



Case studies of nurseries in Malawi

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Publication date:
2007

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Namoto, M., & Likoswe, M. G. (2007). *Case studies of nurseries in Malawi*. Skov & Landskab, Københavns Universitet.



Forest & Landscape

UNIVERSITY OF COPENHAGEN

Working Papers
No. 20-2007
Development and
Environment

Case studies of nurseries in Malawi

M. Namoto and M.G. Likoswe



World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES



Forest Research Institute
of Malawi

Title

Case studies of nurseries in Malawi

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Publisher

Forest & Landscape Denmark,
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Series-title and no.

Forest & Landscape Working Papers no. 20-2007 published on www.SL.life.ku.dk

ISBN

ISBN 978-87-7903-320-7

DTP

Melita Jørgensen

Citation

Namoto, M. and M.G. Likoswe. Case studies of nurseries in Malawi. *Forest & Landscape Working Papers* no. 20-2007. *Forest & Landscape Denmark*

Citation allowed with clear source indication

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Preface

This study of 42 case studies of nurseries was made as part of a major sample survey of 360 nurseries in 6 districts in Malawi (see Preface under Mvula & Lillesø, 2007). The purpose of the study was to let the small nurseries in the country explain in their own words how they manage the following aspects of their nursery work:

Deciding on species to collect and mother tree
Number of mother trees and flowering trees around
Collection of seed
Output and distribution (markets)
Nursery management options
Customers
General opportunities

Note: Species names in the document have been edited to conform to a common language and spelling (either english vernacular or botanical names). In cases of unidentified species, the local language name is given.

The assessment was made within the framework of Improved Seed Supply for Agroforestry in African Countries (ISSAAC), a Danida supported programme implemented in cooperation between *Forest & Landscape Denmark* and World Agroforestry Centre (ICRAF).

The overall objective of the assessment was to contribute to an improved seed supply to tree planting farmers in Malawi and the immediate objective is to contribute to a comprehensive understanding of opportunities and constraints for improving seed systems for agroforestry in Malawi.

ISSAAC carried out surveys on different aspects of tree seed systems in Burkina Faso (with a focus on villagers' use of seed), Kenya (with a focus on sources of reproductive material), Malawi (with a focus on small-scale nurseries, and Uganda (with a focus on non-governmental organisations and community-based organisations).

The surveys are documented in the following reports:

Ræbild, R., Bassirou, B., Lillesø, J.P.B., Yago, E. L. and Damas, P. 2004.

Farmers' planting practices in Burkina Faso. A survey carried out by the project 'Improved Seed Supply for Agroforestry in African Countries' (ISSAAC). *Forest & Landscape Working Papers no. 5-2004.*

Mbora, A. and Lillesø, J.P.B. 2007.

Status of tree seed and vegetative sources of various organisations in Kenya: Mt. Kenya Area as a Case Study. Development and Environment Series No 9-2007. *Forest & Landscape Denmark.*

Mvula, P. and Lillesø, J.P.B. 2007.

Tree Seedling growers in Malawi – who, why and how? Development and Environment Series No 5-2007. *Forest & Landscape Denmark.*

Namoto, M. and M.G. Likoswe. 2007.

Case studies of nurseries in Malawi. *Forest & Landscape Working Papers* no. 20. 2007.

Brandi, E., Lillesø, J.P.B., Moestrup, S. and Kiseru, H.K. 2007.

Do organisations provide quality seed to smallholders? A study on tree planting in Uganda, by NGOs and CBOs. Development and Environment Series No 8-2007. *Forest & Landscape Denmark*.

In addition to the above surveys, two preliminary baseline studies were conducted in Uganda (a district study of nurseries and farmers) and in Malawi (a preliminary investigation of organisations involved in seed supply).

Asare, R. and Pedersen, A.P. (2004).

Distribution of Tree Seed and Seedlings. A survey conducted in Kabale District, Uganda. The ICRAF/Danida Programme on Improved Seed Systems for Agroforestry in African Countries (ISSAAC). *Forest & Landscape Working Papers* no. 2-2004.

Pedersen, A. P. and Chirwa, P. W. (2005).

Tree seed in Malawi. Organisational survey. *Forest & Landscape Working Papers* no. 8-2005.

Methodology

This study comprises a 2-stage sampling of the survey districts. The districts were purposely selected taking into account Population density and Environment variation. Taking the above into account, six districts were selected. Research Assistants were then sent out to the six districts to take stock of the nurseries in the districts. Every operator in the district was listed and all the nurseries were listed recording the sizes and location of the nurseries. After obtaining a complete list of nurseries in the district, the nurseries were stratified by size beginning with the smallest to the largest and divided into four groups. Fifteen nurseries were then randomly selected for interviews from each group giving a total of sixty nurseries per district.

Research Assistants were then trained to conduct the interviews based on the questionnaire that had earlier been prepared. FRIM technicians had been trained in doing case studies but since the nature of their work is more technical, more experienced research assistants who have been doing this type of work before, were oriented in the case studies as well (the complete case studies are published separately from this document. Extracts from the case studies are used in the present document to illustrate particular points in the present report). This was aimed at providing a balance of the information to be collected. After the training, the survey instruments were pre-tested in Zomba and necessary adjustments made to the instruments.

Thereafter the team left for data collection.

Acknowledgements

This study would not have materialized was it not for the goodwill of the nursery owners that responded to the questionnaire and were willing to give their life histories. To all the respondents, the authors of this report owe great gratitude.

The authors also wish to thank the Research Assistants and Technicians for the professional and hard work that they did. They spent sleepless nights writing reports so as to keep up with time. The Research Assistants included Mr. James Mwera, Mr. McDonald Chitekwe, Mr. Patrick Msukwa, Miss Monice Kachinjika and Miss Monica Kububa. The technicians comprised Mr. M. Namoto and Mr. M.G. Likoswe. In the same line we would like to thank the very hard working drivers from FRIM for safely driving the teams around.

Last but not least, Management at FRIM deserve special thanks. Special mention is made of Dr. Kayambazinthu and Dr. Chilima for supporting the survey team and process technically, morally and financially.

We are grateful to the Foundation - G.B. Hartmanns Fond - for making it possible for J.P.B. Lillesø to write up and finalise the present document as part of a more general assignment of documenting tree seed supply in the tropics.

Abbreviations

ADMARC	Local Administration Office
Chibuku	Chibuku powdered beer
FRIM	Forest Research Institute of Malawi
ICRAF	World Forestry Organization
ISSAAC	Improved Seed Supply for Agroforestry in African Countries
JICA	Japan International Cooperation Agency
K in front of a number	Kwacha (Malawi currency)
MASAF	Malawi Social Action Fund
NGO	Non-governmental Organization
T in front of a number	Tambala (Malawi currency)
VNRMC	Village Natural Resource Management committee

Contents

Preface	i
Methodology	ii
Acknowledgements	iii
Abbreviations	iii
Contents	v
LILONGWE	1
LILONGWE - Respondent: Likiasi D. Chindenga	1
LILONGWE - Respondent: Eliza Samson	6
LILONGWE - Respondent: Stanley Sainani	9
LILONGWE - Respondent: Chimwemwe Moyo	12
LILONGWE - Respondent: Mr. Maganizo Nchoka	15
LILONGWE - Respondent: Mrs. Veronica Kanyalang'omba	19
SALIMA	23
SALIMA - Respondent: Tereza Edison/chairman	23
SALIMA - Respondent: Kozekani Banda	26
SALIMA - Respondent: Joseph Machado	28
SALIMA - Respondent: Mr. Gift Ntauchira	32
NKHATABAY	35
NKHATABAY - Respondent: Lucy Nkhoma	35
NKHATABAY - Respondent: John Kondowe	38
NKHATABAY - Respondent: Mr. Charles K. Gondwe	41
NKHATABAY - Respondent: Evans Zulu Mwale	43
NKHATABAY - Respondent: Washington S.C. Banda	46
NKHATABAY - Respondent: Hasting Nyirongo	49
BLANTYRE	52
BLANTYRE - Respondent: Mr. Joseph Mawala	52
BLANTYRE - Respondent: Mr. Lewis Kaliati	55
BLANTYRE - Respondent: Mr. Kanifa	58
BLANTYRE - Respondent: Mr. John Saidi	60
BLANTYRE - Respondent: Mr. Austin Samson	62
BLANTYRE - Respondent: Mrs. Senate Elias	64
BLANTYRE - Respondent: Mrs. Kambewa	66
BLANTYRE - Respondent : Mr. James Kwenje	68
BLANTYRE - Respondent : Mr. Mkwichi Chisale	70
CHIKWAWA	72
CHIKWAWA - Respondent: Mr. Thomas Khonje	72
CHIKWAWA - Respondent: Mr. Amos Masangano	75
CHIKWAWA - Respondent: Mr. Jackson Saikande	78
CHIKWAWA - Respondent: Mr. Wilfred Mchacha Sintilawo	80
CHIKWAWA - Respondent: Mrs. Veronica Harry	82
CHIKWAWA - Respondent: Mr. Patrick Kusowa y	84
CHIKWAWA - Respondent: Mr. Yohane Zing'ando	87
CHIKWAWA - Respondent: Mr. Steal Mite	90

MWANZA	92
MWANZA - Respondent: Mrs. Chimphonda	92
MWANZA - Respondent: Mr. Benito Chingwetsa	96
MWANZA - Respondent: Mr. Steven Maliseni tree nursery	101
MWANZA - Respondent: Mr. Benson Pawindo	103
MWANZA - Respondent: Mr. Kasapha Nursery	104
MWANZA - Respondent: Mr. Lackman Patrick Nursery	104
MWANZA - Respondent: Mr. Henderson Chaphankhani Nursery	108
MWANZA - Respondent: Mr. Peter Beselemu Mwangidzi Tree Nursery	110
MWANZA - Respondent: Mr. Mavuto Fedsoni Nursery	112

LILONGWE

LILONGWE

Respondent: Likiasi D. Chindenga

Gender: Male

Introduction

Mr Likiasi D. Chindenga was born on 27th August 1963; he is 40 years old and has a wife and four children at the moment. He was born in the village of Mgombe, Traditional Authority Kalumbu and learnt at Mtenthera Primary School up to std. 8. He obtained his standard 8 certificate in 1981, but did not manage to go to Secondary School because of lack of money and somehow lack of good guidance.

