investigations were made to those people who agreed to have their own woodlots. Inquiries were made to find out the sizes of the woodlots they owned as individuals or household. Analysis was detailed based on Sex of household heads and geographical position. Table 5.2 below presents the study findings on woodlot ownership and size of the woodlots:

Table 5.2: Average Size of Woodlot

Traditional Authority	Sex of household head	
	Male	Female
	Mean (ha)	Mean (ha)
Mkanda	1.67	0.25
Mkhumba	.	.
Nkhulambe	.21	0.38
Njema	.	.
Mabuka	.25	0.22

According to the study findings in Table 5.2, the average sizes of woodlots owned by male household heads in Mkanda, Nkhulambe and Mabuka TAs are 2 ha, 0.2ha and 0.3ha in their respective order. The average sizes of woodlots owned by female household heads In Mkanda, Nkhulambe and Mabuka TAs are 0.3ha, 0.4ha for Nkhulambe and 0.2ha for Mabuka TA. This supplements to the findings above that in addition to having very few households that own a woodlot, the woodlots owned per house hold are not in large sizes. This further tells that there is need for households to extend their woodlot sizes if their acquisition capacity allows. Additionally, the little land sizes of the woodlots they posses now should be well and sustainably managed for future generations to benefit from them later.

5.1.2 Years of Experience with Woodlot Management

The study did a further analysis on the years of experience the households and household heads have with woodlots. The study thus sought to find out how many years have the respondents been involved with woodlots and woodlot management. To this, household heads were asked in which year was their woodlot established. The Figure 5.1 below has the details:

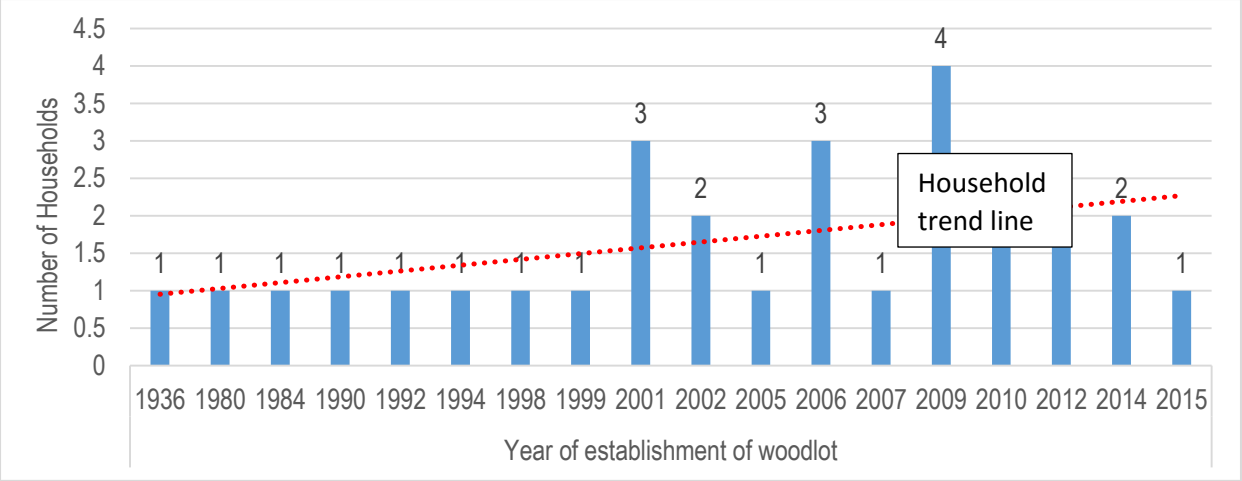


Figure 5.1: Years of experience with woodlots

From Figure 5.1, analysis results indicate that the trend of household experience with woodlots has been slightly increasing at a decreasing rate as indicated by the household trendline in Figure 5.1 above with the lowest counts of households that owned woodlots between the years 1936-1999. This could be due to either decline interest in woodlot ownership or limited access to production inputs including land (due to population growith and increasing food crop production demand) and access to seedling for establishing woodlots. In any case, this means that during the period of analysis, there has been increased deforestation of natural forests to meet fuel wood energy for domestic uses. The analysis results further indicate that in the last decade or so (2001-2014/15), there has been a slight increase in the number of housholds that own woodlots. This simply means the people in the study areas increased their knowledge and experience with woodlots. The increase in the numbers of households that own their own woodlots evidently indicates the local people in in the two districts have so far developed in woodlot ownership over the past decade.

5.1.3 Number of Trees on Woodlots

Further to inquiries on household ownership of woodlots and the sizes, the study also investigated on the number of trees that were currently available in each of their woodlots. Households were asked to tell the number of trees that are in their woodlots. Analysis was done by geographical position and results of the analysis are presented below:

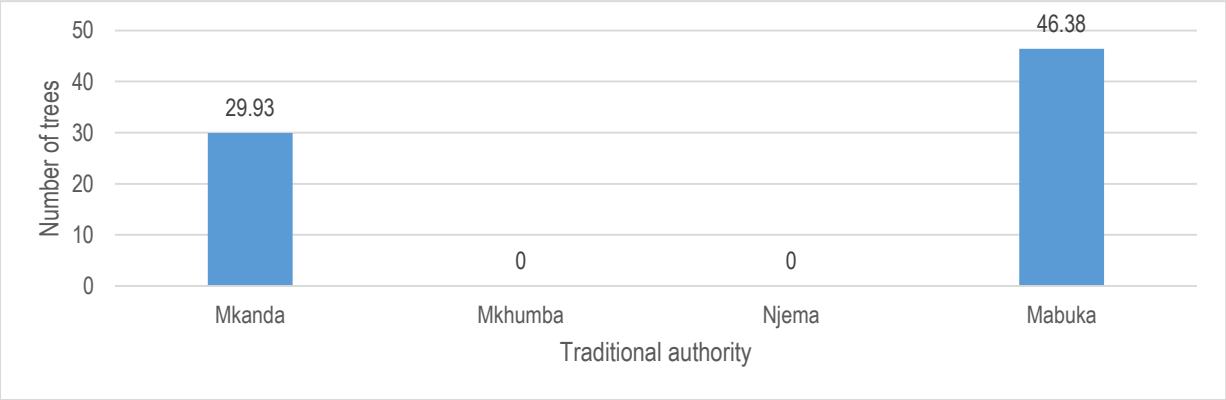


Figure 5.2: Number of Tees Currently Available in the Woodlot

According to Figure 5.2 above, results of the analysis show that the average number of trees for each woodlot of the households that own a woodlot in for Mkanda TA is 30 trees and for Mabuka TA is 46 trees. This means the supply of wood and wood products currently does not meet the demand that is actually on the ground. This further means there is need for awareness of the importance of planting more trees both to meet the current demand and for sustainable environmental management in all the TA of the study area.

5.1.4 Woodlot Seed Sources

In addition to the analysis made on the current availability of trees in the woodlots owned by households in the study area, the study also analysed seed sources for the trees planted in the woodlots. The woodlot owners were requested to state the sources from which they find seeds and seedlings for their woodlots. Analysis on seed sources was then made based on the geographical location of the household head. The Table below details the results:

Table 5.3: Woodlot Seedling sources

Seed sources	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka	Total
Forest department	7	0	3	0	1	**11**
Private suppliers	1	0	0	0	0	**1**
Own Collection	5	0	3	0	5	**13**
Friends	0	0	1	0	1	**2**
NGOs	1	0	0	0	0	**1**
Other sources	1	0	1	0	1	**3**
Total	**15**	**0**	**8**	**0**	**8**	**31**

From Figure 5.3 above, the study analysis show that out of the 31 households that agreed to own their own woodlots, 13 of them had their own collection of seeds when they were planting in the woodlots, 11 of them opted to collect their seeds from the forest department of their area while very small numbers of households got their seeds from private suppliers, from friends and some from non governmental organisations respectively. Only 3 households had other sources from which they got the seeds for the woodlots.

A number of implications that can be drawn from these analysis results: firstly the results that 13 of 31 of the respondents rely on own collection of seeds for the woodlots. This is mainly due to lack of established nurseries where households could purchase the seed. Secondly, based only on the number of respondents that own woodlots, there is a significant response to forest extension service as a good number of households obtain their seed and seedlings from the forest department. Nevertheless, need is there to encourage many people in the area to establish tree nurseries with the seeds from the forest department or MMCT.

The findings further imply that NGOs and private suppliers have not done enough in the area to supply seeds to the households that own woodlots. The study then encourages that there is need for such entities to put much effort in encouraging planting of treated seeds and seedlings in their woodlots. From the results on Table 5.3 above, most household heads (7) from Mkanda TA source their seeds for the woodlots from Forest department followed by 3 households out of the sampled households in Nkhulambe TA. Complimenting on the analysis results presentented just above that; 13 households rely on their own source of seeds, out of these 13 households, 5 are from Mkanda TA and 5 from Mabuka TA and the last 3 are from Nkhulambe TA. As aready presented in Table 5.1 above, Mkhumba and Njema TAs did not register ownership of woodlot and so can not have any source from which they obtain seeds for their woodlots.

5.2 Household Use of Forest Resources

Further to investigations that were made on household ownership of woodlots, the experience they have with woodlots, sizes of the woodlots, number of trees currently in the woodlots and sources from which seeds and seedlings are obtained, the study also inquired on Household use of forest resources. Below are the details for each analysis made:

5.2.1 Forest Products used by Households

Inquiries were made on forest products used by each household. The households were asked to name the products they get and use from the forests. Details of the analysis are presented in the table as follows:

Table 5.4: Forest products use

Forest Product	Traditional Authority					
	Mkanda	**Mkhumba**	**Nkhulambe**	**Njema**	**Mabuka**	**Total**
Fuel wood	48	23	10	14	26	**121**
Timber/Poles	5	2	0	0	3	**10**
Charcoal	0	0	0	0	1	**1**
Thatch grass	24	17	7	2	12	**62**
Fruits	25	11	6	3	4	**49**
Mushroom	21	9	3	2	2	**37**
Game	1	0	0	0	0	**1**
Other	4	1	0	0	0	**5**
Multipurpose medicine	0	1	0	0	0	**1**
Total	**128**	**64 64**	**26**	**26 21**	**48 1**	**48**	**287**

From Table 5.4, analysis results indicate that out of 287 responses on forest product use, firewood emerged to be the most commonly used forest resource with a total of 121 responses. These 121 responses are a total of 48 responses from TA Mkanda, 23 from TA Mkhumba, 10 from TA Nkhulumbe, 14 from TA Njema and 26 from TA Mabuka. Thatch grass was found to be second from firewood with a total of 62 response as a summation of responses from all Traditional Authorities. These results explains that quiet a good number of households in the study area rely on the forests for products such as firewood, thatch grass, fruits and mushrooms mainly[2]. There are other benefits of products in their small quantities that households agreed to rely on from their forests. These are; timber, and game which together do not add up to a significant number of responses out of the total number of responses.

The Table above further indicates that out of the 5 TAs, TA Mkanda had a total of 128 responses as a summation of all responses from households on the forest products they use. TA Mkhumba had 64 responses, 26 responses from Nkhulambe, 21 responses from Njema and 48 responses from Mabuka. These results translates that there is high consumption of forest resources in TA Mkanda which in turn refers to high deforestation rates in Mulanje montain as TA mkanda is just at the base of the mountain. Interestingly, the results indicate that there is low dependence on the forests for charcoal in all the TAs, this can be explained by the high usage levels of firewood.

5.2.2 Distance to Source of Forest Products

The study took a further step to inquire on the distance that is travelled by the household heads to fetch for the forest products of their choice. But before the study results on distance to source of forest product, it was thought necessary to first investigate on the sources of forest products from which most of the households get. Investigations on the source of forest product have been analysed both by gender of the household head and based on district. Results of both analyses are presented in the subsequent table below:

[2] It must be noted that charcoal production was reported as the main cause of forest degradation from the FDGs and KII with the Forestry Department. However, the household survey under-reported the seriousness of charcoal production due to its sensitivity.

Table 5.5: Source of forest products

Sources of Forest Products	Sex of household head		District	
	Male	Female	Mulanje	Phalombe
Forest reserve	152	84	157	80
Forest Plantation	19	8	22	5
Communal forest	0	8	8	0
Own woodlot	3	3	3	3
Private farms or markets	3	4	5	2
Others sources	1	3	4	0

According to Table 5.5, the study indicates that there are many male household heads (152) that source their forest products from forest reserves, this was slightly different from the total of females (84) who also source their forest products from forest reserves. Female household totals were 68 less the male household totals. Now since more males are seen to be the ones sourcing from forest reserves, it means males are the ones that have contributed much to the deforestation in the study area. Still more women have a significant role they have played towards deforestation in the area. There are very few people both males and females that benefit from communal forests, own woodlots, private farms or in markets and from other sources as shown by the insignificance of there totals in Table 5.5.