In his course of life, he married at a nearby village on 27th August 1988 and their main source of economic activity is farming. They grow crops like maize, (MH 18 and local,) Tobacco (Barley), Groundnuts (Malipinta), and Beans (Nanyati, Khalatsonga and Anapilira). He is an original inhabitant of the area and started his nursery work in 1997, he learnt about tree nurseries in the village, in the Assemblies of God Church, which is close to his house, (taught by Forest department). He has a nursery, which is about 700 metres away from his house, there are two species in his nursery and these are *Senna* species and *Eucalyptus* species. The respondent has a total of 9,200 seedlings; *Senna* species have 4,200 seedlings whilst *Eucalyptus* species have 5,000 seedlings.

Deciding on Species to Collect and Mother Tree

Both species in the nursery were collected; of course some of the seedlings for both species were given to him by the forest department. When he saw that the seedlings given to him were not enough he collected himself from his own trees that are close to the nursery. He determines the species to collect seed from by the mother trees that he has and from encouragement by NGOs like NASFAM. This season NASFAM encouraged him to sow *Eucalyptus* species because they said they will buy some of the seedlings so that they would distribute to other farmers.

He also admitted that seeds for *Senna* species and *Eucalyptus* species are very close to his nursery and he has a small forest about half a kilometre away, which has a lot of *Senna* species and *Eucalyptus* species. Also *Eucalyptus* species are very good for poles used for constructing houses, an example was given where he showed me his house built of *Eucalyptus* species poles. He said, “*Bluegum ndidamukonda chifukwa cha phaso, mwachitsazo nyumba yanga ili apoyo ndidamangira Bluegum ochita kutchyola ku khalango yanga yanga*”.

The respondent said that, Mr Chigalu an extension worker for forest taught him that for him to choose which mother tree to collect seeds from, for *Eucalyptus* species the tree has to be straight and must have enough seeds. On the other hand *Senna* species must have mature seeds and the tree must have enough seeds. This, he said is followed and on top of that, the area has a lot of *Senna* species and *Eucalyptus* species which were planted long time

ago which makes him not to have a choice but to look at those trees that are near as they are many.

He added to say that, it is very easy to find the mother trees in the area because they are everywhere in the village and even just close to his nursery; about 20 metres away he has enough mother trees. Usually when he cannot find the species that he wants he asks for some from the forest department and some of his friends that have nurseries. If both options fail there is nothing he can do. He said, “*Basitu ndiye mzeru zanga zathera pompo, ndiye ndinagosiya nanga ndikayitenga kuti, poti podalirapo palibenso*”.

Number of Mother Trees and Flowering Trees Around

Senna species was collected from three mother trees that are very close to the nursery whilst *Eucalyptus* species was collected from one mother tree. *Senna* species was collected from three mother trees because the seeds were not that good, they were not mature. For *Eucalyptus* species, he used one tree because the mother tree was straight and had enough mature seedlings. The trees are surrounded by other trees of the same species with a number of natural trees like *Acacia* species. There are about seven cashew and approximately about 10 natural trees.

Collection of Seed

He does collection of seed; to collect *Eucalyptus* species seeds he uses a hook to cut off branches that contain the seeds. He then removes the leaves from the branch and puts the remainder into a pot “mbiya”, and then he puts it on the sun for three days. On the same day, thus the third day he removes the fruit/capsule and he sieves the seeds, which makes the good seeds to remain in the sieve and the bad ones go down. He said, “*pakhani yotolera mitengo ndimachita ndekha, ndikamakatola bluegum, ndimagwiritisa ntchito ngovi kuthotholera nthambi imene ili ndi njere. Kenako ndimasaza timasamba timene tatsalira kumitengo tija nkukayika m’mbiya, ndikuyanika pa dzunwa kwa masiku atatu, pa tsiku lachitatu lomwelo ndimaomba mbewu ija kuti ndiyoyole njere kenako ndikusefa. Njere zabwino zimatsala mu sefa muja pomwe zoyipa zonse zimapita pansu*”.

For *Senna* species he said, he looks at how mature the seeds are in the trees, when he sees that they are mature he climbs in the tree with a bag and plucks the Fruits that contain the seeds and puts them into the bag. When he gets down with the bag he hits the bag with a stick to separate the seeds from the capsule. He said, “*Senna species ndimadikira kuti akhwime kaye mutengo momwemo, ndikaona kuti wakhwima ndimakwera mumtengo ndi thumba ndikumathothola nkumaponya musakamo kuopa kuti ukazipangira nkha za ziyoyokamo zonse. Ndikatsika ndimapondaponda sakalo kapena kumenya ndi mtengo waun’gono kuti nditsale ndi njere zokha*”.

Upon being asked when he starts collecting the seeds, he said that for *Eucalyptus* species he waits to see the maturity of the seeds, when the seeds are mature he just sees the seeds falling and they crack, the seeds also turn from green to brown. He said, “*Timaona m’mene zankhwimira njere chifukwa nthawi ikangopita umangoona kuti zayoyokamo. Njere zikankhwima ziman’gambika ku kamsonga kwake komanso zimachoka mtundu wa green zimapita ku brown, zimango-*

tunwa mbuu! For cashew, he said it is very easy to see when to start collecting the seeds because the fruits totally change from the green colour to dark brown colour and the fruits which are mature are very smooth and easy to open once they fall on ground. He reported, “*Zonkhwima sizichedwa kusweka zikagwa pansu*”.

It does not take him a long time to collect seeds, for *Senna* species it takes him three to four days but if the tree is very good and has enough mature seeds it takes him a day. For *Eucalyptus* species it takes a day because most of the times *Eucalyptus* species mother trees have enough mature seeds. He said, “*bluegum ukatola pang’ono njere zake zimakhala zamhiri wasiyana ndi casius*”. It is very easy for him to transport the collected seeds, as already explained the mother trees are very close to the nursery and his house, he carries the seeds in a bag and sometimes he just puts them as a bunch and collects using his hands to his house. He stores both species on a cloth, he ties the ends of the small cloth and he keeps them in the house far away from water to avoid rotting. The respondent has two ways of taking care for seeds from the time he collects the seeds to the time he sows, for *Eucalyptus* species he said, he burns all the unnecessary things on the nursery and he digs the nursery and after that he collects the seeds that were on the cloth and put them little by little in a matchbox mixed sand and he spreads on a bed. He said, “*Ndimakawotcha nazale yanga, kuwotcha maudzū ndi tizilombo kenako ndi kupunthapuntha pa nazale paja kenako ndikufetsa. Ndimatenga njere ndikut-sira ku kachibikiti ka machesi mosakaniza ndi m’chenga ndikumawaza ndatipula paja*”.

The other way is that he just takes care of his nursery by digging the nursery and on top he puts sand and mixes the two together and he sows. He also uses a matchbox where he puts sand and seeds in the box and spreads on the dug place. He said, “*Njirayina imene ndimagwiritsira ntchito ndiyongolima pa nazale paja ndikutsira mchenga pamwamba ndikusakaniza ndi dothilo kenako nkufetsa, ndimatenga chibikiti cha machesi mosakaniza ndi mchenga ndikumawaza paja ndalima paja*”. He usually mixes sand and the soil so that the seeds should not fall on one place.

Senna species, he said, is just put on the cloth and stored in the house and he later uses germination process, which will be explained later in the report. It takes a month from the time he collects seeds to the time he sows. There are no major problems that he encounters but the only problem is that sometimes collection becomes a bit difficult, as it is not easy to know the real difference between mature and immature seeds. Some seeds look mature and when he sows the seeds, they do not germinate.

On germination for *Eucalyptus* species he said, he just sows straight on the bed at the field, this is after he has already done his process of putting the seeds in a pot (mbiya) and after sieving and storing. He then waters the seeds twice every day and after four days the seeds grow, that is if good seeds were collected. For *Senna* species water is boiled and he leaves water to cool and he takes one cloth containing seeds and throws it in the water and leaves the seeds for 2 days. On the second day the cloth is removed from

the water and left anywhere to drain the water, after 2 hrs the cloth containing seeds is put in a plastic bag and stored in the house for 2 days. If the collected seed was mature it starts to grow inside the cloth and the shoots are seen just outside the cloth and then it is ready to be put in tubes in the nursery. He said, *“Timaphitsa madzi kuti afike pa size yoti munthu atba kusamba m’maso, ndiye njere zimakhala zitamangidwa mu nsalu zosiyana siyana, timatenga nsalu imodzi nkuponya madzi muja ndikusiya Kwa masiku aviri keneko ndikud-zayichotsa m’madzi muja ndikuyisiya mavola aviri kuti ikhe madzi. Tikatero timayikulunga nsalu ya njere ija mu plastic paper ndiye mbewu zabwino pakapita masiku aviri zimayamba kumera, pa tsiku lachiwiri lomvelo timamasula pepala ndi nsalu ija ndikuyamba kuyidzala m’matube ndikumayitsilira”*.

The problems that are encountered in germinating the seeds are as follows,

- Some of the seeds do not germinate if they were collected when immature or sometimes when watering the seeds some of the seeds are washed away if the seeds were not sown properly. The seeds also do not germinate if the boiled water killed the seeds. He said, *“madzi akatethetsa nthawi zina amapha mbewu zathu zija ndiye sizimera”*.
- High labour demand because of lack of implements like water canes, wheelbarrows that can at least reduce the work of carrying water and sand on the head.