Further to this, the analysis results in Table 5.5 indicate that more households in mulanje (157) rely on forest reserves as their main source of forest products. Similary in Phalombe, quiet a significant number of household heads (80) have forest reserves as their main source of forest products. Comparing the number of households that rely on other sources of forest product such as forest plantations, communal forests, own woodlots and private farms and markets, to that of forest reserves, the study concludes that there is high dependence on forest reserves by the household heads both in Mulanje and Phalombe. This further means that deforestation is highly innevitable in these districts specifically posing a threat to Mulanje mountain forest reserve.

Results of the analysis made on the distance that household heads travel to access their nearest forest product sources are presented in the table below;

Table 5.6: Distance to source of Forest Products (km)

	N	Mean (km)	Std. Deviation (km)
Distance to 1st forest product source	124	2.9528	2.68785
Distance to 2nd forest product source	84	2.5732	2.29849
Distance to 3rd forest product source	44	2.8977	2.34595
Distance to 4th forest product source	25	2.5400	1.75547

The results in Table 5.6 shows that the average distance most households cover to reach the forest product sources is 3km. This is understandable considering that the interviewed households were largely around Mulannje Mountain which is a major source of the diverse forest products for most Mulanje and Phalombe households. The closeness to Mulanje Montain explains the household propensity to engage in unstainable use of forest products, ie deforestation and exploitation of of valuable forest species.

5.2.3 Mode of Transport to Source of Forest Products

Further to investigations made on the distance travelled by household heads to find their desired forest resource, the study also sought to establish the transport modes that are used in bringing the forest resource to their homes. The analysis was done based on gender. Below are the details of the analysis;

Table 5.7: Transport mode used by households to source forest products

Mode of transport for the products	Sex of household head	
	Male	Female
On head	137	98
Bicycle	1	0
Personal vehicle	0	1

The analysis in table 5.7 above show that 137 male households and 98 female households carry the forest products from their sources on their heads. Only 1 household head indicated that he uses a bicycle and this result was the same as that of 1 female household who agreed to use a personal vehicle for transportation. These results mean many people in the area do not have other reliable sources of transportation apart from using their heads. It futher tells that the people do not own valuable assets in their homes as not many have vehicle not to mention bicycles. This shows that many households in the study are are peasants.

5.3 Wood Products Marketing

Apart from inquiring on household use of forest products the study further sought to know the involvement of household heads in the marketing of wood and wood products. In detail, the household heads were asked on issues such as; their involvement in selling of wood and wood products, the quantities of wood they have so far sold as a household, source of wood products being sold, distance to the wood products sources, their major customers of wood and wood products as well as mode of transport and cost of wood product sales. Details for each of the analyses are as below:

5.3.1 Whether a Household sells Wood Products

The study sought to establish the involvement of the household heads in selling of wood products in the study area. To achieve this, the household heads were asked whether they sell wood products or not. Analysis of the study has been done based on gender of the household head and their geographical position (TA). Below are the details of the analyses;

Table 5.8: Household Involvement in Selling of Wood Products

Household Involvement	Traditional Authority										Totals
	Mkanda		Mkhumba		Nkhulambe		Njema		Mabuka		
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
Yes	7	6	1	2	2	3	0	1	0	0	22
No	29	15	12	10	7	2	8	4	16	12	116

From Table 5.8 above, it is evident that 22 (16%) of the interviewed household heads are involved in wood selling and 116 (84%) households are not involved in wood selling in the study area. Table 5.8 further reveals that out of the household that indicated to have been involved in the sale of wood

products, most of them (12) are females. This means that women are actively involved in commercial wood and wood products sales in the target areas.

Table 5.8 results above also indicate that 13 households out of the sampled households in Mkanda TA are involved in selling of wood products. TA Mkanda is followed by TA Nkhulambe which has 5 households recorded to have been involved in wood product selling. The relatively higher number of responses on commercial activities involving forest products from TA Mkanda compared to other TAs can be explained by the fact the former is closer to Mulanje Mountain, hence the easier access.Interestingly, none of the interviewed households in TA Mabuka reported engaging in selling of wood products.

5.3.2 Quantities of Forest Products Sold by Households per week

Further to the analysis on household involvement on selling of wood product, the study sought to establish the quantities of wood products sold by households per week. For each of the products, household heads were asked to state the approximated quantity they sell per week. Details of the analysis are presented below:

Table 5.9: Quantities of wood products sold per week

Type of wood product	Average amount of quantities
Fuel wood	12.41
Timber/Poles	29.76
Charcoal	6.50
Thatch grass	14.33
Fruits	12.32
Mushroom	7.58
Game	8.00
Other	10.71
Multipurpose medicine (Fresh or Dry)	1.00

According to Table 5.9, analysis results indicate that at a household level, the following average quantities of wood products are sold on a weekly basis; 12 kg of fuel wood, about 30 kg of timber/poles, 6.5 kg of charcoal, about 14 kg of thatch grass, 12 kg of fruits, 8 kg of mushrooms, 1 kg of multipurpose medicine and a combination of many other products that approximately accounts to 11 kg. These results tell that one huge reliance on the forests for the natives of the study area is for timber/poles. This is evidenced by the huge average quantities of the timber or poles sold per week. The study results further reveal that households in the target area also depend on the forest for products such as thatch grass (harvested on average 14kg), and fruits for business. There are few other products that household's source from the forests that are in very small approximated quantities to be considered significant.

5.3.3 Sources of Wood Products being Sold

Further to the information gathered on quantities of wood products sold by households per week, the assessment also sought to establish the sources of these wood products that households sell. Household heads were asked to choose from which source they collect their wood products. Table 5.10 has the details for the analysis results.

Table 5.10: Sources of Wood Products being Sold

Supply source	Traditional Authority				
	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
	Column (%)	Column (%)	Column (%)	Column (%)	Column (%)
Forest reserve	100.0	100.0	80.0	0.0	0.0
Plantation forest	0.0	0.0	0.0	100.0	0.0
Customary forest	0.0	0.0	0.0	0.0	0.0
Own woodlot	0.0	0.0	20.0	0.0	0.0
Bought from private farms	0.0	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	0.0	0.0

According to the study findings in Table 5.12, it is evident that all people in TA Mkanda and TA Mkhumba rely on forest reserves for the wood products they prefer. This is evidenced by the 100 percent of the responses indicating forest reserves as sources of marketed wood products in TAs Mkanda and TA Mkhumba. 80 percent of the responses for TA Nkhulambe indicates that they too, rely on forest reserves for wood products while a small number of the responses (20) indicated having relied on their own woodlots for wood products. These analyses underscure the fact that there is over dependence on forest reserves for the desired wood products particularly in the three TAs of Mkanda, Mkhumba and Nkhulambe. As such, deforestation of forest reserves will continue if no sustainable measures are taken to provide sustainable alternative wood product sources to the households in the said 3 TAs.

5.3.4 Distance to Wood Products Supply Source

Data was also collected to know the distance travelled by the household heads in trying to source the wood products. Determining these distances help understand the commitment given by the household heads into the business involving wood products. On the other hand, understanding of the distance travelled to supply source helps to explain the observed prevailing market prices in the destination markets where these household do their sell their wood products. Table 5.11 below has the details;

Table 5.11: Distance to wood products supply source

Distance to supply source	Traditional Authority				
	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
	Mean (km)	Mean (km)	Mean (km)	Mean (km)	Mean (km)
Average distance to 1st major supply source	3.39	1.73	4.50	4.00	.
Average distance to 2nd major supply source	.	.10	.	.	.

Table 5.11 shows that households in TA Nkhulambe and TA Njema were covering the longest distances to their wood products sources. The analysis show that households in TA Nkhulambe cover on average a distance of 5km, while in Njema TA household heads cover on average a distance of 4km to their major wood products supply source. On the other hand, for households from TA Mkanda and

TA Mkhumba, they have to travel average distance of 3km and 2km, respectively. The fact that household heads are able to travel up to an average of 5km to supply source indicates the value they place on wood products especially because most of them travel by foot and carry the said products by head. The results also indicates the intensity of the need for home use of the wood products.

5.3.5 Major Customers for Wood Products

Following the analysis done to ditermine the distance travelled by household heads to supply sources of wood products, the study went further to understand who the major customers of wood products are. Understanding who the household heads involve their trade with gives an insight of who motivates them to keep on with the business with wood products. To gain the desired insights, household heads were asked to mention who they are involved with in wood products marketing and the Table 5.12 below presents the results of the analysis by TA.

Table 5.12: Major customers for wood products

Traditional Authority	Major customers					
	Local people within the village (%)	Vendors (%)	Foreigners (%)	Companies (%)	Other customers (%)	Total (%)
Mkanda	92.9	7.1	0.0	0.0	0.0	100.0
Mkhumba	100.0	0.0	0.0	0.0	0.0	100.0
Nkhulambe	100.0	0.0	0.0	0.0	0.0	100.0
Njema	0.0	0.0	0.0	0.0	0.0	0.0
Mabuka	0.0	0.0	0.0	0.0	0.0	0.0

Analysis results from Table 5.12 above show that most people (93%) in TA Mkanda conduct their wood selling business with the local people and rely on them as their major customers. However, a very small percentage (7) of the total responses for the TA do their business transactions with vendors. All the households that agreed to involve themselves in wood selling business in TAs Mkhumba and Nkhulambe conduct their business with the local people from within their villages. This is shown by the 100 percent of the responses for each of the Traditional Authorities.

5.3.6 Transport Modalities and Costs for Wood Product Sales

The study also sought to determine the means of transport used by the household heads in moving wood products from their source points to the selling place. To determine this, heads of households were asked to mention what transport modalities they employ in doing their wood products business. Table 5.13 below gives the details of the analysis by gender.

Table 5.13: Household Transport Modalities for wood product sales

Mode of transport	Sex of household head		Totals
	Male	Female	
On head	62(54.9%)	51(45.1%)	**113(100%)**
Bicycle	1(100.0%)	0(0.0%)	**1(100.0%)**
Ox-cart	0(0.0%)	0(0.0%)	**0(0.0%)**
Personal vehicle	0(0.0%)	1(100.0%)	**1(100.0%)**
Hired vehicle	0(0.0%)	0(0.0%)	**0(0.0%)**

Other mode	0(0.0%)	0(0.0%)	**0(0.0%)**

According to Table 5.13 above, analysis results show that 113 household heads carry their wood products on their heads. Out of the 113 responses, 62 households represented by 55 percent of the total responses were male headed households and 51 households represented by 45 percent of the total responses were female headed households. The results further presents 100 percent household relying on bicycle and 100 percent relying on personal vehicle for transportation of wood products with the first being male headed and the later female headed. Based on the analysis and complementing on the analysis results on distance travelled and major customers, the results means that many of the households are poor as they can not manage to purchase better transport modalities such as bicycles and vehicles, as evidenced by the large quantities of both males and females who carry wood products on their heads.. This is also to say these poor people rely much on the wood products to earn their daily living and for survival of their families.

5.4 Non-wood Forest Products Marketing

Further to investigations made on household involvement in selling of wood products, the study further sought to know the involvement of household heads in the marketing of non-wood products. Households were asked to shade more light on issues such as; their involvement in selling of non-wood products, the quantities of non-wood products they have so far sold, source of non-wood products being sold, distance to the non-wood products sources, their major customers of non-wood as well as transport modalities and cost of non-wood product sales. Details for each of the analyses are as below:

5.4.1 Whether a Household sells Non-wood Products

The study sought to establish the involvement of the household heads in selling of non-wood products in the study area. To achieve this, the household heads were asked whether they sell non-wood products or not. Analysis of the study results were based on their geographical position (TA). Below are the details of the analysis.

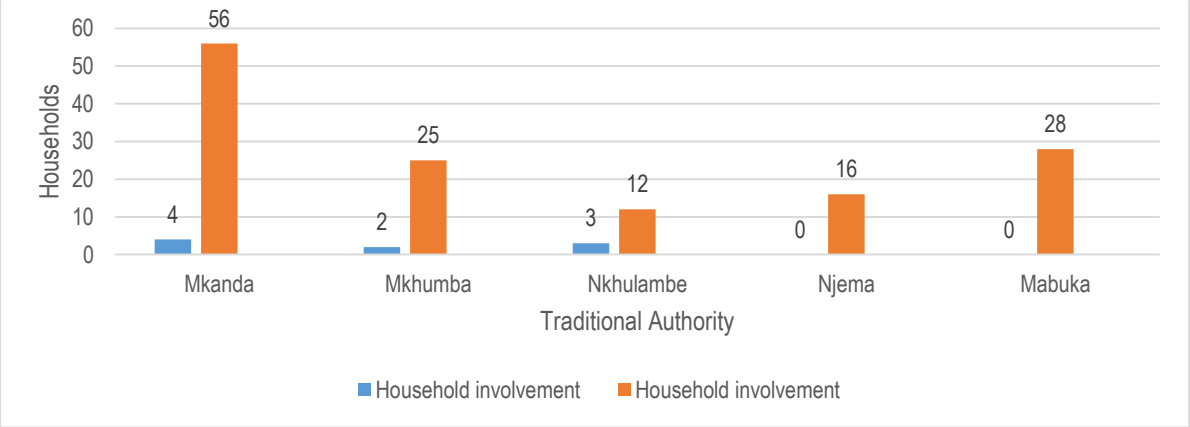


Figure 5.3: household involvement in non-wood product sales

Findings in Figure 5.3 show that the majority of the sampled household heads in TA Mkanda (56) are not involved in selling of wood products. Four (4) household heads in Mkanda TA agreed to have been involved in selling of non-wood products. 25 household heads from Mkhumba TA, 12 from Nkhulambe TA, 16 from Njema and 28 households from Mabuka TA are as well not involved in selling of non-wood products. Only 2 household heads and 3 household heads in Mkhumba and Nkhulambe in that

respective order agreed to be involved in the selling of non-wood produtcs while Njema and Mabuka did not register any household involvement.

The results from the analysis mean that there is not much of the trade involving non-wood products in the study area as evidenced by the small numbers of households that are incolved in non-wood product business. The study further suggests that atleast very few households from Mkanda TA benefit from the Mulanje mountain forest in terms of non-wood products in comparison with other TAs who registered few or no household at all.

5.4.2 Quantities of non-wood products sold by households per week

Further to the analysis on household involvement on selling of non-wood products, the study sought to establish the quantities of non-wood products sold by households per week. For each of the products, household heads were asked to state the approximated quantity they sell per week. Details of the analysis are presented in the table below:

Table 5.14: Quantities of non-wood products sold by households per week

	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
Non-wood product	**Mean (kg)**	**Mean (kg)**	**Mean (kg)**	**Mean kg)**	**Mean (kg)**
Mushroom	0.75	2	5.5	0	0
Fruits	1.125	0	5	0	0

Table 5.14 presents the details of the analysis on quantities of non-wood products sold by household heads per week. The analysis was done based on geographical position. According to analysis results in the table, Mkanda TA sold an average of 1kg of mushroom, Mkhumba TA sold average of 2kg, Nkhulambe an average of 6kg and Njema and Mabuka did not sell any bit of mushroom as presented by the results in table 5.15. Mkhumba sells an average of 33kg of honey while all other TAs do not sell honey. Further, the study show that Mkanda TA sold an average of 1 kg of fruits per week while Nkhulambe sold an average of 5kg. The results of the analysis means that there is not much involvement of marketing of non-wood products in the study area. Nkhumba area has emerged to be the only one investing much in honey production. The results shows that our weak sampling strategy that did not capture those that rely of forest-based enterprises. In the study area, beek keeping is one of the robust forest based industry where beekeepers are allowed to hang their beehives in a forest reserve and to date there are >800 people in this industry.

5.4.3 Sources of Non-wood Products being sold

Adding to the information collected on quantities of non-wood products sold by households per week, the assessment also sought to establish the sources of these non-wood products that households sell. Household heads were asked to mention from which sources they gather their non-wood products. Details of the study findings were done on TA level and Table 5.15 has the details for the analysis results.

Table 5.15: Sources of Non-wood Products being Sold

Supply source	**Traditional Authority**				
	Mkanda	**Mkhumba**	**Nkhulambe**	**Njema**	**Mabuka**
	Column (%)	Column (%)	Column (%)	Column (%)	Column (%)
Forest reserve	100.0	100.0	100.0	0.0	0.0

Plantation forest	0.0	0.0	0.0	0.0	0.0
Customary forest	0.0	0.0	0.0	0.0	0.0
Own woodlot	0.0	0.0	0.0	0.0	0.0
Bought from private farms	0.0	0.0	0.0	0.0	0.0
Other sources	0.0	0.0	0.0	0.0	0.0

According to Table 5.15 above, results of the analysis show that all the household heads from Mkanda, Mkhumba and Nkhulambe TA depend on the forest reserves for non-wood products with 100 percent representation of the respondents for each Traditional Authority. Njema and Mabuka did not register any supply source of non-wood products. From the results, although in small quantities, there is still high dependancy on forest reserves for the non-wood products and this translates to high levels of innevitability to the extinction of some valuable rare species on non-wood products, rare animal species, for instance.

5.4.4 Distance to Source of Non-Wood Products

The study further investigated on the distance travelled by the household heads in trying to source these non-wood products. As already reasoned before, determining these distances help understand the commitment given by the household heads into the business involving non-wood products. On the other hand, an understanding of the distance travelled to supply source helps to explain the observed market prices in the destination markets. Table 5.16 below has the details of the analysis by geographical location (TA).

Table 5.16: Distance to Non-wood Products Supply Source

	Traditional Authority				
	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
	Mean (km)	Mean (km)	Mean (km)	Mean (km)	Mean (km)
How far is it from the major supply source for non-wood products?	1.25	6.00	3.00	.	.
How far is it from the 2nd major supply source for non-wood products?	1.00	.	.	.	.

Table 5.16 analysis results show that household heads in TA Mkanda travel an average distance of 1km to the source of non-wood products. In TA Mkhumba, households travel an average of about 6km to the source places for non-wood products compared to 3km for those in TA Nkhulambe. Table 5.16 further shows that in TA Mkanda, households travel for at least a kilometer to access non-wood products. These results simply show that the minimal efforts invested by households in transporting the non-wood products from their sources as the distances travelled are short. With these minimal transactions for non-wood product transportation, it should be relatively easier for households to venture into non-wood product businesses.

5.4.5 Major Customers for Non-wood Products

Further to distance to non-wood product supply source, the study collected and analyzed data to know who the major customers of non-wood products are in the study area. Results of this analysis detailed in the subsequent table was done based on geographical position.

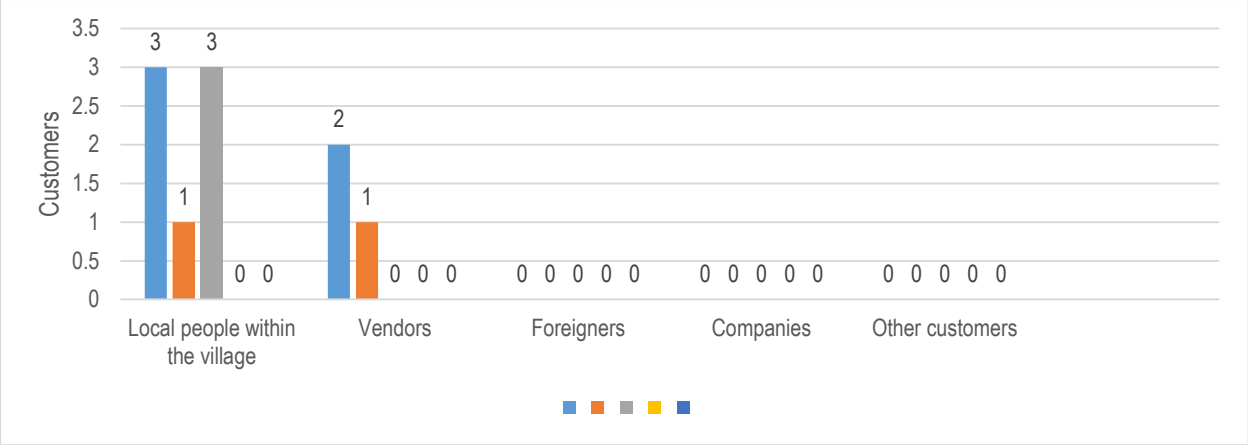


Figure 5.4 Major Customers for Non-wood Products

Results from the analysis as shown in Figure 5.4 above reveal that many households involved in selling of non-wood products do their business with local people within the village with Mkanda and Nkhulambe scoring 3 each. Figure 5.4 further show that very few people in Mkhumba TA also trade with local people from the villages. A few people from TAs Mkanda and Mkhumba trade with vendors. The results also show the minimal costs associated with transportation of non-wood products by households.

5.4.6 Mode of Transport and Costs for Non-wood Product Sales

The study also sought to determine the means of transport used by the household heads in moving non-wood products from their source points to the destination markets. To determine this, heads of households were asked to mention the transport modalities they employ in their non-wood product business. Table 5.17 below gives the details of the analysis by TA.

Table 5.17: Mode of Transport for Non-wood Products

Mode of transport	Traditional Authority				
	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka
On head	1	1	0	0	0
Bicycle	1	1	1	0	0
Ox-cart	0	0	0	0	0
Personal vehicle	0	0	0	0	0
Hired vehicle	0	0	0	0	0
Other mode	0	0	0	0	0

Acccording to Table 5.17 that households in TAs Mkanda and Mkhumba carry the non-wood products on their heads from one place to another. Results also show that some household heads in Mkanda, Mkhumba and Nkhulambe use bicycles to transport the non-wood products. The zero respnses for the other transport modes means that no household uses such transport mechanims for the non- wood products transportation purposes.

5.5 Access to Extension Services on Environment and Natural Resources

The study also interrogated the access to extension services on environmental and natural resources. The study thus, sought to establish whether the household heads have had access to extension

services on environment and natural resources. Analysis was done both by gender and geographical position and the table below presents the details of the analysis:

Table 5.18: Access to Extension Services on Environment and Natural Resources

Access to ENRM	Traditional Authority					Sex of household head	
	Mkanda	Mkhumba	Nkhulambe	Njema	Mabuka	Male	Female
Yes	53	21	14	9	22	73	45
No	5	4	1	4	6	9	11

Table 5.18 presents a reflection of access to extension services on environmental and natural resources based on gender and geographical position. When asked whether they had access to ENRM, 53 household heads from Mkanda, 21 from TA Mkhumba, 14 from TA Nkhulambe, 9 from TA Njema and 22 from ta Mabuka indicated to having access. These results of the analysis imply that a lot of people from the study area have knowledge of environment and natural resource management. Interestingly, household access to ENRM extension services is not necessarily translating into reduction in overexplitation of natural resources for the Mulanje Mountain Forest Reserve. This is more so as the earlier analysis results show that large quantities of fuel wood and other forest products are being being unstainable harvestd from Mulanje Mountain and being sold per week, in constrast to the reported availability of knowledge in ENRM by the local inhabitants in the DMCIL target areas.

5.6 Summary of the Chapter

In conclusion, the study found out that a large number of the households in the study target area rely on natural forest for wood and wood products since only few people own their own woodlots. There is male dominance in owning woodlots and deductively land in general. The woodlots owned per household are not in large sizes. The study suggest that the little land sizes of the woodlots they posses now should be well and sustainably managed for future generations to benefit from them later.

The study further revealed that the supply of wood, wood products and non-wood products currently does not meet the demand that is actually on the ground. As such, there is need for awareness of the importance of planting more trees both to meet the current demand and for sustainable environmental management in all the TAs of the study area.

There is a significant response to forest extension service as a good number of households obtain their seed and seedlings from the forest department. Nevertheless, need is there to encourage more people in the area to access the seeds and seedlings from the forest department. NGOs and private suppliers have not done enough in supplying seeds to the households that own woodlots.

Quiet a good number of households in the study area rely on the forests for products such as firewood, thatch grass, fruits and mushrooms mainly. Specifically,there is high consumption of forest resources in TA Mkanda which in turn refers to high deforestation rates in Mulanje montain as TA mkanda is just at the base of the mountain. Interestingly, the study found that there is low dependence on the forests for charcoal in all the TAs, this can be explained by the high usage levels of firewood and not charcoal.

Females were found to take an active part in the trading of wood and wood products. However, many businesses are Micro, Small and Medium businesses operating in the study area since most household heads only deal with from within their villages. Additionally, although in small quantities, there is still

high dependancy on forest reserves for the non-wood products and this translates to high levels of innevitability to the extinction of some valuable rare species on non-wood products and rare animal species. for instance.