The species that he has in the nursery he said, do not take a long time to produce as already explained when *Eucalyptus* species are on the bed it takes only 2 days and for *Senna* species soon after they are put in a plastic paper it takes 2 days.

Output and Distribution

Customers are very difficult to find he said, he has people surrounding the area who buy less from him and sometimes he puts some trees close to the tarmac road and by chance people passing by order and they buy from him. It was reported that he has no specific customers and that sometimes the trees dry out because of lack of customers. The people surrounding the area do not buy much as some of them do not understand the necessity of buying a tree to plant. From the two species that he has in the nursery, *Senna* species are more important because it helps to improve soil fertility in their gardens because of its leaves which fall down and form manure and also provides very good shelter. He said, *“Senna species amathandiza chonde kumunda chifukwa cha masamba ake ndipo amapereka nthuzi wabwino pomwe bluegum masamba ake sayoyoka wamba ndiye chonde m’manda sichikhalamo”*.

As already explained he has no specific customer as people do not see the need of planting trees in the area. People just come to buy 1 or 2 trees and they go. Only once a certain man passing the tarmac road ordered 100 trees and he bought, he does not remember where the man came from. He has sold a new species once *Senna* species and he used the same way of selling, by putting some trees on the tarmac road and surrounding people also used to buy once in a while. A lot of seedlings dried because of lack of customers.

Prices of species he once sold:
cashew 1 kwacha/tree in 1997
Senna species 5 kwacha/tree
Eucalyptus species 5 kwacha/tree

Nursery Management Options

He uses polythene tubes given to him by Mr Chigalu, an extension worker from forest department and for this season, also gave him polythene tubes. *Senna* species goes straight into the tubes whilst *Eucalyptus* species are transferred from seedbed to the tubes in the nursery. The potting soil is taken from the field; he said he uses soil that does not have a lot of manure to avoid killing the seeds. He mixes the soil with sand that is collected along the tarmac road, the sand is dug using a hoe and is collected in an already used fertilizer bag. The soil collected in the field is “*makande*”, which as already explained, is mixed with sand. The respondent does not produce bare root seedlings and he said he does not use shade because he has a lot of work to do, however he admitted that shades are good as they protect the trees from dying due to too much sun. He does use vegetative propagation. He takes water from unprotected well, which is about a kilometre away from his house. To improve germination as already explained he puts the seeds in water for two days and thereafter there is no special treatment, the seeds are then watered frequently, twice or thrice a day in the nursery.

Customers

It is about half a kilometre to the tarmac road, if people are footing they walk for about 25 minutes from the village to the tarmac road. The nearest forest to his nursery is his personal forest, which is a kilometre away and contains three species and these are, *Acacia* species, *Senna* species and *Eucalyptus* species. He does not have a lot of customers; he only has about ten customers. The customers buy very few trees, most of them are within the village and they walk about 700 metres to the nursery.

General Opportunities and Constraints in Nursery Management

The respondent is in contact with other nurseries; the benefits that he sees from this contact are;

- Sharing of information/knowledge about nurseries
- Finding of private customers through those nurseries. He said, *anthu timawuzana za anthu ena amene akufuna kugula mitengo ya mtundu umene mzanthu adadzala*”

The only main opportunity that he sees is that he has a choice to the best trees to plant for himself, as result he plants very good trees and that he can make a very good woodlot anytime he wishes.

The constraints for his business are;

Constraints	How they can be overcome
<ul style="list-style-type: none"> No market as a result some of the trees dry up 	<ul style="list-style-type: none"> The government should provide very good market for farmers.
<ul style="list-style-type: none"> Limited tree seedlings especially fruit seedlings are scarce 	<ul style="list-style-type: none"> Forest department should provide seedlings to farmers.
<ul style="list-style-type: none"> Lack of inputs/implements i.e. watering cans and shovels. 	<ul style="list-style-type: none"> Forest department should provide enough inputs and implements.
<ul style="list-style-type: none"> Limited tubes given which determines how many trees one can grow that season 	<ul style="list-style-type: none"> Enough tubes should be given to tree nursery farmers
<ul style="list-style-type: none"> Scarcity of water 	<ul style="list-style-type: none"> The respondent had no solution to this water problem he said "this problem is difficult to deal with, maybe the government can help".

Conclusion

The interview was very good, the respondent answered very well and he was very happy to hear that he was one of the selected respondents from the long list.

LILONGWE

Respondent: Eliza Samson

Gender: Female

Participation of the Respondent

An interview was conducted with Eliza Samson, a wife to Mr Samson who owns a nursery and assists each other in day-to-day activities of the nursery. The participation of the respondent was not all that good, it seems she has a faint idea of other activities that take place in the nursery. However a little information was collected from her.

Introduction

Eliza Samson is a female-aged 22, She is married and has 3 children. She did her primary education at Chiguwe primary school in Salima and left school in Standard 4 because she became pregnant. The main source of income of the family is business; they sell different types of fruits and sometimes flitters and *zitumbuma* at Chitedze market. They sometimes do a bit of farming and they grow maize (MH18) and groundnuts (CG1). They have a nursery, which is within their home yard. The nursery has just started this year. They learnt skills of running the nursery in the village at Mrs Mboundoma's house (extension staff forest).

Deciding on Species to Collect and Mother Tree

There are nine species in the nursery and these are *Acacia* species, *Faidherbia albida*, cashew, *Senna* species, *mvunguti* (species not identified), mango, *Uapaca kirkiana* and papaya. The species that he collected himself are *Senna* species, cashew, mango and *Faidherbia albida*, the rest of the seeds were given to him by Mrs Mbondolo (forest extension staff). The species to collect seed from is determinate by the maturity of the seeds in the tree, and availability of surrounding trees. Choice of mother trees to collect seed from is determined by

availability of enough matured seeds in the trees. If he cannot find the species he wants, he asks the extension staff from forest and also people far away from the area but if both options fail there is nothing he does, he just relies on available species. Like *Senna* species which is everywhere around the village.

Number of Mother Trees and Flowering Trees Around

Cashew was collected from four mother trees, *Senna* species was collected from six mother trees and mango were collected from four mother trees. The respondent said she does not know how many mother trees the husband used to collect *Faidherbia albida* as it was collected from Msalu village, which is 97 km away from Chitipi (where they are staying at the moment). They used this number of mother trees depending on maturity of seeds in the mother trees, when the seeds are enough they stop collecting as it has met their requirements. Other trees of the same species surround the trees; there are a lot of cashew, *Senna* species and mango trees in the area, which are of course very close to the nursery.

Collection of Seed

The nursery owner uses different methods of collection depending on species collected and these were explained as follows;

Cashew. When the fruits are mature, they fall down, which makes them to open and the seeds remain on the ground, they pick up the good seeds from the ground into a plastic paper and they keep the seeds at home.

Senna species. They climb into the trees when they see that the seeds are mature (mature seeds change colour from green to brown) and they pluck one by one into a plastic paper.

mango. When the *mango* are mature and some are ripe they eat the mango and they keep the seed.

Faidherbia albida. They use a stick to get the fruits down, the fruits fall down and they are collected in a plastic bag. Mrs E.Samson does seed collection with the help of the husband.

For them to decide when to collect the seeds it depends on species, *Senna* species is collected when mature. They know that the seeds are mature when colour of the seeds changes from green to reddish and when the fruits are closely looked at they have a crack and sometimes the seeds are even seen through the crack. She said, “*Timaonera kunkhwima kwa zipatso chifukwa zipatso zimasintha mtundu kuchoka ku green pamene zikankhwima kupita ku Red ndipo ukapenyetsa umatha kuwona kuti zipatso zija zathetheka ndipo nthawi zina umatha kuona njere zikusuzumira*”.

Cashew is collected when the fruits fall down without anyone tampering with them and that is a sign of maturity. When the fruits fall, they are able to differentiate the mature seeds and the immature seeds as the mature seeds are smooth and they are a bit heavy whilst immature seeds have wrinkles and they are not heavy. *mango* are collected when they are mature, they have small dots on them which is a sign of maturity and they are not very green. This is the right time to collect mango for seeds, the immature mango are very green and do not have dots on them. *Faidherbia albida* is collected when mature, they know that the

seeds are mature as the fruits change colour from green to dark brown.

It takes them four months to collect cashew seeds, three months to collect *Senna* species seeds, three days to collect mango seeds and one day to collect *Faidherbia albida* seeds. *Senna* species and cashew takes them a long period of time as it is very difficult to find a Mother tree which has enough mature seeds within a day and also because they have a lot of work to do as they have to go for business and to the field as a result collection is only done 1hr of the day, in the morning. Sometimes *Senna* species and cashew has a lot of immature seeds, which makes them to pick a few from a lot of seeds. All the species are kept in a plastic paper in the house, a place where it is not very hot to avoid “*kuphikika kwa mbenu*” The following things are done to take care of the seeds from the time they pick the seeds the time they sow.

A. Cashew. After collection of seeds from the ground closer to the mother tree, at home they also select the good seeds into a plastic paper until the seeds reach the required level. They later boil the seeds for about five minutes to make the seeds soft and then they sow two seeds in one polythene tube.

B. *Senna* species. When the fruits are collected from the trees into a plastic paper, at home they separate the fruits from the seeds. They use hands and sometimes they use a very small stick by hitting the bag. The wanted mature seedlings are taken and kept into a plastic paper until the seeds collected are enough. The seeds are boiled for five minutes and then sowing is done where two seeds are sown in one tube.

C. mango. When the seeds are taken from an eaten mango, they put the seeds on a mat so that the sun dries them for about a week and seeds are sown on a seedbed and watered, for three weeks. Thereafter the mango start to shoot.