The results of the analysis means a lot of people from the study area have knowledge to do with management of natural resources. Interestingly, this contradicts to the way the natural resources are handled in the area. As already explained before, the study has found out that there are large quantities of fuel wood and other forest products being sold per week, this does not correspond to the availability of knowledge in ENRM to the natives of the study area.

6.0 MULANJE MOUTAIN FOREST MANAGEMENT AND CONSERVATION

Further to investigations on forest resource utilization, the study inquired on Mulanje Mountain Forest management and conservation. Specifically inquiries were made on ecosystem services provision from Mulanje Mountain Forest Reserve, natural resources utilised from Mulanje Mountain and distance to the sources points, major uses of the natural resources obtained from Mulanje Mountain, household participation in Natural resources management committees, household participation in ENR&M, existence of NGOs/CSO promoting ENR&M activities and knowledge, attitude and practices (KAP) towards conservation and restoration of Mulanje cedar. Details of the analysis for each of the variables are presented in the subsequent topics below.

6.1 Ecosystem Services Provision from Mulanje Mountain Forest Reserve

Mulanje Mountain Forest Reserve (MMFR) provide ecosystem services to people around the mountain. The study sought to establish whether the people around Mulanje obtain ecosystem services from MMFR. Household heads were asked to agree or disagree to obtaining specified types of provisioning ecosystem services from the forest for free. Results of the analysis was done based on the geographical position the respondents are based from. Details of the study findings are as below:

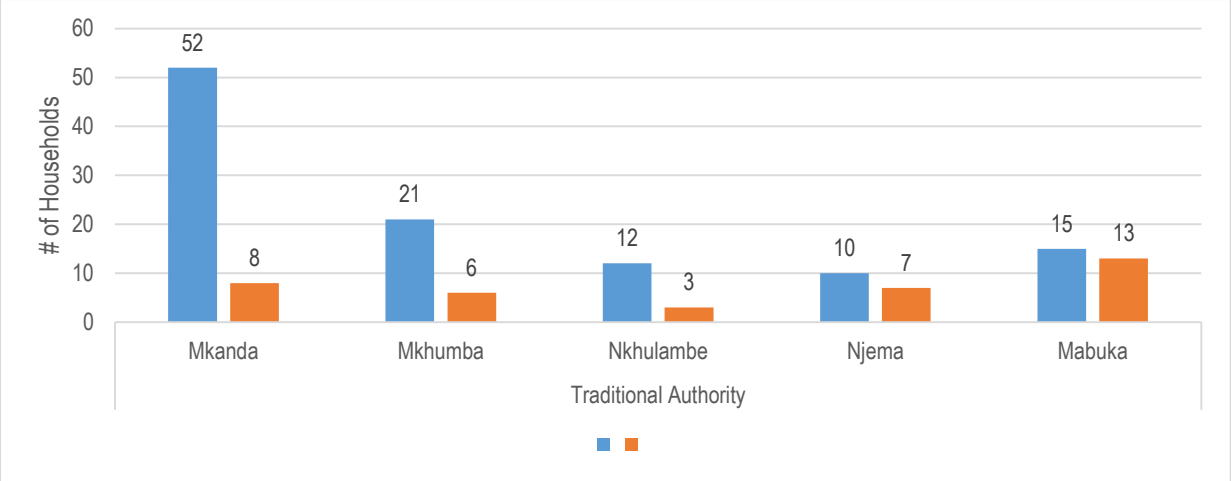


Figure 6.1 Ecosystem Services Provision from Mulanje Mountain Forest Reserve

From Figure 6.1, results of the analysis show that 52 respondents from Mkanda TA agreed to have free access of ecosystem services from Mulanje forest reserve. 21 respondents from TA Mkhumba, 12 from TA Nkhulambe 10 from TA Njema and 15 from TA Mabuka all accepted to have had access to free ecosystem services from Mulanje mountain forest reserve. The analysis results tell us that many people from the study areas rely much on the Mulanje forest reserves and so the forest reserve is highly prone to deforestation and extinction of precious rare species of nature. The study then suggests that there should careful and sustainable management of the available resources in Mulanje Mountain Forest Reserve.

6.1.1 Natural Resources Utilized from Mulanje Mountain

The assessment further inquired on the natural resources that are utilized by the sampled household heads from Mulanje Mountain and the distance they take to reach the actual source of the resource. Details of the responses are provided in Table 6.1 below.

Table 6.1: Natural resources utilised from Mulanje Mountain.

Type of Resource	Traditional Authority									
	Mkanda		Mkhumba		Nkhulambe		Njema		Mabuka	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Timber	8	7	2	2	2	1	2	1	3	2
Non timber	17	15	9	7	1	4	0	3	5	6
Fuel wood	35	16	14	12	7	4	6	6	13	8
Medicinal plants	20	8	4	7	2	3	4	1	2	0
Honey	11	7	4	5	2	3	4	1	2	0
Wild fruits	27	14	11	7	7	3	6	1	4	3
Mushroom	24	15	10	8	2	3	6	2	6	2
Wild animals	11	6	2	4	1	2	6	1	3	0
Other edible products	11	6	1	4	1	2	5	1	3	0
Fish	0	0	1	0	0	1	0	0	0	0
Grazing animals	0	0	0	0	0	0	0	0	0	0
Other specify	0	0	0	0	0	0	0	0	0	0
Sub totals	164	94	58	56	25	26	39	17	41	21
Totals	**258**		**114**		**51**		**56**		**62**	

As shown in Table 6.1 above,the analysis results on natural resources that household use based on both geographical position and gender of the household. The results in the Table 6.1 show that the major benefits obtained by households in the sample 5 TAs, from Mulanje Mountain Forest include: fuel wood, medicinal plants, wild fruits, mushrooms, wild game, just to mention but a few.

In any case, the results presented in the Table 6.1 mean is that the people in the target project area do significantly rely on the Mulanje Mountain for the diverse natural resources for their livelihoods. It would, therefore, not be a far fetched idea to state that without Mulanje mountain and its natural provisions to the people of the area, it would be very difficult for the people to survive as many aspects of their lives would be greatly affected.

6.1.2 Major Uses of the Natural Resources Obtained from Mulanje Mountain

The study also sought to understand the major uses that household heads have for the natural resources obtained from Mulanje mountain. Inquiries were made to the household heads on what main uses for the resources are. Analysis results are in Figure 6.2 below.

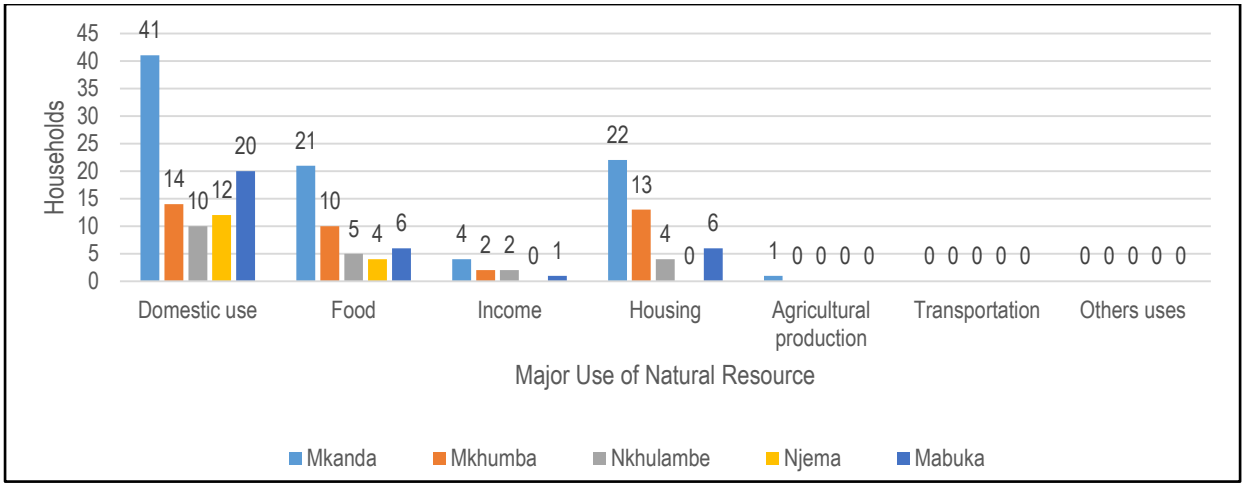


Figure 6.2 major uses of natural resources obtained from Mulanje mountain.

As shown in Figure 6.2, most natural resources obtained from Mulanje Mountain are used for domestic purposes. This is evidenced by the large numbers of responses that are shown on domestic use given as follows: 41 from TA Mkanda , 20 from TA Mabuka, 14 and 12 from TA Mkhumba and TA Njema respectively and 10 from TA Nkhulambe. Many other types of natural resources from Mulanje Mountain are used for housing purposes and others for food across all the TA, while very few were reported to being used as a source of income. Apparently, the natural resources from Mulanje Mountain are not deemed as major food source, but rather for other domestic uses such as housing, such as thatch grass.

6.2 Participation in Natural Resource Management Committees

Further to inquiries made on major uses of natural resources obtained from Mulanje Mountain, the study also investigated on household participation in natural resources management committees. Figure 6.3 below has the details of the analysis results:

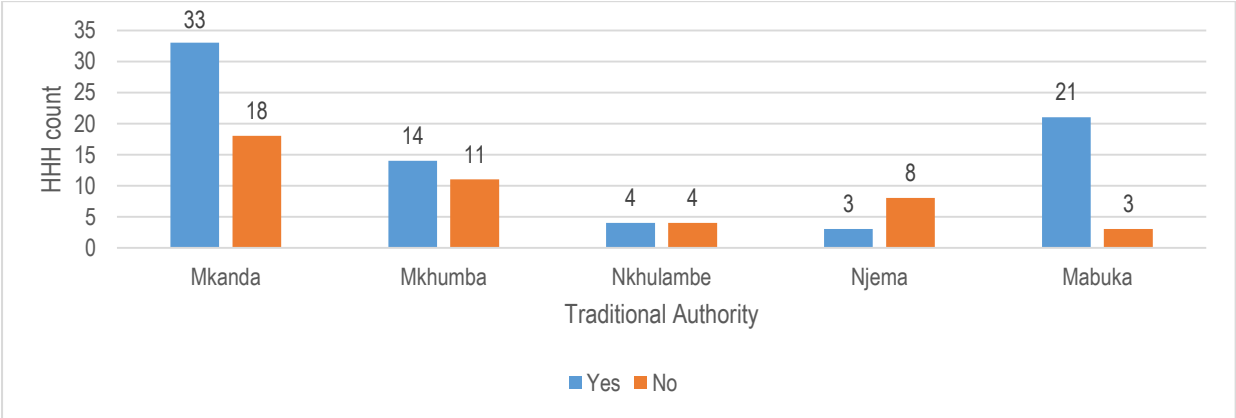


Figure 6.3: Household participation in natural resources management committees

According to the analysis results shown in Figure 6.3 above, a good number of households indicated to have participated in some form of environment and natural resource management activities, with 33 household from TA Mkanda accepted to have been participating in natural resources management committees. Further to that, 14 household heads from TA Mkhumba, 4 from TA Nkhulambe 3 from TA Njema and 21 household heads from TA Mabuka also indicated to have ever participated in natural resources management committees. These results imply the existence of willingness by households to

cooperate with local initiatives aimed at promoting environment and natural resource conservations. From another perspective, the results would also mean the people have the willingness to work together as a community in managing these natural resources from Mulanje Mountain. With this background of household experience in ENRM governance structures, further ENRM activities in the target areas should be implemented with ease.

6.2.2 Existence of NGOs/ CSO Promoting ENR&M activities

In addition to the inquiries made on participation of household heads in natural resources management committees, the study did further investigations on the existence of Non-Governmental Organizations (NGOS) or Civil Society Organization (CSO) that promote ENR&M activities in the study area. Head of households were then asked whether there are such organizations in the study area that promote ENR&M activities. Analysis of results was done based of the geographical position where the household lives. Below is the Table for details of the analysis:

Table 6.2 existence of NGOs/CSO promoting ENR&M activities.

Traditional Authority	Existence of NGO promoting environmental management		Total
	Yes	No	
Mkanda	47 (88.7%)	6 (11.3%)	53 (100%)
Mkhumba	20 (80.0%)	5 (20.0%)	25 (100%)
Nkhulambe	13 (92.9%)	1 (7.1%)	14 (100%)
Njema	10 (62.5%)	6 (37.5%)	16 (100%)
Mabuka	22 (84.6%)	4 (15.4%)	26 (100%)
Total	**112**	**22**	**134**

According to Table 6.2 above, out of 134 respondents, 112 agreed to the existence of NGOs/CSO in the area against 22 who responded no to the existence of such NGOs that promote environmental management activities. Out of the 133 respondents, 53 household heads were from TA Mkanda out of which 89 percent said yes and 11 percent of the household head said no. 25 respondents were from TA Mkhumba out of which 80 percent said yes to the existence of NGOs against 20 percent of the households who said otherwise. 14 respondents were from TA Nkhulambe and out of these, 13 (93%) responded positively to the existence of NGOs while only 7% of the respondents said no. A subtotal of 16 respondents were from TA Njema from which 63% household heads said yes while only 37 percent of the households said no. TA Mabuka had a total of 26 respondents from which 85 percent of the household confirmed existence of NGOs/CSO while only 15 percent of the households could not confirm.

What the results from the analysis mean is that people in the DMCIL project target do already have some information concerning good management practices of natural resources owing to the existence of stakeholders such as NGOs/CSOs in the area. This, therefore, means that if people in the area keep on engaging in unstainable use of natural resources, it is not out lack of knowledge of the negative effects, but other factors such as poverty levels which leave them with no choice but to continue exploiting the Mulanje Mountain Forest Reserve.

6.3 Knowledge, Attitude and Practices (KAP) towards Conservation and Restoration of Mulanje Cedar

Further to the existence of NGOs/CSO in the target areas, the study specifically investigated households' knowledge, attitude and practices towards conservation and restoration of Mulanje cedar.

To achieve this objective, household heads were required to respond whether they have ever participated in the restoration and conservation of Mulanje cedar in the past. Results of the analysis on knowledge, attitude and practices towards conservation and restoration of Mulanje cedar were analyzed based on the geographical location. Further to this, the question posed to the household heads was sectioned into two; whether they have ever participated in restoration of Mulanje cedar or not, and whether they have ever participated in the conservation of Mulanje cedar or not. The findings of the analysis are presented in Table 6.3 below:

Table 6.3: Household Knowledge, Attitude and Practice Towards Conservation and Restoration of Mulanje Cedar

Traditional Authority	Participation in conservation of Mulanje cedar		Participation in restoration of Mulanje cedar		TOTAL
	Yes	No	Yes	No	
Mkanda	32 (56.1%)	25 (43.9%)	31 (53.4%)	27 (46.6%)	**115**
Mkhumba	17 (65.4%)	9 (34.6%)	16 (61.5%)	10 (38.5%)	**52**
Nkhulambe	5 (33.3%)	10 (66.7%)	5 (33.3%)	10 (66.7%)	**30**
Njema	3 (23.1%)	10 (76.9%)	3 (23.1%)	10 (76.9%)	**26**
Mabuka	21 (75.0%)	7 (25.0%)	22 (75.9%)	7 (24.1%)	**57**
TOTAL	**78**	**61**	**77**	**64**	**280**

Analysis results in Table 6.3 show that a total of 280 responses were accumulated. Out of this total, 78 responses agreed to have participated in the conservation of Mulanje cedar before. 61 responses were in denial to have participated in conservation activities of Mulanje cedar. In more details, out of the 78 responses that put a hand in conserving Mulanje cedar, 56 of the repondents were from Mkanda TA, 65 percent from Mkhumba, 33 percent from Nkhulambe TA. 23 percent from Njema and 75 percent from TA Mabuka. On average and in comparison to the total responses that did not take part in conserving Mulanje cedar, many people in the study area have a keen interest to conserve the cedar in Mulanje Mountain.

The results further show that out of the 280 responses 77 agreed to have had a play in the restoration of Mulanje cedar while 64 respondents denied to have taken a step in restoring Mulanje cedar. Moving into details, out of the 77 responses who have been involved in restoring of Mulanje cedar, 53 percent of the responses were from Mkanda TA, 66 from from TA Mkhumba 33 percent from TA Nkhulambe 23 percent from Njema and 76 percentwere from TA Mabuka. As explained on conservation of Mulanje cedar, on average and in comparison to the total responses that did not take part in the restoration of Mulanje cedar, many people in the study area have a keen interest to restore the cedar on Mulanje Mountain.

It is also interesting to note that despite greater numbers of people who have participated in the conservation and restoration of Mulanje cedar, there are significant numbers too that prove the contrary. This simply means there are more people in the study area that have not taken a hand too in taking care of the Mulanje cedar,

6.4 Summary of the Chapter

In summary, people from the study areas rely much on the Mulanje forest reserves and so the forest reserve is highly prone to deforestation and extinction of precious rare species of nature. Without Mulanje mountain and its natural provisions to the people of the area, it would be very difficult for the

people to survive as many aspects of their lives would be greatly affected since most natural resources obtained from Mulanje mountain are used for domestic purposes,food and housing purposes; thatch grass for example.

Turn up to participation in natural resources management committees is very high. Household heads in the study area are cooperative enough to manage the natural resources at their disposal. People have the willingness to work together as a community in managing these natural resources from Mulanje Mountain. Having enough knowledge in natural resources management, the people of the area can sustainably manage the resources in Mulanje Mountain.

The study found out that if people keep on cutting down trees and using natural resources unsustainably, it could be because of extreme poverty levels which leaves them with no choice but to rely on the natural supply of needs from the Mountain forest reserves but generall consesus is that many people in the study area have a keen interest to conserve the cedar in Mulanje Mountain.

It is also interesting to note that despite greater numbers of people who have participated in the conservation and restoration of Mulanje cedar, there are significant numbers too that prove the contrary. This simply meant there are more people in the study area that have not taken a hand too in taking care of the Mulanje cedar, late alone conserving and restoring this rare specie of trees (cedar).

7.0 CONCLUSION AND RECOMMENDATIONS

7.1 Conclusions

The study has sought to undertake an in-depth and gendered lens socio-economic baseline assessment of the 150 DMCIL project beneficiaries from 10 villages around Mulanje and Phalombe districts, focusing on issues such as household farm and non- farm income sources; household expenditure behavior; asset ownership; land ownership and use; food security nutrition status; household woodlot ownership, use and ecosystem management practices; access to ENRM services, amongst others.

The study findings show that the Domestication of Mulanje Cedar for Improved Livelihood (DMCIL) project had targeted an economically active age group of 27 to 49 years to participate in the Mulanje Cedar nursery management activities.

Investigation into education levels of the identified project beneficiaries show that most of them attained primary education level especially female headed households. For those that dropped out of school, more female household heads had dropped school at primary level as compared to their male counterparts. Interestingly, in TAs such as Nkhulambe, Njema and Nkhumba, over 33 percent o the male headed housheolds reported to have attained some secondary level. In any case, the variations in the attainment of education levels implies that the DMCIL project should realize that this could translate into differences in uptake of project technologies, hence the need to treat each nursery group differently.

On the marital status the DMCIL project beneficiaries, the findings show that most of the household heads are married to one spouse. Only 3 percent of male household heads reported to have been divorced, while 5 percent of male household heads were polygamous. The relative stability in the marital status of the selected beneficiaries means that they have minimal marital related disturbances that could affect their participation in the planned village nurseries. It would also be important to monitor whether the expected increased incomes earnings from the DMCIL will actually strengthen or distabilize the marriages.

Inquires into household head occupation show that most of the people in the project areas are peasant farmers as their main accupation. On the expenditure side, most of them reported to spend most of their incomes on groceries, church/mosque donations, health and food which is by female headed households. The results also revealed that majority of livestock owned in the area are goats and local chicken. It would be therefore, of interest to observe during the project period if their participation transforms their occupational status, and also the expenditures items to more investment- oriented outlays from the current consumption- oriented items as is currently the case.

On asset ownership, study findings show that results indicated that most of the asset owned by the households are basic productive assets such as hoe, axe, panga knife, amongst others. High value assets such as motorcycle, bicycle, radio and household furniture are mostly owned by male headed households.

Analysis of incomes earned from different sources revealed that much as crop production activities dominate the household economic activities, in terms of household reliance on income sources, livestock and non-farm eonomic activities provdied the larger share of household incomes. For instance, households reported that 30 percent of their incomes come from selling livestock like pigs,

goats, cattle, and poultry; followed by 29 percent from non-farm income activities. Other sources such as forest resources such as charcoal, firewood, mushroom, wild fruits, and timber constituted 23 percent of household income, and 19 percent from crop sales.

Most households in the target areas do engage in marketing of crops produce despite the fact that crop income does not constitute the largest income shares. This means that households have significant interactions with the market.

Production inputs such as crop seeds and fertilizer are largely obtained from ADMARC and private traders. The major transport modality used for transporting farm inputs is hired bicycles, while a good number use their head.

Most crop sales income is from tea with an average amount of MK38,000 while the highest income earnings of up MK160,000 were also reported. In terms of household food consumption, the results show that nsima is the most eaten food followed by sweet potatoes though the consumption rate vary by geographical location. Most households eat one to two times a day, while few households reported to be taking three meals a day.

With respect to household coping strategies when they run out of the food, the findings show that people mostly reduce the amount of food size consumed per day and also reduce number of meals consumed per day. There are also some households reported that they go to bed empty stomach and still others go to other people's farms to do casual labour (ganyu).

Household access to the credit is a challenge for most of the would be DMCIL project beneficiaries, and situation is more acute for male headed households than their female counterparts. The relatively improved credit access conditions by female- headed households could be due to the village bank services which are largely patronized by females.

The study also established that 59 percent of the households reported to have sold their harvested crops and maize was not exceptional in terms of being sold on the market. Enquiry on the household source of income to buy food when run out has shown that they mostly get the money from ganyu work followed by income from crop sales.

The study results also show that most inputs used in crop production are seeds and fertilizer bought from ADMARC and private traders as well as local people mostly transported by using hired bicycles and on head.

On farming activities, the findings show that most of the land used by households for farming is low in fertility which is mostly accessed through inheritance from wife's parents. Very few of the households had bought or rented land demonstrating the limited land markets in the target areas.

The crop that are mostly grown in the two districts is maize in both Mulanje and Phalombe districts. Pigeon peas is the second most important crop in the two districts. The study also established that most farmers have access to the extension services in all areas except TA Njema where low percentage of female headed households reported to have low access to extension services on farming practices.

Inquiries into the household ownership of woodlot practices showed that 78 percent of the sampled households do not own their own woodlot. This means that much as household rely on fuel wood energy for household energy needs, they have to look elsewhere such as natural forests for their

energy needs. For the few households that do own woodlots, most of such woodlots are on a 0.2 ha of land. The limited ownership of woodlots means that the DMCIL project should endeavour to promote woodlot ownership besides the planned Mulange Cedar.

For the households that own woodlots, their major reported seedling sources are own collections and Forestry Department. Very few responses indicated non- governmental organizations or private nurseries as sources of seedlings for the households that own woodlots. The limited seedling supply sources means that DMCIL project beneficiries stand a good chance of selling their seedlings to those households with interest in wood lot ownership.

Mulanje Mountain Forest Reserve is a relibale source of natural forests products such as firewood, thatch grass, fruits and mushrooms obtained from Mulanje Mountain Forest Reserve. Interestingly, minimal dependence on forests for charcoal was reported in all the impact areas. In any case, households have to walk only 3 km to access the forest reserve.

Most households utilize the natural resources obtain from the forests for domestic needs with few engaging in commercial sales of the forest products as evidenced by the fact 84 percent of the responses indicated as not engaging in natural wood sales. For the few households that do sale the forest products, women were found to take an active part in the trading of wood and wood products. However, many of such businesses are at micro or small scale level as the trading takes place within the village or given locality.

There is good level of knowledge relating to management of natural resources owing to extension services provided by the Forestry Department and other NGOs stakeholders in the two districts. However, this does not deter them from depending upon the Forest Reserve for their energy and livelihoods.

Owing to the environment and natural resource management extension services in the target areas, household participation in natural resources management committees is very high. Households demonstrate willingness to work together as a community in managing these natural resources from Mulanje Mountain.

Inquires into why households do engage in forest depletion activities showed that poverty is one of the casual factors. However, households are keen to conserve Mulanje Mountain Forest Reserve since it acts as their livelihood source in many respects.

7.1 Recommendations

The DMCIL to establish a strong monitoring, evaluation and learning system that would effectively report on the changes in household socio-economic status as well as production and consumption behaviour during the project period. For instance, the said Monitoring and Evaluation (M&E) system should be able to establish differences in occupational status, income levels and structures, school attendance and completion, expenditures levels and structures, food consumption, participation in ENRM activities, woodlot ownership, between the project beneficiaries and non- beneficiaries. The evaluation aspect should seek to establish in precise terms, the extent to which the DMCIL is contributing to the attainment of the changes in the indicators.