D. *Faidherbia albida*. *Faidherbia albida* is kept in a cup where they mix water and the seeds for 3 days and on the fourth day the seeds are transferred from the cup into the nursery where they sow single seed in a polythene tube. It does not take them a long period from the time they collect the seeds to the time they sow but it depends on how they collect the seeds. When the seeds are enough all processes are started immediately and seeds are sown, (she was unable to state the specific period taken).

The respondent said that they have only one major problem, the problem is that there is too much work during collection as immature seeds are many and that makes them to collect a few in a day. She stated that to germinate the seeds, she boils the seeds (only cashew and *Senna* species) and for mango she just waters the mango three times a day. Lastly for *Faidherbia albida*, she puts them into a cup of water for two days and transfers into tubes in the nursery and watering is done twice everyday. There is only one major problem during germination and sowing, the problem is that seeds sometimes do not germinate because of poor collection. *Faidherbia albida* takes the longest to produce seedlings. It takes a month. The quickest species are mango, cashew, *Senna* species and *Acacia* species. These only take one week.

Output and Distribution

The nursery has only started this year hence they have never sold their seed-

lings before. They might try to sell this year and she said, they will carry their trees to the nearest trading centre (Chitedze) for sell and also they will ask assistance from extension workers so that they help them to find market. The most important species are cashew because it does not take a long period of time to grow and also that; it is very good for firewood.

Nursery Management Options

For them to start raising seedlings, they get potting containers from forest Department, they collect soil from the field, they dig their nursery and collect soil that has a lot of manure. The manure is mixed with the collected soil and it is placed into the polythene tubes. The soil that is taken from the field is called katondo, they also produce bare root seedling. They use shade. She said, *“Timangofetsa Nkuphimbapo udzu kuti padzikhala chinyontho Komanso udzu uja umathandiza kuti mbewu zisamaonongeke ndi dzuma.”* They do not use vegetative propagation. To improve germination as already explained they just boil the seeds and for *Faidherbia albida* they put it in water for two days to improve germination. Water is taken from the borehole 300 metres away from the Nursery.

Customers

Their household is 200 metres to the tarmac road and about 1 km to the nearest forest. (As explained already they have no customers as they have just started their nursery).

General Opportunities and Constraints in Nursery Management

The are both not in contact with other nursery managers, she says because they have not thought about it and also because it is a new nursery. May be in Future they might think about visiting nursery owners she explained. The Biggest opportunity that she sees in the business is that at least a person is able to get money for salt if a lot of seedlings are sold and this can be fulfilled if One works extra hard. There are only two major constraints for the business, and these are; Seed collection is a very tough process and watering is another problem. (This problem cannot be solved as in nurseries, no matter what collection and watering is inclusive).

No markets. (This can be overcome if the forest department assists farmers by finding market for them).

LILONGWE

Respondent: Stanley Sainani

Gender: Male

Introduction

Mr. Stanley Sainani's tree nursery is in Traditional Authority Njewa, Chithope village under Extension Planning Area Chitipa. It is an Individual nursery owned by a 26 year old farmer. The main occupation of the nursery owner Mr. Sainani is maize farmer. He grows maize and vegetables for sale in the 'dambo' area. This year, he decided to raise tree seedlings in the

'Dimba gardens'. He has not constructed a fence for his seedlings like most nursery managers do but decided to raise the seedlings in the maize field, between rolls of maize.

The species raised are; *Eucalyptus* species and *Senna* species. The total number of seedlings in pots is 820. The seedlings that are not yet pricked out are over 1300 on a seedbed. The seedlings raised are not for sale, he said. He said he wanted to increase the number of trees in the woodlot that his grandfather established. The main species and most important species in his nursery is *Eucalyptus* species. He has already potted 620 seedlings of *Eucalyptus* species, 200 seedlings of *Senna* species. The seeds used in establishing this nursery were all locally collected.

Deciding on Species to Collect and Mother Trees

The species locally collected by himself were; *Eucalyptus* species, *Senna* species. For him to start raising these trees. He said "Ndimasilira pa nkhani ya mitengo. Monga ndimadziva kufunika kwamitengo". He said terms of providing fuel wood, he thought of collecting *Senna* species. He said this species is good at firewood also when you peel the bark of *Senna* species, the wood will dry very quickly and can be used for fuel wood in a shorter period of time. He said he decided to collect and raise *Eucalyptus* species seeds for the following reason; provide for poles in the construction of houses with iron sheets.

On how to find the mother trees, he said for *Eucalyptus* species, he wanted to raise the species type that grows straight but with a smaller buttress diameter good for roofing beams. He pointed at the species with these characteristics, and also showed me a species with wrong choice of characteristics according to him, he said "Imeneyi imafunika kuisema pofuna kugwiritsa ntchito". He collected from this source because it is the only source available in the village he said. I asked if there are species he intends to raise but cannot find. He said he had asked for assistance from the forestry advisor and just promised that when he has some he will give him. He said he wanted seeds to plant in the home garden. For *Senna* species, he said the tree he collected from is the only *Senna* species tree growing in the village. The tree was planted some years ago and is in his neighbour's backyard. It is an old tree.

Number of Mother Trees and Flowering Trees Around

For *Eucalyptus* species, he said he collected from a single tree. He felled the tree on collection. The *Eucalyptus* species mother tree was not solitary; there are other trees of *Eucalyptus* species growing together. These trees are regenerations from very old stumps of *Eucalyptus* species. They are of a similar type of *Eucalyptus* species. It is a small forest within the 'Dimba' garden. There are 14 stumps of *Eucalyptus* species. At least 11 (eleven) of the stems or regeneration are producing seeds. The other species not preferred is at a distance about 100 metres from the collection area. He said he collected from this felled tree because it was the only one with mature seeds. *Senna* species was collected from one mother tree. There are two trees and are all producing seeds. The *Senna* species trees are about 300 metres from the nursery. He said he collected from the single tree because it had a broken branch from where he obtained the seeds. The branch was broken by wind.

Collection of Seed

Eucalyptus species seeds were collected after felling the mother tree. The equipment used were; “*Lichelo*” (winnowing basket), an axe and plastic sheeting. To collect the seeds, he had to pluck the fruits and sundry in a winnowing basket. Underneath the basket, puts plastic sheets of paper for the seeds that drop through the basket.

It took him two days to collect the seeds. He said sundries for two days and seeds had fallen onto the plastic sheet. He removed the empty cones or fruits away from the seeds. He did all the collection process alone. He said, to decide on when to collect the seeds, he observed on seed maturity. He said “*Mbeu ‘zanthethe’ zimakhala za green ndiye zikhala zokhwima, zimafira koma zina zimada kuti bii*” meaning if seeds are immature or tender, they are green in colour, but when mature, they are reddish but others appear blackish. He also said the other thing that made him decide when to collect is the sowing time factor. He said if he decided to sow in August (by then) he will produce seedlings good for planting during the rain season. He said he had experienced some problems when he tried to sow some seeds early in August. He said they failed to germinate and that’s when he realised that they were not fully matured. To collect the seeds it took him two days. He said it took him about four days to store the collected seeds. He had to store in a cloth (munsalu). It took him four days from collection of seeds to germination of the *Eucalyptus* species seeds. They were stored at home in a room in a cloth. To germinate the seeds, he prepared a sowing bed; he burnt the surface of the sowing bed and waited for two days to cool. Thereafter that’s when he decided to sow. He said he kept on watering everyday. On the first time he tried to sow, he did not get seeds germinating, but on the second time, he germinated the seeds. For *Senna* species, he said he used two collection methods; seeds or fruits were collected from the ground. The branch of *Senna* species mother was broken by wind and decided to collect from this branch. He collected the fruits or pods. The other pods he said he collected were obtained by climbing the same *Senna* species tree. He split open the pods to extract the seeds.

To decide when to collect the seeds of *Senna* species, he said he noticed this when he observed that the seeds were bursting and were all over the ground. He said it took him just a day to collect the whole requirement. He said it did not take him many days to collect and sow because he only wanted 100 seedlings, he had to sow the same day. To process the seed, he emphasised that he had to split the pods with his fingers and seeds were released. He immediately had to sow the seeds in polythene tubes to germinate. He watered the seeds everyday, both in the morning and afternoon. He said on germinating the seeds, he had no problems. The species produced by Mr. Sainani, *Senna* species took a long period to germinate. He said the earliest seedling to germinate took 5 days. The quickest species in germinations according to him is *Eucalyptus* species, It took 3 days to germinate. (From observation, *Senna* species are not germinating. Only a few seedlings have appeared, and in different sizes).

Output and Distribution

He said the seedlings are not for sale, and also its his first time to raise tree

seedlings. I did not probe further on how he obtains customers and how he distributes each of the important species through customers. On trying new species, he said he would try to raise new species for planting in the home gardens such as *Faidherbia albida* and other nitrogen fixing trees. He said he would be interested to plant many trees in the home garden.

Nursery Management Options

He said he obtained his potting soil from a 'mound' in the dambo gardens. "*Chulu cha m'madimba*". He said the potting soil used was not mixed with anything. This mound is about 25 metres from the nursery in the garden. The pots used are polythene tubes. These were issued for free by the forestry extension advisor. The seedlings in polythene tubes have not been shaded. But shade was applied only on the sowing seedbed. This was made out of thatch grass. He said he wanted to protect the seedlings from sunlight. He does not produce bare rooted stock. He said he has not tried grafting or cuttings or even layering. When asked if he treats the seeds to improve germination he said he does not treat any seed in anyway. He said "I just sow the seeds the way, I collected them" The shallow wells for watering the seedlings are 15 metres away from the seedlings.

Customers

The distance to the tarmac road (Mchinji Lilongwe) is about 10 km. The distance from the village forest woodlot is about 800m from the nursery.

General Opportunities and Constraints in Nursery Management

He said he is in contact with other nursery managers. He said he benefits from these contacts in some sowing methods in the nursery and also how to care for seedlings being raised. He said the main constraint in managing a nursery is his occupations. He has to combine maize fieldwork with tree nursery work. On this he said "*Zoletsa kwambiri ndi ntchito zakumunda, Chofunika ndi kulimbikira basi*". (He said all what is needed is dedication and hard work). For the main opportunities in future for him to manage a tree nursery he said, when he raises these seedlings and plants them, he will sell the trees or poles for a lot of money. He said he might also mould bricks and constructs a good house from the same trees intended.

LILONGWE

Respondent: Chimwemwe Moyo

Gender: Male

Introduction

Chimwemwe Moyo is a 15-year-old boy, a form 1 student who owns a personal nursery within his father's home yard. He started this nursery in November 2002. Currently, the nursery has 153 tree seedlings ready for planting out. The nursery has six (6) species, namely, *Senna* species, *mango*, *Toona ciliata*, *Guava* and oranges. Most of the seedlings in the nursery are *Senna* species.

Deciding on Species to Collect

The species in the nursery, that he collected himself are *Senna* species and *Toona ciliata*. According to Chimwemwe Moyo, the species to collect seed from is determined by the following: - Availability of seeds locally, - What his customer's prefers, i.e. for planting around homesteads and gardens. For him to choose which mother tree to collect seeds from, this is determined by availability of enough seeds in the tree nearer to the nursery side. Initially, his intention was to start raising seedlings, he therefore tried pricking-out 'wildlings' of *Senna* species last year. He raised them and sold all. This year he decided to collect seeds from the nearby seed source, 10 metres from the nursery. On species he wants to raise and cannot find the seeds, he says he relies only on the species (mother trees) present at that time.

Number of Mother Trees and Flowering Trees Around

One important species in this nursery is *Senna* species. The seedlings in the nursery of *Senna* species were collected from one tree. On physical observation of the seeds source, there are two other trees similar closer to the mother tree. The other species were also collected just next to the *Senna* species sources. *Senna* seedlings were established from one tree. The mother tree is solitary – also 10 metres (approximately) from the nursery. He says he collected from one tree because the seeds from these mother trees were enough to meet his requirements in the nursery. It was interesting to learn that he cleans the seeds too.

Collecting of Seed

The seeds of *Senna* species were collected by himself alone. He collected from the ground and said there are no problems on collection. He mentioned that there is only one danger on collection that is "collecting immature seeds". For him to determine when to start collecting seeds of *Senna* species, pods turn from green colour to black. He also emphasised that sometimes-immature pods also fall to the ground. He said "I distinguish the mature to immature seeds by wrinkles on the seed surfaces, the surface of mature seeds are smooth. The immature seeds are wrinkled".

He said he does not take along period of time to collect the seeds. He collects pods of *Senna* species falling each day from the ground, this takes him at least two weeks to finish on this species. He sundries the collected pod for a day or two, and manually cracks the pods to remove the seeds. To clean the seeds he said he uses water, he does this in the nursery. The seeds are separated from the chaff or other foreign parties by floatation. He said that good seeds sink in water and other parties or chaff floats. He therefore sows the separated seeds immediately. He sows "directly" in the filled tubes with soil. Clearly, he mentioned that after processing *Senna* species, he does not store the seeds but for other seeds, he could store for a month only, especially *Senna* species. On how to germinate the seeds, he said no special sowing treatments were done. He just said 'this seed species just needs frequent watering, that all'. But to my observation, it's likely that the seed soaks in water on cleaning. Since he knows none of the sowing treatments existing. He says there were no major problems encountered on germinating the seeds. On the species in the nursery, oranges and *Cenderella* took a long time

to germinate. Approximately two weeks. *Senna* species take a shorter period of time. Approximately 4 – 5 days.

Output and Distribution

Customers visiting this nursery are actually individuals. His prominent customer is the neighbour next to their house. Some other customers or individuals come from Chileka trading centre. Some of these customers know of the nurseries existence when they come to meet his father or visit their home, Mr. Mayo's home. So far the biggest customer bought at one time 25 seedlings of *Senna* species. Other customers just buy one or two seedlings each, for these homestead planting. The approximate number of customers purchasing *Senna* species has reached 5. He says he started with two species and now has added four new species. These are guava, mango and *Toona ciliata*. He also mentioned that customers who visited the nursery 'books' these seedlings produced.

Nursery Management

For him to start raising seedlings, he prepares himself with available containers, potting soil. The potting soil is from two areas, from the rubbish pit and soil from maize field/garden. He clearly said he does not put these soils directly in the pots or containers but mixes the two soil types. He said he mixes these two soil varieties to make potting soil richer, he mixes one pail of garden/field soil to two pails of rubbish-pit soil, Ratio 1:2. But emphasized that stones and twigs or other items should be removed. The containers he uses are polythene bags and nice looking 'Chibuku' plastic containers improvised. Polythene bags were given to him by his father who happens to have obtained them from forestry department. Chibuku containers were picked from trading centre, he modifies the Chibuku containers for pots and makes holes at the bottom for easy water drainage. He said he does not produce bare rooted stock of seedlings. He has never incorporated shade before, but only protects his seedlings from goats, dogs and chicken by a nicely thatched grass fence contracted. He does not shade the nursery seedlings neither on sowing nor pricking out. He started his nursery by producing seedlings from wildings of *Senna* species and pricked them out to polythene pots. He said he has not attempted any grafting techniques. Seeds sown in this nursery are not treated in any way! He however hopes to try new sowing treatment in the near future if chance allows.

Customers

The nursery is situated within the home yard approximately 100 metres from the tarred road. A dry well is also approximately 80 metres away from the nursery. The nearest forest to this nursery is a monoculture of *Gmelina arborea*, owned by individuals, the village headman. Most customers purchasing the seedlings he produces comes from within Chileka trading centre. The furthest customer came from Chitipa trading centre approximately 10 km from the nursery.

General Opportunities and Constraints

Interestingly, Chimwemwe Moyo is in contact with other nursery managers near the trading centre. From such contacts, he benefits on the following

issues:-

- Sharing of information on experience on diseases occurring in the nursery
- Information on sowing techniques for these new species
- Customer information and the species currently on demand

The main foreseeable opportunity is to have a big nursery with a wider species selection for his customers. He also has ambitions of establishing a personal woodlot from the seedlings he is raising. Constraints for his nursery business are:- Lack of seeds for demanded species from his customers, i.e. pine species and *Eucalyptus* species - Water problem in drier months to water his seedlings - Insect pest defoliators in the nursery - Few customers requesting for his seedlings.

To curb some of these constraints, he said, he doesn't know where to get these seeds and also how to germinate some of the indigenous trees. Many customers are not aware of his seedlings, so he said he would advertise these seedlings one day by putting them on the tarred road. The new water source is just being dug nearby and clearly stated that this will improve the current situation. Conclusion: In general, he is a brilliant youth relying on informal knowledge on running a small nursery.

LILONGWE

Respondent: Mr. Maganizo Nchoka

Gender: Male

Introduction

Mr. Maganizo's nursery is in traditional authority Chadza, Mongo village. It is under Nathenje Extension Planning area. It is located about 1.3 km west of Nathenje trading centre. The nursery is an individual nursery and well known. The owner Mr. Nchoka is 57 years old, he started raising seedlings in 1996. The nursery is situated in a 'dimba' garden. The 'Dimba' garden is big. He raises seedlings, grows cash crops such as sugarcane and fresh maize in the same garden. He has planted a lot of fruit trees around and inside the 'dimba' garden.

The entire garden is fenced with sisal plants and hedge climbers. The total number of seedlings in this nursery is 4800 of different species.

The types of seedlings raised are agroforestry species, fruit trees indigenous species and ornamental type of species. The species raised are; oranges, lemons, papaya, *Gliricidia sepium*, *Gmelina arborea*, *Acacia* species, *Jacaranda mimosaeifolia*, *Senna* species, mango, *Tamarindus indica*, *Dolix regia*, *Melia azadirach*, passion fruit, guava, avocado, *Eucalyptus* species and *Faidherbia albida* and *Leucaena leucocephala*. The total number of species grown in this season is around 22. He said he once worked as a garden boy at Lilongwe City Works, that's where he had his experiences. The species in the nursery except *Faid-*

herbia albida were locally collected. He was provided with these seeds of *Faidherbia albida* by forestry extension advisors. The rest he did local collections.

Deciding on Species to Collect and Mother Trees

In this nursery, the most demanded and important tree species are; *Senna* species and fruit trees. He said some are also asking for *Khaya anthotheca*. He said the important species were locally collected. To decide on which species to collect, he said, "I have been over hearing on the radio and always says lets replace the trees back in deforested areas". So he collects some indigenous species for home yard afforestation. He also mentioned that seedlings are one of his main sources of income. He collects seeds and raises seedlings for sale. He said 'mbeu Zogulitsa zinandipulumutsa ine ndi amayi anga ndi banja langa lonse nditagulitsa muchaka cha 2000 pamene kunnali njala. Ndinagulitsa mitengo yokwana 9,000-ndikupeza ndalama zokwana K27 000,00 (he sold tree seedlings in the year 2000 and realised about K27,000,00 from the sale of 9,000 seedlings. That year was a crucial hunger devastating year). He said he raises fruit trees for his own planting and also for sale. He said fruits are nutritious that's why he concentrates also in planting more. On how to find the mother trees for collecting of seeds, looks for particular characteristics, he said 'Timayang'ana maonekedwe a mtengo'. The mother trees for establishing seedlings are mainly around Nathenje. He says he looks for trees with mature seeds and not diseased. For species he cannot find, he says he asks for assistance from extension advisors at the land resource offices. But in most cases travels very far (walking distances) to collect seeds. He said he always ensures he has a wider range of trees for customers. For the important trees, the sources or mother trees are nearby (Nathenje). For fruit trees, he said he has no reliable seed source or mother tree. He said he just buys fruits from the market or pick them on the pathways.