In view of the differences in educational levels of the identified DMCIL project participants, there is need for the project management to take into the diverse capacity levels in appreciating the project by designing tailor made training sessions to the different beneficiary groups.

The project to intensify forestry extension services that would stimulate a sustained demand for tree seedlings that would benefit the DMCIL participants who will be trained and have great opportunities to produce and sell the demanded seedlings;

There is need for examining ways of developing and strengthening collaboration with other NGOs in the two districts and their impact areas on how they can support the DMCIL project activities.

In view of the fact that poverty has been identified as one of the drivers of household engagement in natural forest resource depletion activities, the project should consider establishing short to medium term poverty reduction measures to accompany the designed project interventions. If this cannot be done by MMCT, then the management could consider this as one of the issues on which to collaborate with other NGOs operating in the two districts.

Annexes

Annex 1: Scope of Work: Socioeconomic Baseline Study

1. Background to the project

The Mulanje Cedar, Malawi's National Tree, is critically endangered due to over exploitation. The *''Domestication of the Mulanje Cedar for Improved livelihoods (DMICL)"* Project will generate new knowledge to enable the cedar to be grown and sold by local people thereby generating alternative sustainable income. This will lead to raised awareness of the cedar's importance, and improved conservation of this species.

The project will deliver biodiversity and livelihoods benefits by a) defining optimal growing conditions and improving horticultural protocols for cedar restoration on Mulanje and for wider cultivation in Malawi, b) generate alternative sustainable income sources for poor people through sale and planting of cedar seedlings and c) significantly reduce unsustainable exploitation and habitat loss of natural stands of cedar.

The DMCIL project will be implemented by Botanic Gardens Conservation International (BGCI) whose mission is to mobilize botanic gardens and engage partners in securing plant diversity for the well-being of people and the planet. BGCI staff have project experience in Malawi and have been involved in conservation of the Mulanje Cedar since 2001. BGCI will mobilize top international research expertise in cedar conservation, propagation and public engagement from botanic gardens in its network. So far BGCI partner institutions that have expressed interest in participating in this project include RBG Kew, RBG Edinburgh, Bedgebury Pinetum, Forest Research UK, the Eden Project and the World Agroforestry Centre (ICRAF).

BGCI has been involved in this project from its conception, attending planning meetings with FRIM and MMCT in Mulanje and Zomba in September 2015 and therefore it is well placed to carry out this work.

The project was conceived in Mulanje by Mulanje Mountain Conservation Trust (MMCT) and the Forestry Research Institute of Malawi (FRIM). Jointly, they have identified the project site and intended beneficiaries, designed interventions, and conducted prefeasibility studies. MMCT and FRIM have liaised with the local District authorities and chiefs from Mulanje and Phalombe, through a Stakeholders' meeting held on 8th April, 2016 to get their buy-in.

MMCT, an environmental endowment institution, with 14 years' experience in carrying out habitat restoration on Mulanje Mountain, principally replanting and restocking Mulanje Cedar forests is responsible for the day to day management of the project in Malawi, including nursery establishment, recruitment, training, workshops and public awareness.

MMCT and FRIM would like to sub-contract the socio-economic study to external consultants familiar with the work area and fluent in the local language, hence these Terms of Reference.

2. Objectives of the project

2.1 Overall Objective

The overall objective of the project is to generate new knowledge to enable the cedar to be grown and sold by local people for better livelihood outcomes and biodiversity conservation of Mount Mulanje.

2.2.2 Specific Objectives

2.2.2.1 To categorize best cedar growing conditions to improve reforestation on Mulanje Mountain and define areas suitable for cedar cultivation elsewhere in Malawi

2.2.2.2 To develop improved horticultural protocols to improve cedar survival and growth rates in community nurseries.

2.2.2.3 To propagate cedar in community nurseries and generate income for local households

2.2.2.4 To identify cedar markets and promote the cedar and access to those markets by local and national cedar stakeholders working with experts.

2.2.2.5 To significantly reduce unsustainable exploitation and damage to natural stands of cedar as a result of local communities working with the authorities to protect and restore the cedar on Mulanje Mountain.

These specific objectives define the *Key Expected Outputs* against which the success of the project will be measured.

Prior to commencing implementation of project activities a Socio Economic Baseline survey will be conducted in the project area.

MMCT and FRIM as project partners have designed this project brief for an external consultant to implement the baseline survey, and analyze the findings in an appropriate manner in order to increase understanding of factors impacting on the cedar's over-exploitation and how this affects the livelihoods of communities in Mulanje and Phalombe districts, specifically those surrounding Mulanje Mountain Forest Reserve. To do this, the appointed consultant will be provided with appropriate project documents to inform his preparation for the survey.

3. Scope of the Baseline Survey

The overall purpose of the baseline survey is to gather information on household incomes, social and economic drivers of cedar exploitation, and receptiveness to new approaches.

Specifically the survey will:

i. Establish baseline values of log frame indicators, against which future measurements of changes related to the project objectives can be made
ii. Gather information from local villagers, including staff recruited to work in community nurseries, on current household incomes, income sources, use of cedar and other natural resources, current attitudes to cedar and natural resource conservation and management
iii. Identify social and economic drivers of cedar exploitation
iv. Assess receptiveness to new approaches to promote cedar exploitation and restoration
v. Identify community priority needs and expectations of external support.
vi. Identify existing community structures and decentralized government structures, their functionality and linkages
vii. Identify specific groups within the project area where cedar exploitation is very high and natural resources management is particularly low in order to guide the targeting of project activities.
viii. Provide an analysis of collected data, including key constraints affecting cedar conservation and community livelihoods, to enable, if appropriate, project activities, and the log frame to be refined.
ix. Data should be segregated by gender and marginalized/disadvantaged groups/ caste as appropriate.
x. Summarize the findings and analyze strength, weaknesses, opportunities and threats of current socio-economic (including tourism and culture) situation to the management/development planning.
xi. Specifically point out issues to be addressed and recommend potentialities to be harnessed by the implementation plan of the project.
xii. Socio-economic survey results will be publically available.

4. Methodology and Approaches

As the scope of this task is broad it requires the use of a wide variety of methods, tools and techniques. The consultant is expected to propose appropriate methods specific to the detailed activities while preparing the proposal. The survey questions must be reviewed and approved by MMCT, BGCI and FRIM prior to the survey commencing. It is advised that the methodology be detailed and scientifically strong, yet practicable (considering time, cost and the local context of Mulanje Mountain Forest Reserve).

The Consultant shall consult with key stakeholders: Department of Forestry, Forestry Research Institute of Malawi (FRIM), Botanical Gardens Conservation International (BGCI), District Forest Offices (DFOs), District Executive Committees (DECs), Village Development Committees (VDCs), Village Natural Resources Management Committees (VNRMCs), NGOs and other stakeholders including chiefs.

The working modality should provide opportunities for all interested parties including women, socially and economically marginalized groups of people and other local institutions to participate in all aspects of the study. The consultant should observe transparency in all its activities and all the suggestions regarding implementation of the new project, issues and concerns shall be made open to all project partners (MMCT, FRIM, and BGCI) as well as any other interested party who have a stake in conservation of Mulanje Mountain Forest Reserve.

5. Deliverables

The expected deliverables from the baseline Socio Economic Study are as follows:

a) An inception report demonstrating understanding of the assignment. This will include a detailed approach/ strategy to be used for the survey including data collection tools, proposed questions and how these will be used to measure project progress, an outline of the work plan, budget and timelines. This report shall be presented to a team of MMCT, FRIM and BGCI representatives for consideration and approval within the first days of the assignment. Upon approval of the report, the Consultant will then proceed with the study.
b) First draft report of the survey which will be reviewed by a team of MMCT, FRIM and BGCI representatives
c) Second draft survey report incorporating comments, observations that will be used for validation workshop with key stakeholders
d) Final report with an Executive Summary and Data set. The final report should concisely outline the socio economic status (vulnerabilities and potential adaptations responses) and local capacity development needs to implement them based on the field assessment as well as capacity gaps. The findings, analysis and actionable recommendations should be in line with the study objectives.

6. Duration of the Assignment

It is expected that the assignment will be completed within estimated 25 working days.

7. Management and support arrangement

The Consultant will work in close collaboration with a team of representatives from MMCT, FRIM and BGCI. MMCT will assist the consultant with introductions to key stakeholders and employed nursery staff for the interviews and other logistical support deemed necessary (e.g. transport and photocopying services). The consultant will be expected to travel to the field covering villages (representational samples of the project area) surrounding the Mulanje Mountain Forest Reserve, in Mulanje and Phalombe districts. The Consultant shall train the Team of enumerators at MMCT premises for at least 2 days including pre-testing of the study tools in surrounding villages that are not targeted by the project.

Annex 2: Study Tools

Household questionnaire and Participatory Rural Appraisal (PRA) checklist for Mulanje Mountain Forest Reserve

Name of Enumerator		Household Number	
Name of District		Name of Household Head	
Traditional Authority		Name of Respondent	
Name of Village		Time Started	
Date of Interview		Time Finished	
Checked by		Date Checked	

1. HOUSEHOLD DATA

A1	A2	A3	A5	A6	A7	A8	A9	A10	A11	A12
Name of household member	**Tribe**	Age/ DOB	Sex	Relation to head	Highest level of education	Residence status	Years of residence	Main Occupation	Marital status	Type of household

A2	A4	A5	A6	A7	A8	A9	A10	A11
1=Yao 2=Chewa 3=Ngoni 4=Tumbuka 5=Tonga 6=Lomwe 7=Sena 8=0ther	1. Male 2. Female	1=Head, 2=Spouse, 3=Father, 4=Mother, 5=Son/daughter, 6=Son/daughter in-law, 7= Uncle, 8. Worker /laborer, 9= Grandchild, 10= Relative, 11=Visitor, 12= Brother/sister, 13=Other	1. None 2. Junior primary 3. Senior primary 4. Junior secondary 5. Senior secondary 6. Technical 7. Diploma 8. Degree 9. Adult Literacy 10. Other, specify	1. Resident 2. Polygamist 3. Resident at school 4. Immigrant/Settler 5. Visitor 6. Resident worker 7. Hired laborer 8. Other	1. Migrant 2. Citizen 3. Worker 4. Other	1=Peasant farmer 2=Semi-commercial farmer (e.g. cash crop grower) 3=wage laborer/worker 4=fisherman 5=artisan/carpentry 6=housewife 7=business person 8=student, 9=none, 10=other	1=single 2=married (monogamy) 3=married (polygamy) 4= separated 5=widowed 6=cohabitation 7=divorced 8=other	1. Male headed 2. Female-headed 3. Child headed 4. N/A

2. WOODLOT OWNERSHIP

Do you own a woodlot? 0=No 1=Yes If yes, state the size of establishment and source of seeds/seedlings

Planted Woodlot (Common species)	Size (ha)	Year of establishment	# of trees planted	# of trees now	Source of seed	Indigenous woodlot (Common species)	Size (ha)	CODE FOR SOURCE
								1=Forest Dept.
								2=Private suppliers

								3=Own collection *4=Friends* *5=NGO 6=Other_____*

3. FOREST RESOURCE USE

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
Forest Product	Source	How obtained	If bought, indicate current price	Distance to the source	Trips per week	Transport mode	Person for collection (Indicate age)	Amount collected per trip	Name of Species where applicable

List of wood products

Fuelwood	Poles and building materials	Farm tools/implements	**A2**	**A3**	**A7**	**A8**
Timber/poles	Arts and craft (curios)	Other	1=Forest reserve 2=Forest plantation 3=Village/communal forest 4=Own woodlot 5=Private farms/markets 6=Other____	1=Bought 2=Free collection 3=Given as gift 4=Poaching 5=Other	1=On head 2=Bicycle 3=ox-cart 4=Personal vehicle 5=Hired vehicle 6=other	1=Husband 2=Wife 3=Female children 4=Male children 5=Hired laborers 6=Contract experts 7=Other____
Charcoal	Furniture					
List of non-wood products						
Thatch grass	Game (wild animals)	Natural fertilizers from trees				
Fruits	Caterpillars	Multi-purpose medicine (fresh or dry form)				
Mushroom	Honey	Other				

4. MARKETING OF WOOD PRODUCTS: Have you been involved in the sale of the following wood products over the last 12 months?