Number of Mother Trees and Flowering Trees Around

Senna species seeds were collected from 5 trees. From observation, there are around 9 trees closely spaced on the collection site. The site is around Nathenje. He said he collects from this number of trees because there are some trees around which are diseased. He said signs could be seen from the seedpods, he said he selected from those with good seeds. Some of the trees around are also having a dead shoot. For *Senna* species, he collected from one tree, it is near his nursery. He said he has some *Senna* species trees but they are not producing seeds. He said he collected from this number of trees because it is the only tree very close to his nursery and producing enough seeds. The tree is solitary, but some *Senna* trees are about 50 metres away from the mother tree. For species like *Delonix regia*, *Jacaranda mimosaeifolia* and *Gliricidia sepium*, he said he collected from single trees. Its only *Jacaranda mimosaeifolia*, which has about 11 trees growing together. These are along the road to the ADMARC office. For *Gliricidia sepium*, its only a single tree in the yard, also is *Delonix regia*. These are solitary; there are no other similar trees nearby. On the same site, he showed me a tree of *Eucalyptus* species where he collected the seeds. It's also among other types of tree. There are no *Eucalyptus* species trees nearby, the nearest *Eucalyptus* species trees are about 60 metres away from the mother tree.

Collection of Seed

To collect *Senna* species, he said he climbed the trees. He used a bamboo stick to hit the pods and they fall to the ground. The pods are then split open whilst on the ground manually to obtain the seeds. The seeds are placed in an empty plastic bag. Sometimes picks or collects seeds one by one from the ground.

To decide as to when to start collecting *Senna* species seeds, he said the seeds should be matured. Matured seeds of *Senna* species are noticed when pods start drying. Mature pods are dry and also he can see some seeds on the ground of the mother trees. To collect *Senna* species, he said it might take him 7 days to finish the whole sowing target in the nursery. He said he uses a plastic bag to transport seeds from collection site to the nursery. He said he does not store the seeds once he collects. He said he treats the seeds immediately and sows after 4 days. He said that's why he takes at least 7 days collecting the seeds. He collects alone, no helper. To clean the seeds, he said removes the immature seeds. These seeds are blackish, small and wrinkled, but the good seed are brownish. He mentioned that he had problems germinating seeds he collected sometime ago. He said this was due to immature seeds. The seeds had many of these small tiny seeds, they were rotting in polythene tubes after two weeks. But for the good seeds, they germinated. To germinate the seeds, he treats the seed in hot water. Then has to sow the seeds directly in polythene tubes. He has to continue watering three (3) times a day until the seedlings are strong, then can water two (2) times a day, morning and afternoon. On germinating the seeds, he said there are no problems but said he is getting old and does all the work alone. He has a lot of work to do by himself so he is under stress. He has no other assistant except when his wife comes at times to assist him watering the seedlings. *Khaya anthotheca* seeds this year did not fruit satisfactorily, he said. "He got the seeds from two sources". He collected some seeds from within Nathenje. He said the seeds he got were also not good. Some seeds were collected from Lilongwe city centre at Lilongwe hospital. He said the seeds he got from Lilongwe town germinated well. He said he collected under five (5) trees; he collected from the ground manually by hand picking. To determine when to collect *Khaya anthotheca* seeds, he said he notices or observes seeds being dispersed from the tree to the ground. 'On seed maturity, the mother trees does shed off the seeds', he said. "So I pick their seeds".

He said he has had problems with the collected seeds. The seeds he collected at Nathenje Health Centre were not germinating. He said but those from the town did. He also mentioned that *Khaya anthotheca* seeds do rot or get insect attack on the ground, so he said picks good seeds and not insect attacked. To collect the seeds, he said it might take him one day. He said he used a big plastic bag to put in the collected seeds. He does not store the seeds collected. He said he only kept the seeds collected from town one day. To clean the seeds, he always removes the insect damaged seeds. To germinate the seeds, he says he sows the seeds directly in the polythene tubes. He does not treat the seeds. He waters two times everyday, morning and afternoon. On germination of seeds, he said there are no problems only that it takes along time to produce seedlings. The species that take a long time to

produce seedlings are: - *Senna* species, it takes 3 weeks approximately, *Khaya anthotheca* takes 2 weeks, oranges takes about one and half weeks.

Output and Distribution

Some years ago, he said he used to advertise himself by carrying the seedlings to the trading centre (Nathenje) but now he is well known that he raises various kinds of seedlings. Seedlings are also at time produced on order. He said he tried to contact non-governmental organisation to supply them seedlings but got a negative response. Customers buying important species ranged in number each year, but approximately figures were given like this for last year. *Senna* species – 20 customers. Some buy up to 3,000 seedlings. Individuals buy seedlings between 5 – 50 seedlings each, *Senna* species– approximately 5 customers buying at least 50 seedlings each, fruits (mango, papaya, *Uapaca kirkiana* and oranges) said customers could be 54 individuals – buy ranges from 2 – 20 seedlings, fruit seedlings cost K100.00 each, Other seedlings are sold at 3.00 and K5.00 each. He said he sometimes raises new species in the nursery. He is always on the lookout for new species. He said some are bought but many are not bought. Other people also bring seeds for him to raise. Species he has never sown before.

Nursery Management Options

The soil that is put in polythene tubes is collected from small-reserved indigenous trees in his home garden. He said '*imeneyi ndi naisunga mkhalango kuti ndizimmweta udzu komanso ndizitengapo dothi*'. The soil is dambo soil. ('*dothi ndi la mstiro, lokuda limene amazilira myumba*'). Meaning the soil is black soil used for floor smearing in houses. He said he does not mix with anything. The type of containers used are; Small plastic bags: These are picked at the market places. These are commonly found. They are used for hot clips selling and buns, also uses empty sugar plastic packets and salt plastic bags. He improvises a lot; all fruits are in improvised materials. He modifies sizes for sugar packets. Polythene tubes: In here it's where he is putting the *Senna* species. He said part of it was from forestry extension advisors and the others, he said he just recycles and begs from friends.

He does not produce bare rooted seedlings. The garden has fruit trees and some *Senna* species trees. So he places his seedlings under shade from those trees i.e. most seedlings are under a guava tree, others are under a lemon tree. He said he produces seedlings from vegetative propagation most seedlings of fruits are grafted. Fruits like mango, oranges, citrus species and lemons are grafted and budded. He said he is trying to produce *Khaya anthotheca* seedlings from cuttings. He treats some of the seeds to produce seedlings. The species that are treated are:- *Senna* species, *Faidherbia albida* and *Delonix regia*.

To treat the seeds, he puts seeds in cloth material, Soak in seed in warm water until it cools whilst in a cloth, Remove the seed from the cloth and place in a plastic bag and tie loosely, Leave the seed to swell for 3 days. When the seeds start germinating or cracking, he sows the seeds directly in polythene tubes, sowing is at least 6 seeds in one polythene tube. He sows 6 seeds because he said this will help in other seeds failing to germinate and the seedlings will act as reserves.

To treat seeds of oranges and *Uapaca kirkiana*, he said he removes the outer cover of the seeds (seed coat) on sowing. He said this improves germination. He sows on a seed if they are oranges or lemons, If it is *Uapaca kirkiana*, he sows directly in polythene tubes. To protect from insects, he says he sprays chemicals such as 'sypamethlene'. The water sources in this nursery are wells. They are within the *dimba*. Some seedlings are very close to the wells. They are about 15 metres from the well. Other seedlings are at a distance about 40 metres from the wells. There are two wells dug in the *dimba*.

Customers

The tarmac road is 600 metres away from the nursery, the nearest forest is a forest of indigenous trees which is 100 metres from the nursery. He has over 74 customers most of them are individuals, organisation that bought him seedlings were, MASAF, Inter-Aid and some churches but said most customers are individuals. Customers coming to buy his seedlings are mostly from, Nathenje trading centre. The furthest customer came from Mzimba to purchase seedlings that's 350 km away.

General Opportunities and Constraints

He is in contact with other nursery managers; he said he benefits from these contacts by sharing knowledge and also encouraging each other on the importance of owning a tree nursery. He actually said "*Timapatsana mzeru ndi kupatsana mphamvu kuthandiza kutukula Malawi*". The main opportunities he foresees is that his family will not have difficulties in the near future for the availability of tree products such as fuel wood, fruits and poles. The other opportunity foreseeable is that his family will continue with this nursery business and possibly obtain or earn a living from this business. To fulfil the above opportunities he said he is teaching family members on how to do most nursery activities. He also said he wants to lease the whole garden to ensure security of children on the piece of land the nursery is located.

The main constraints to his business he said are:- Lack of reliable customers such as non-governmental organisations, Lack of money to improve the nursery and Labour for watering. To overcome some of the constraints, he said, if non-governmental organisation could place orders to aim to produce seedlings, he would be able to improve his standards. He said the non-governmental organisations and the Malawi government should assist to improve the nursery by lending money. He said the nursery is big and now he is using the wife to assist in watering. Himself, he said is ageing and now needs additional labour to assist in watering so he said he needs money to employ one person to assist in the nursery work and watering.

LILONGWE

Respondent: Mrs. Veronica Kanyalang'omba

Gender: Female

Introduction

Mrs Veronica Chinyang'omba nursery is an individual nursery, owned by herself. The nursery is located at Chalendewa village, Unit 1 Traditional Au-

thority Kalumba, Chadza EPA. It is within her home yard. For inputs such as polythene tubes, obtains from forestry department extension staff and also from her private sources. To run the nursery she is assisted by her own children. The total number of seedlings in the nursery is 910. She produces these seedlings for sale and for her own planting. She started planting/raising these seedlings in 2001. For seed sowing in the nursery, obtains locally through her private collections. She is a housewife. The husband is a Civil Servant

Deciding on Species to Collect and Mother Trees

Her nursery has 12 species in total. These are in pots and also on sowing bed. The species are: *Senna* species, *Jacaranda mimosaeifolia*, *Delonix regia*, *Thevetia peruviana*, *Acacia* species, *Toona ciliata*, oranges, papaya, mandarins, lemons and sweet peas, also avocado. All the species seed are locally collected. She collected these seed species mainly for sale, and also for her own planting. She said she has a very big woodlot at her home of origin. It's near to her current location and she said she has done a lot of planting from the same seedlings produced by herself.

For the mother trees for seed collection, she said 'look there are a lot of trees around to collect from' these trees are quite close to the nursery. Most of them are at a distance 50 – 150 m from the nursery, most of these were planted. For fruit trees the collection area has none. She said she buys fruits for her home consumption and said in the process extracts the seeds. The other reason why she collects these seeds, she said these are easy to establish. In her woodlot, they grow fast and start providing needs such as fuel wood, poles and fruits. In the nursery, the most important tree species are; *Senna* species and *Jacaranda mimosaeifolia* are for sale, mostly *Jacaranda mimosaeifolia*. But for seeds that she wants and cannot find locally, she said she usually asks friends to assist looking for such species where they are growing so that they fetch for her on behalf. She gave an example of sweet peas, *Uapaca kirkiiana*. Her friends brought her the fruits. *Jacaranda mimosaeifolia* and *Senna* species are preferred in town for home planting.

Number of Mother Trees

Jacaranda mimosaeifolia was collected from one tree. She said she collected from this number of trees because just a basin full of *Jacaranda mimosaeifolia* seedpods is enough to sow the whole filled tubes. A single pod has many seeds, she said only needs just a basin full of these pods to complete her sowing needs.

Upon visiting the collection tree, there are two trees growing/producing fruits. These trees have plenty of pods now, the mature and immature pods. About 150m away from the collection mother trees, there are four other *Jacaranda mimosaeifolia* trees also producing fruits/seeds. *Jacaranda mimosaeifolia* pods were collected from the tree by climbing.

Collection of Seeds

The *Jacaranda mimosaeifolia* pods were collected from the tree with the help of children. The pods are used as fuel wood so she said she removes the seeds before utilising the pods as fuelwood. To collect mature seeds, she

said they observe colour changes. The *Jacaranda mimosaeifolia*. pods are green and will turn to brown on maturity. She said the children would collect from the tree by climbing. They collect brown pods, which are dry and will light upon on fire (after seeds have been extracted).

One days' collection is enough for Mrs. Kanyalan' gombas nursery. To carry the collected pods, she said she uses basins or pots. Just after collecting the pods, she immediately breaks the pods to remove the seeds. She stores the seeds in a plastic material away from children's reach in a room at home. She said she does not clean the seeds but ensures that they are safely kept away from children and in a plastic bag and tightly tied. She said it might take up to two months storage from the time of collection to sowing in the nursery. She said there are no problems encountered on the collected seeds from time of collection and even sowing.

The other sources visited and observed were from *Senna* species and *Delonix regia*. For *Senna* species, she collects from one tree. There are five trees but she collects from only one. The other tree she collects seeds from is a *Delonix regia*. It is at the Agricultural office and is only one tree solitary. The *Toona ciliata* seeds were also obtained near the agricultural office of Chalendewa, it is solitary standing. She said she has sown some of the seeds from all these trees and are in the nursery. To germinate seeds of *Jacaranda mimosaeifolia*, she said she sows the seeds in polythene pots and water. She said to ensure easy germination, she waters two times every day, in the morning and in the afternoon. The species that germinate very quickly are:- *Senna* species and *Jacaranda mimosaeifolia*, they take 4-5 days to germinate also *Acacia* species. Also *Delonix regia* if sown untreated. The species that take a longer time to emerge or germinate is *Senna* species. Also the untreated *Delonix regia*.

Output and Distribution

Customers purchasing these seedlings are all individuals; they are mostly from within the village or nearby villages. The seedlings are not advertised but these customers are regular ones, they purchase seedlings for sale also to Lilongwe city residents (in town). The seedlings are not produced on an order but to wait for whoever needs them, Each year these customers come. They are about 4 customers but come frequently each year. She said they call these men 'order men' because they do it on business, buying and selling. She said the mostly purchased and important trees seedlings in her nursery are *Senna* species and *Jacaranda mimosaeifolia*. But 'order men' buy a lot of *Jacaranda mimosaeifolia* and *Senna* species. On each trip these customers purchase, she said, they purchase in a carton of about 40 to 50 seedlings each. The seedlings price ranges from K2.00 to K4.00, but these customers sell highly in town at around K15 to K25 per seedling. She said she tries to sow new species in the nursery but most of these are not bought. She has some citrus species but just a few were bought. Villagers around sometimes buy for the home planting.

Nursery Management Options

For her to start raising these seedlings, she said she has to first find pots and secondly the potting soil. She also has to construct a fence (thatch

grass) around. She has a nicely done big fence 15 x 20 m. Of course she uses it as well for vegetables. The potting soil used from the maize field, it is “*makande*” soils she says. The soil is mixed with soil from the rubbish pit called manure and she also mixes with river sand. On mixing, she said she adds a bit of manure soil and a bit of sand to the maize field soil. The largest proportion is the maize field soil, ratios were difficult to determine. Through observations on demonstration, she meant two-third part field soil, one-third manure soil and the river sand. The soil mixture is potted in polythene tubes. The polythene tubes were issued free from forestry extension officers and some were obtained from friends who work at land resource centre. The nursery does not produce bare rooted stock. All the seedlings are not produced under shade. She said she has heard about grafting, but she does not produce these seedlings. Some of the seeds species she produces, she treats them some are not treated. The species she sows with no treatments are: - *Jacaranda mimosaeifolia*, *Senna* species and *Afzelia quanzensis*. The treatment procedures are: -

Delonix regia. She said to germinate the seeds quickly; she rubs on cement or stone to scratch the seeds. She said she has just been instructed recently to be following this procedure by forestry officers.

Senna species. She said she does boil the seed. Seeds are placed in a pot and pours in water then put on fire. She boils the seeds for what she called a few minutes. Upon inquiring further, she said she observes the seeds in water until the water boils (*kuvila*). After boiling, waits for some seconds then removes the pot and seeds from fire. She removes the seeds in hot water and place in a plastic bag; the plastic bag is tied tightly. She said, waits until 4 days. The seeds will start cracking (*kutbetbeka*) and will sow the cracked seeds in polythene pots. She finds it difficult to germinate these seeds even after the treatments. For *Senna* species, she said she even collects wildlings in the rainy season for her nursery stock.

Customers

The distance to the nearest tarmac road is approximately 5 km. The nearest forest is a village forest indigenous woodlot, 150 m (approx.) away from the nursery. The distance to the water source is also around 150 m, it is a pump (*Mjigo*). Customers who come to buy these seedlings come from within the village and also surrounding villages. Most of these are individuals who come to buy mainly for sale as well. They sell these seedlings in town about 24 km away.

She says she has 4-5 customers coming to buy the seedlings frequently each year. She does not know them.

General Opportunities and Constraints in Nursery Management

There are other nurseries around and even near to her nursery, they are women group nurseries and communal. She is not contact with any nursery manager. She said she operates alone and just gets some technical help from the extension workers and mostly from her traditional knowledge. About the main opportunities foreseeable for operating a nursery, she said when

she sales the seedlings she makes money and when she raises many seedlings she even makes more money. She said ‘if I have a lot of customers, my business will improve’ The main problems for her nursery business she said were lack of reliable markets for the seedlings, she said customers buying the seedlings are buying at lower prices. This she said is due to nearby nurseries bargaining for such much lower nurseries. She also mentioned that sometimes customers come when the seedlings are very small, so they do not buy these seedlings. I asked her on how she can overcome some of these problems, she just laughed and said, ‘you should help me to find customers’. She also mentioned of lack of seeds for sowing in the nursery, she was just busy pricking-out *Toona ciliata* seedlings.

SALIMA

SALIMA

Respondent: Tereza Edison/ chairman

Gender: Female

Introduction

Teresa Edison lives in Mwamadi village, traditional authority Kambwiri. She is married and has four children. Her main source of income is ‘ganyu’ and she also has a garden where she grows maize (MH 18) and groundnuts (CG 7). In the past years both her and the husband were members of *tigwirizane* club, which is in the village but because of a few quarrels in the club they pulled out in the year 2002 and started their own tree nursery in 2003. She explained, ‘*anthu amu club ndiwouta; amakamba mabodza komanso anagulitsa mitengo ya K10, 000 ndikudyerako K3, 000 zimene zinakwiyitsa ine ndi amuna anga ndiye tinachoka*’. She does her nursery work with her husband and her two small children.

Deciding on Species to Collect and Mother Trees

The nursery has two species, *Khaya anthotheca* and *Senna* species. They grew three species but unfortunately *Eucalyptus* species did not germinate. *Khaya anthotheca* has 75 seedlings and *Senna* species has 52 seedlings, the seedlings for *Khaya anthotheca* were given to her by extension worker for Forest Department whilst seedlings for *Senna* species were collected. They decide what species to collect depending on the mother tree that they have at the house, *Senna* species is the only mother trees they have. The mother trees are very easy to find. She said, ‘*mitengo yotoleramo njere ndiyosavuta, poti ili pakhomu pompano timangoyang’ana mtengo umene ukuwoneka kuti uli ndi njere zonkhwima komanso zochulukuka*’. If they do not find the species they want, they ask assistance from extension worker (forestry department) and if the extension worker for forestry department doesn’t have they just depend on the available stock.

Number of Mother Trees and Flowering Trees Around

Senna species was collected from two mother trees 100 meters away from the household. The number of mother trees depends on the maturity of

the seeds; the mother tree that matures very fast and has enough mature seeds to meet their requirement is the one they collect from. 26 trees of *Senna* species and also two trees of 'Chimphakasi' (species not identified) surround the two trees.