Wood product	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**	**A13**	**A14**	**A15**
	0=No 1=Yes	If yes, how long has the household been involved?	Indicate the supply source	Distance to supply source	How obtained	Where sold	Distance to market	Major customers	Quantity sold/week (indicate units)	Unit price	Gross Sales	Mode of transport	Transport costs	Other costs	Net Revenue
Trees															
Firewood															
Charcoal															
Poles															
Sawn timber															
Semi-finished curio															
Finished curio products															
Logs															
Furniture															
Other															

CODES

A3		A5		A6		A12	
1=Forest reserve	4=Own woodlot	1=Bought	4=Poaching	1=Home	4=Urban market	1=On head	4=Personal vehicle
2=Plantation forest	5=Bought from private farms	2=Free collection	5=Other	2=Roadside	5=Hotel/Resorts	2=Bicycle	5=Hired vehicle
3=Customary forest	6=Other_____	3=Given as gift		3=Organized market	6=Other_____	3=ox-cart	6=other

5. MARKETING OF NON-WOOD FOREST PRODUCTS

Have you been involved in the sale of the following non-wood products over the last 12 months?

Non-wood products	**A1** 0=No 1=Yes	**A2** If yes, yrs. of involvement	**A3** Indicate supply source	**A4** Distance to supply source	**A5** How obtained	**A6** Where sold	**A7** Distance to market	**A8** Major customers	**A9** Amount consumed at home	**A10** Quantity sold/week (indicate units)	**A11** Unit price	**A12** Gross Sales	**A13** Mode of transport	**A14** Transport costs	**A15** Other costs	**A16** Net Revenue
Mushrooms																
Honey																
Game (wild meat)																
Fruits																
Medicine																
Insects (caterpillars)																
Baskets (weave/cane)																
Other																

6. LIVELIHOOD AND INCOME SOURCES

Has the household used the following sources of livelihood during the following months? Rank the sources by importance to the household.

Livelihood Source	**Rank**	**How much did you earn for the past 12 months (MK)**
CROP SALES		
Tobacco sales		
Maize		
G/Nuts		
Cassava		
Soybean		
Beans		
Others		
LIVESTOCK/POULTRY/FISH		
Cattle		
Goats		
Chicken		
Fishing		
Others		
FORESTS-BASED		
Selling poles		
Selling firewood/charcoal		
Selling timber/planks		
Hunting (selling game)		
Selling curios		
Carpentry		
Pit sawing		
Others		
OTHER		
Own business		
Petty trading		
Remittances		
Piece work (kind payment)		
Piece work (cash payment)		
Wage/salaried employment		
Rent/sell land		
Others		

7. HOUSEHOLD EXPENDITURE

How much cash does your household spend on the following (per week or month?)

COMMODITY	TOTAL ESTIMATED EXPENDITURE (MK)	WHO MAKES EXPENDITURE DECISION	CODE FOR DECISION MAKER
Grocery			1. Head 2. Spouse 3. Both 4. Children 5. Other, specify
Health			
Church/mosque			
Fuel			
Water			
Village contributions			
Ceremonies			
Gifts			
Beer			
Furniture			
Firewood/charcoal			
Food			
Clothing			
School fees/uniform			
Renting land			
Buying seeds			
Buying fertilizer			
Hired labor			
Other (specify)			

8. LIVESTOCK OWNERSHIP AND CONTROL

Name of Livestock	NUMBER			UNIT PRICE	ESTIMATED VALUE (MK)	WHO CONTROLS (1) Husband (2) Wife (3) Both (4) Children
	No. of Livestock	Consumed (Past 12 months)	Sales (Pat 12 months)			
Beef cattle						
Dairy cattle						
Goats						
Sheep						
Pigs						
Broiler chickens						
Layers chickens						
Ducks						
Doves						
Rabbits						
Other						
Total Value						

9. ASSET OWNERSHIP AND CONTROL

What assets do you own at your household?

ASSET	WHEN ACQUIRED		NUMBER	Unit Price**	ESTIMATED VALUE (MK)	WHO CONTROLS (1) Man (2) Woman (3) Both (4) Children
	YEAR	MODE OF ACQUISITION*				
Vehicle						
Motor-cycle						
Ox-cart						
Bicycle						
TV						
Radio						
Furniture: Dining set						
Sofa						
Bed						
Other (specify)						
Fishing net						
Fishing boat (canoe)						
Plough/Ridger						
Hoe						
Axe						
Total Value						

*Mode of Acquisition Code: (1) Cash (2) Credit (3) Inherited (4) Self-made (5) Other

**Unit Price Code: Use price paid if bought more than a year ago. If more than one year, use the current sales value.

10. ACCESS TO CREDIT

Did you obtain any credit over the last season (0) =NO, (1) = YES. If Yes:

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
Type of credit	Purpose of loan	Source	Amount	Maturity period	Grace period	Interest rate	Amount repaid	Repayment terms	Conditions for granting credit	Penalty for default	Lending mode
Cash											
Farm inputs											
Business											
Other											

CODES					
A2	A3	A9	A10	A11	A12
1=Capital for business 2=Buying food 3=Buying inputs 4=other	1=Commercial banks 2=NGOs (specify)_____ 3=Friends/relatives 4=Government 5=Informal money lenders 6=other (specify)_____	1=At once 2=Quarterly installments 3=Twice a yr. 4=Any time	1=Paying deposit 2=Declare collateral 3=Good credit history 4=Group membership 5=Knowledge of someone 6=No condition 7=other____	1=Imprisonment 2= Confiscate property 3. Blacklist	1=Individual 2=Group 3=other

11. LAND ACQUISITION AND QUALITY

We are intending to collect data related to number of gardens, mode of acquisition and so forth. For each plot, the enumerator should ask the following questions:

Plot #	C1	C2	C3	C4	C5	C6
	When acquired? (yrs.)	How acquired?	How big is the plot (ha)	Distance from homestead (km)	Priority crop on plot	How much can you ask for each of the plot if you were to sell it?

CODES

C2		C5	
1=Inherited from wife's parents	5=Allocated by chief	1=Maize	4=Beans
2= Inherited from husband's parents	6=Allocated by government	2=Tobacco	5=Cassava
3=Encroached a virgin forest	7=Other, specify_____	3=G/Nuts	6=Other, specify_____
4=Purchased			

12. LAND ACQUISITION

Is there more land in the area that could be used for farming?	Over the last farming season, have you expanded, bought, rented in, out or loaned your land?					
	Expand	Bought	Rented in	Rented out	Loaned	Sold
0=N0 1=YES	0=N0 1=YES	0=N0 1=YES	0=N0 1=YES	0=N0 1=YES	0=N0 1=YES	0=N0 1=YES
If YES, indicate sources_____	Size_____ha Source_____ Reason____	Size_____ha Source_____ Payment_____	Size_____ha Source____ Payment__	Size_____ha Source_____ Payment_____	Size_____ha Source_____ Payment_____	Size_____ha Source_____ Payment___

CODE FOR SOURCE	CODE FOR SOURCE		CODE FOR REASON (if expanded)	CODE FOR PAYMENT
1=Government forest 2=Communal forest 3=Virgin land 4=Other_____	1=Parents 2=Village headman 3=Friends/non-relatives 4=Government	5=Relatives 6=Private 7=Virgin forests 8= Virgin land 9= Other, specify individuals	1=agricultural expansion 2=settlement 3=infrastructure development 4=other	1=Free 2=Cash payment 3=Kind payment 4=Other

13. HOUSEHOLD LABOR SUPPLY AND DEMAND

Over the last 12 months, how long did it take you to accomplish the following tasks (specify days/weeks/months where applicable)?

Plot Number	*Land preparation*	*Planting*	*Weeding*	*Fertilizer application*	*Harvesting*

14. CROP PRODUCTION DATA

What are the main food crops that you normally grow on your land?

Crop grown	**Rank (importance)**	**Area (ha)**	**Amount harvested (kg)**	**When did the main food crop last? (month)**	**Coping mechanisms**	**If maize was purchased from the market, indicate source, distance and price**			**Source of income for buying food**
	Food	**Last season**	**Last season**			**Source**	**Distance**	**Unit price**	
Maize									
Soybeans									
Cassava									
Sweet potatoes									
Sorghum/millet									
Pulses (specify)									
G/nuts									
Tobacco									
Other									

CODES					
COPING MECHANISMS **(List in terms of importance)**		**SOURCE OF MAIZE**		**SOURCE OF INCOME**	
1=Reduce # of meals 2=Sale of household items 3=Hire out labor 4=Borrow money 5=Food for work 6=Selling charcoal/firewood	7=Gifts 8=Consumption of maize substitutes 9=Buy food 10=Other	1=Local market 2=ADMARC 3=Private traders	4=Friends 5=Relatives 6=Other	1=Sale of crops 2=Sale of livestock 3=Piecework 4=Selling firewood/charcoal	5=Wages 6=Remittances 7=IGA's 8=Other

15. INPUT MARKETS AND UPTAKE What input items under the following categories did you purchase last season? Probe for the following data:

Crop	**Production input**									
	Item	Quantity bought last season (specify units)	Unit price	Total spent on inputs	Where bought/obtained?		Distance to market (km)	Mode of transport to market		Transport costs incurred	Transport payment mode	
					1=Own seed 2=ADMARC 3=Private traders	*4=supermarkets 5=Farm inputs dealers 6=Local market 7=other____*		*1=On head 2=Bicycle 3=ox-cart 4=Personal vehicle*	*5=Hired vehicle 6=other*		*1=None 2=Free 3=Cash 4=Cash after sales*	*5=Deducted from sales 6=Payment in kind 7=Other__*
MAIZE												
Seed												
Fertilizer												
Chemicals/Pesticides												
Hired Labor												
GROUND NUTS												
Seed												
Hired Labor												
CASSAVA												
Cuttings												
Hired Labor												
SWEET POTATO												
Planting materials												
Hired Labor												
OTHER												

15. Crop Marketing (For households selling crops/products)											
commodity	Where sold?	Dist. to market	Mode of transport	Amount sold (units)	Unit price	Total income	Transport costs	Mode of payment	**CODES FOR** Where sold	Mode of transport	Payment mode
Maize									1=Home 5=Roadside	1=On head 4=Personal vehicle	1=None
Cassava									2=ADMARC 6=private buyers	2=Bicycle 5=Hired vehicle	2=Free
Sweet potato									3=Auction floors 7=other	3=Ox-cart 6=Other	3=Cash
Ground nuts									4=Produce market		4=Cash after sales
Beans											5=Deducted from sales
Other											6=Payment in kind
											7=Other__

17. CO-MANAGEMENT GROUP MEMBERSHIP

1. How long have you been a member? _____ What position do you currently hold? _____What portfolio(s) did you hold in the past_____
2. How did you become a member? 1=Voluntary 2= Forced by government 3=Forced by the chief 4= Other
3. Did you have prior knowledge/experience of managing forests such as raising seedlings, protection, harvesting practices? 0=No, 1=Yes. If yes, how did you acquire the knowledge?

Previous knowledge/experience	*When acquired*	*How acquired*	*Codes for how acquired*
Raising seedlings			1=Parents
Silvicultural (e.g. firebreak)			2=Extension agents
Harvesting			3=Friends/relatives
Selling			4=Formal training
Other related experiences			5=informal training
			6=Other

4. Do you belong to other groups besides co-management? 0=No 1=Yes If yes, state both the current and previous membership, the main activities, length and your roles e.g. committee member, or any portfolio

Previous Group(s)	Main activities	No. of years as a member	Any portfolio	Current membership	Main activities	No. of years as a member	Portfolio

5. Does prior experience help you in the current group, explain
   _____
   _____
6. Do you like the idea of working as a group in managing the forests? 0=No 1=Yes
7. What are the advantages and disadvantages of participating in co-management?

Advantages	*Disadvantages*

8. Can you list how co-management has assisted you to improve your livelihood?
   _____
   _____
9. What else needs to be done to enhance the benefits of co-management?
   _____
   _____
10. What problems do you face as a member of co-management and how do you address the problems?

Problem	Solution

11. What are the critical factors for achieving cooperation (and factors that affect cooperation) in managing forest resources in your area? (What makes co-management a success/failure in the area)

Success Factors	Suppressing Factors

12. If you were to be paid for participating in forest co-management activities, how much would you ask for per month? MK_____ per month.

18. Participatory Rural Appraisal (PRA) check list on forest co-management program *(Before the PRAs, obtain information – list of villages, population through mapping exercises, list all households in each village. Groups of interest include village forest committees, chiefs and local villagers).*

1. How was co-management program introduced in the area? When, by whom, why, how was it received by the community?
2. Was there any training conducted on the program? What training, by whom, purpose, usefulness?
3. Before its introduction, historically what used to happen in the past with respect to management, access and utilization?
4. Who is eligible to participate? What does it mean to participate in the program - obligations of participants?
5. What are the benefits? (Social, developmental, material or any other benefits). What are the main forest products obtained from the forest reserve and their general uses-distinguish between uses---ranking and prioritizing the main uses).
6. How is the program implemented in the block? (rules, organizational structure, leadership, decision making process, voting power, main co-management activities, who is responsible for initiating activities, the role of different committees, how they are elected, demoted, when are meetings/activities undertaken-who initiates).
7. Are there penalties for not participating in the program? How are conflicts resolved? (Roles of committees, chiefs, forestry staff in conflict resolution.
8. Was it worthwhile to introduce the program in the area?
9. What are the noticeable changes since its introduction (resource condition, accessibility and utilization-current and past situation)?
10. Are there other forest resources in the village (e.g., village /communal forests or private/plantation forests- what are their sizes, access rules and conditions).
11. What are the critical factors for achieving cooperation (and factors that affect cooperation) in managing forest resources in your area? (What makes co-management a success/failure in the area) (List all factors, vote on the most five important factors in each case—i.e., success and failure factors).
12. If the program were to be extended to other areas, what advice would you suggest based on your experience?

Annex 4.4 Mulanje Cedar Trial Plots – design and location

FORESTRY RESEARCH INSTITUTE OF MALAWI (FRIM)

and

FOREST RESEARCH (FR)

EXPERIMENT PLAN

Experiment Number:	20/5/2/2016
Experiment Title:	Comparison of survival, growth and form of three provenances of Mulanje cedar (*Widdringtonia whytei*) at eight sites across Malawi
Key Words:	Mulanje cedar; *Widdringtonia whytei*; Malawi
Background:	Malawi's national tree – the Mulanje cedar (*Widdringtonia whytei*) – occurs naturally only in the Mulanje Mountain Biosphere Reserve, and is critically endangered (Bayliss et al, 2007). The latest estimates (2014) indicate that cedar forest cover has declined from 1462 hectares in 1986 to 917 hectares in January 2014, i.e. a 37% decline in 28 years. Recent reports suggest that much of the 2014 stands have now been felled. The main cause of the cedar's destruction has been over-exploitation. Mulanje cedar is a high value softwood used for construction and joinery, and it represents an important source of income for local communities. Attempts to restore cedar forests on the mountain are ongoing but, due to its complex autecology, have been largely unsuccessful. Ultimately excessive logging and fires will lead to extinction in the natural range unless the population can be increased by natural or artificial regeneration. In addition, a diminishing population size of the remaining trees increases inbreeding depression which decreases fitness of the surviving population. A few stands of Mulanje cedar have been established elsewhere in Malawi and in neighbouring countries. Seed from these stands, along with stored seed from Mount Mulanje, provide an opportunity to establish provenance trials at a range of sites to determine the extent of adaptive variation within and been provenances. The results will enable the best seed sources to be identified for reintroduction to Mount Mulanje and for use in wider domestication. The trials will also help define the potential climate space of Mulanje cedar which will support identification of future planting sites for successful silviculture.
Objectives:	The objective of this trial is to compare the survival, form and growth of three provenances of Mulanje cedar planted at 8 sites across Malawi. The original plan included a provenance from the natural range and three from ex situ plantations. Unfortunately, the Mulanje seed source has been dropped because of poor germination. The results will inform decisions about using remaining seed sources for future planting, and will increase knowledge about the potential climate space of Mulanje cedar.
Location:	Trials will be established on 8 montane sites in Malawi, including two on Mulanje Mountain. (See below).
Species:	Mulanje cedar, *Widdringtonia whytei*.
Experiment	**Seed provenances (3)**

Treatments:

Provenance treatment codes:

Z = Zomba

C = Chikangawa

T = Tanzania

Seed sources information

Seed Source	Lat. (S)	Lon. (E)	Rainfall (mm)	Altitude (m)	Collection yr
Zomba	15°21'15''	35°17'53''	1250	1780	2015
Chikangawa	11°51'45"	33°49'16"	1800	1743	2016
Tanzania	82°8'37"	35°18'16"	1576	1930	2016

Sites (8)

Site number	Location/District	Site
1	Mulanje	Chambe
2	Mulanje	Lichenya
3	Blantyre	Chigumula
4	Zomba	Makoka
5	Zomba	Zomba Plateau
6	Dedza	Mapale
7	Viphya Plantations	Luwawa
8	Viphya Plantations	Chikangawa

(See maps and Appendix 1 for more detail).

Design:

Randomised Complete Block Design at each site.
3 provenances x 5 blocks = 15 plots per site.
Plot Size – 7x7 tree plots.

A single row buffer can be planted around each plot using spare Mulanje cedar seedlings if available or *Pinus patula* which has been tried as a nurse species.

Methods:

Nursery production

Seedlings for the trial are raised in FRIM Nursery (25°19'E, 15°26'S) in Zomba District in March 2016. Seed was sown on a seedbed and after germination; the seedlings were pricked out into black polythene tubes (10cm diameter, lay flat) following Malawian Forestry Department procedures (Igram 1983). While in the nursery, seedlings are being watered twice a day during morning and evening except on rainy days. This will however be reduced to once everyday three weeks prior to planting to harden-off the seedlings. Weeds are manually removed from the tubes upon detection and root-pruning is done wherever roots out grow the polythene containers. Seedlings were fertilized with NPK two months after transplanting. 113gms of NPK fertilizer were mixed with 15litres of water and sprayed over 2m2. Seedlings will be out-planted once they attain 20-25cm height.

	Site preparation Site preparation will involve clearing the vegetation manually, Marking for pitti ng and pitting will follow. Using a hoe, planting pits of 30 cm x 30 cm x 30 cm will be prepared at each site.
Requirements:	List all the significant resources
Records & Assessments:	**Variables** For each seedling: Survival: live or dead. Health: score on 1-5 scale and note symptoms and known causal organisms. Growth: height and stem diameter at planting and then yearly for 10 years. At each site: daily maximum and minimum temperature using Tiny tag loggers, monthly rainfall at nearest met station if available. Hard copy data sheets will be stored in FRIM Library while electronic d ata files will be stored at FRIM and Forestry Research –UK.
Statistical analysis:	Variates such as height, stem diameter, and survival will be analysed a s mixed-effects models with the interaction of site and provenance as fi xed effects and the effect of nested blocks as random effects. If trees s egregate into two different morphologies, then this can be included as a factor to test if seed origins differ in the prevalence of bushy and strai ght forms. See Appendix 2 for example analyses using R.
Duration & Responsibilities:	Likely duration of 25-years followed by long term retention
Relevant approvals:	
Health, Safety and Environment:	
Bibliography:	Bayliss, J. L., Hecht, J., Makungwa, S., Nangoma, D., & Bruessow C. (2007). Saving the Island in the Sky: the plight of the Mount Mulanje cedar *Widdringtonia whytei* in Malawi. Oryx 41 (1): 64-69. Igram C. L. 1983. Guide to nursery techniques for Eucalyptus. Report No. 83018, Forestry Research Institute of Malawi, Zomba, Malawi 7pp
Drafted by:	Dr Tembo Chanyenga, FRIM Dr Richard Jinks, Forest Research
Date:	September 2016
Design Approved:	Jack Forster, FR Statistician
Appendices:	1. Planting site details. 2. Experiment layout Sequence (plots etc.) 3. Statistical analysis

Annex 4.5 Nursery Payment Schedule

	SALARY BUDGET				SEEDLING PURCHASING BUDGET		TOTAL BUDGET		NO. OF SEEDLINGS	SEEDLING PRICE	
	Darwin		MMCT		MMCT						
	GBP	MK	GBP	MK	GBP	MK	GBP	MK		GBP	MK
YEAR 1	8,064	7,270,213	8,064	7,270,213	30,000	27,046,923	46,128	41,587,349	500,000	1	83
YEAR 2	13,709	12,359,542	13,709	12,359,542	30,000	27,046,923	57,418	51,766,007	500,000	1	104

PERFORMANCE BASED PAYMENT **= Total Budget / No. of Nurseries**

GBP	MK
4,612.80	**4,158,734.90**

PROPOSED PAYMENT SCHEDULE (This will base on activity level and depending on # of seedlings)

	FUNDS TO BE PAID				
			MK	**GBP**	**MK**
ACTIVITY DONE	**%**	GBP (10)	10 GROUPS	ONE GROUP	ONE GROUP
Nursery Construction (NC)	10	4,612.8	4,158,734.90	461.28	415,873.49
Pot filling (PF)	15	6,919.2	6,238,102.35	691.92	623,810.24
No. of young cedar (NYC)	20	9,225.6	8,317,469.80	922.56	831,746.98
10cm high saplings (SH)	25	11,532.0	10,396,837.25	1,153.20	1,039,683.73
Buying time (20 -25cm)	30	13,838.4	12,476,204.70	1,383.84	1,247,620.47
	100	**46,128.00**	**41,587,349.00**	**4,612.80**	**4,158,734.90**

Annex 4.6 Project Dissemination

Summary of press coverage in Malawi

Prepared by Kondwani Chamwala, Environmental Education and Communications Officer, MMCT

The “Save our Cedar” project received notable press coverage in its initial year. The official launch on 8th June 2016 attracted media coverage from both print and electronic. The following covered the event; Malawi Broadcasting Corporation (MBC television and Radio), Times (Television, Radio and Newspaper), Joy (Television and radio), Nation through Malawi News Agency, Zodiac Broadcasting Station (ZBS) and Mnzati Community Radio.

After the actual start of the project, there has been follow up stories especially on the State Owned broadcaster, MBC and Mnzati Community Radio.
Mnzati Community, which broadcasts in a vernacular language but broadcasts to about 5 districts close to Mount Mulanje, has been frequently asking for guest to speak on myths surround the planting of cedar. Some of the leaders from cedar groups have been featured on the radio as well.

In addition, the project has been highlighted in the Sapitwa Newsletter in both English and Chichewa languages. Sapitwa Newsletter is a Mulanje Mountain Conservation Trust newsletter that enjoys wide readership both around Mount Mulanje and beyond.

Leaflet printed and distributed at project launch

Mulanje Cedar akusoweka thandizo lathu

Kwa nthawi yaitali anthu ambiri amakhulupilira kuti Mulanje Cedar ndi chozizwa chochokera kwa Chauta. Kotero palibe nzeru ya munthu imene ingathe kuteteza mitengoyi kuti isathe mphiri kaamba kakuti Cedar sadzalidwa.
Koma kafukufuku watsimikiza kuti Cedar wambiri yemwe agwiritsidwa ntchito lero anadzalidwa kalekale. Mwachitsanzo, misitu ina ya Sombani, Chambe, Lichenya ndi Fortlister inachita kudzalidwa.
Cedar wina anakadzalidwanso ku Zomba ndi ku Chikangawa ndipo anachita bwino. Kotero nzotheka kubwedzeletsa mtengowu.

Ngati mukufuna kudziwa zambiri;

Mulanje Mountain Conservation Trust
P.O. Box 139,
Mualanje, MALAWI

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Ndondomekoyi ikuyendetsedwa ndi Nthambi ya za Nkhalango, Botanic Gardens Conservation International komanso Mulanje Mountain Conservation Trust ndi thandizo lochokera ku U.K. kudzera ku Department for International Development (DfID)

SAVE OUR CEDAR

MALAWI'S NATIONAL TREE

Links to project web pages

http://www.bgci.org/where-we-work/malawi/

http://globaltrees.org/projects/save-our-cedar-malawis-national-tree/

http://globaltrees.org/news-blog/save-our-cedar-working-together-to-save-malawis-national-tree/

Checklist for submission

	Check
Is the report less than 10MB? If so, please email to Darwin-Projects@ltsi.co.uk putting the project number in the Subject line.	Yes
Is your report more than 10MB? If so, please discuss with Darwin-Projects@ltsi.co.uk about the best way to deliver the report, putting the project number in the Subject line.	No
Have you included means of verification? You need not submit every project document, but the main outputs and a selection of the others would strengthen the report.	Yes
Do you have hard copies of material you want to submit with the report? If so, please make this clear in the covering email and ensure all material is marked with the project number.	No
Have you involved your partners in preparation of the report and named the main contributors	Yes
Have you completed the Project Expenditure table fully?	Yes
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