Collection of Seed

On collection of seed, they climb into the tree of *Senna simea* and pluck the mature fruits, which are thrown on the ground. The fruits are collected on a piece of cloth and they separate the seed from the fruit using their hands. They select the mature seeds and put them in a bottle, the mature seeds are smooth and heavy whilst immature seeds are wrinkled and light. She reported, '*timakwera mumtengo wa Senna species ndikumayoyola zipatso, mkumaponya pansi. Zikatero timatolera zipatso zomwe taponya pansi paja ndikuyika pa nsalu, ndikumakachotsamo njere zimene ife tikuwona kuti ndizonkhwima. Timasunga nkuika mbotolo. Njere zonkhwima zmalemera, khungu lakenso limakha losalala komanso khungulo limakhala la khofi pamene zosankhwima, njere zake sizilemera, khungu lake limakhala lotuwa mbuu! Komanso njere zake zimakhala zokwinyika kwinyika*'. They decide when to collect the seeds when they are mature, mature seeds have the same characteristics as explained above. They also decide to collect the seeds when they see that a few fruits have fallen down from the tree without anybody tampering with them in the trees.

The only problems that were pointed out are lack of germination due to rotten seeds collected, immature seeds and pests attacking the seeds. It takes them two weeks to collect seeds because the seeds in the same tree mature differently; this means plucking the fruits is done at a different day. She said '*zimatemnga 2 weeks kuti titolele mbenu chifukwa mankhwimidwe a njere amasiyana, zina mtengo omwewo zimakhala kuti zankhwimiratu pomwe zina zikuyamba kunkhwima kumene ndiye kutolera kumakhala masiku osiyana siyana*'.

It is very easy for them to transport the seeds as the mother trees are very close to the house, so they just collect the seeds on a piece of cloth to the house. The seeds are stored in a Coca-Cola bottle. (*Amayika kuseri kwa denga*) to avoid the children from playing with the seeds. There are no specific measures that are taken to care for the seed they said. On the day that they want to sow, they just put the seeds in water to identify the rotten and immature seeds. Immature seeds float on top of the water, as they are not heavy. The rotten and immature seeds are removed and the mature seeds are directly sown into the tubes. She explained, '*Sititsata njira ina iliyonse posamala mbeu yathu kufikira kufesa, koma patsiku lakuti tidzale timayinyika mbeu yathu m'madzji kwakanthawi kochepea kuti tichotsemo yowonongeka ndi yosankhwima imene imayandama pamwamba pamadzji chifukwa siyimalemera. Mbeu yovunda ndi yosankhwima imachotsedwa ndiye yabwino ija imadzjalidwa*'.

It does not take a long period from germination to collection, about 3 weeks she said. She explained that since this is their first experience they think in future it might take them longer, close to 2 months because the polythene tubes are given to them late in the season. The seed is germinated by watering twice in a day for three weeks and after this the seeds are watered once every two days. This is done to allow the sun to heat the seed-

lings to avoid rotting of the seeds because of too much water. Two points were mentioned on problem in germinating the seed and these are: Pests attack the seedlings when they just germinate, she said, '*Chiswe, nyelele ndi sidze zimaluma mpaka kudula mitengo yoti ikungomera.*'

Watering of the seedlings is a very tough job and sometimes they get fed up and they do not water.

On the species that they have in the nursery, *Khaya anthotheca* takes the longest to produce seedlings. It takes about 9 days (approximately); *Senna* species is the quickest to produce seedlings, approximately 4 days. She said, '*Khaya anthotheca umatenga masiku ambiri usanamere chifukwa khungu lake ndilolimba pomwe Senna species sachedwa chifukwa nyama yake yakunja (Khungu) ndilofewa kwambiri.*'

Output and Distribution

They have never sold their seedlings, as this is their first year, in future they may sell to surrounding people and customers will be found through their extension staff forest. They said they will ask him to help them find market, on their own they have never thought of how they would get customers.

Nursery Management Options

When they want to start preparing for raising their seedlings they ask for potting containers from their extension workers forest, they prepare the nursery. She reported, '*tikamakonzekera kudzala timapempha ma tube Kwa a forest, timalambulanso, ndikugawula pa nursery pathu. Tikatha izi timakumba mawenje woyika mitengo ndikukhonzanso mkati momo mwa nazale poti tiziyika ma tube.*' The potting soil is taken from their '*dimba*' close to where they planted *Faidherbia albida* long time ago. The soil is collected there because of good fertility as they heard that *Faidherbia albida* helps to improve soil fertility. The type of potting soil that they use is "*makande*". The potting soil is mixed with a bit of sand that is collected close to the tarmac road. To collect the potting soil, they use a bucket that is sometimes used to carry drinking water for their household. They do not produce bare root seedlings. They use shade to avoid livestock from damaging their seedlings. She said, '*poti mbuzi zimatha kudya mitengo ya pa nazale timayesetsa kusamalira ndi shade kuti zisalowe.*' Shade is also used to avoid too much heat from the sun that may dry up the germinated seeds. There are no grafting techniques that have been used. On treatment of the seed to improve germination they said that *Senna* species is not treated in any way but *Khaya anthotheca* is soaked in water for a day to make it become a bit soft for easy germination. Water for nursery use is taken from a borehole that is 300 m away from the household.

Customers

It is approximately 500 m from the household to the nearest tarmac road and approximately 3 km to the nearest forest. (As already explained they have never sold their seedlings).

General Opportunities and Constraints in Nursery Management

They are not in contact with other nursery managers because they are afraid

of gossip. She explained, '*kuopa zoyankhula yankhula za m'mudzi muno ife sitikuona chifukwa cholumikizana ndi a ma nazale ena*'. The main opportunity that they can see is that sometimes trees are a source of income to the family that is if one has successfully sold the trees. The last opportunity is that one is able to have his/her own woodlot. To fulfil the opportunities they said one has to work extra hard to have a good woodlot and the government especially forest department should assist individuals to get good market. The main constraints for the business are:- no market and shortage of implements e.g. water cans, good hoes and shovels. These can be overcome by government working hard with farmers to be able to find market for them and to buy all needed implements for the nursery.

SALIMA

Respondent: Kozekani Banda

Gender: Male

Introduction

Khombeza village is 20 km north of Salima district, traditional authority Khombeza. An interview was done with Kozekani Banda aged twenty-nine, he has a wife with three children. He is an original inhabitant of the area and has been a farmer since he was thirteen years old. He grows maize (MH 18) maize (local) groundnuts (C97), and groundnuts (local). His nursery work was started in 1998; the skills of running his nursery were done in the village through the extension worker for forest who is his neighbour.

Deciding on Species to Collect and Mother Trees

Eucalyptus species are the only species that he has in the nursery. He collected *Eucalyptus* species at agricultural offices at Khombeza; the offices are found approximately 2 km from his house. He decided to collect *Eucalyptus* species only because that is the only mother tree that is common in the area; the other mother trees are not available. This collection was also done because that's what his three customers preferred. He said, '*Anthu akuno amagula Bluegum yekha basi zinazi samagula, kweni-kweni chifukwa Bluegum ndiwabwino ku matabwa, kupangiranso milimo komanso kupangira ma pole amagetsi*'.

The mother trees were identified by the extension worker for forestry who showed him. When the mother trees were shown to him, he was also happy with the way the fruits of the trees looked. The fruits looked dark brown and had small cracks, which is a sign of mature seeds. When he cannot find the species that he wants, he asks for some from the extension worker forest, who checks with his office and sometimes he collects from other sources. If he does not find the seeds also, there is nothing done because he is used as seeds are very scarce in the area.

Number of Mother Trees and Flowering Trees Around

One mother tree was used to collect the seedlings that he has in the nursery. One tree was used because it had enough mature seedlings that met his requirement for this season. The trees are surrounded by trees of the same species.

Collection of Seed

He uses 'Msungwi' with a hook at the end to get the fruits from the tree, the fruits fall down and when they are enough he puts them together and carries them on a plastic piece of cloth to his house. He said, *'Timapeza msungwi ndikuyikako ngowi ndikumakola zipatso mumtengo muja. Zipatso zimagwa pansi ndiye ine ndimazisonkhanitsa zipatso zija pa msalu nkumapita nazo kunyumba*'. The collection of a seed is determined by maturity of the fruits, the fruits turn dark brown and have small cracks. He reported *'Ndimaona kankhwimidwe ka zipatso zija chifukwa zonkhwima kunsonga kwake zimathetheka komanso zimasintha mtundu kuchoka ku green kupita ku dark brown'*, the respondent explained. The collected fruits are kept in the same cloth (as collected); they are stored in a *'nkhokwe'*.

It takes him three days to collect the seeds. The days may sometimes be less depending on the maturity of seeds, if the fruits are mature and the mother trees have enough fruits it may take him a day. To clean the seeds he said, *'ndimayika pa dzuwa kwa masiku atatu ndiye zimauma gwa! Ndikumathetheka zokha, chipatso chimachoka ndikutsara njere zokha. Ndiye pang'ono pang'ono malingana ndi mathethekedwe ndimachotsa zakunja zija ndikumgotsala njere zokha, zimamangidwa mu nsalu ndikusungidwa m'chikwama mpakana patsiku lakuti ndikukadzala'*. It takes him a month from collection to germination. He has only one problem with the collected seed, he said, collected seeds may sometimes be immature as a result they do not germinate. The seeds are germinated by watering three times a day for seven days. On the 8th day, seeds are watered two times in a day, *(mpakana ku tsiku lakuti akukawokera)*. On problems in germinating the seed he said, pests (especially ants) eat the roots, as a result seeds do not germinate. He has got *Eucalyptus* species only in his nursery but still he knows that the species that takes longest time to produce seedlings and he mentioned *Khaya anthotheca* and *Senna* species, which takes about 7 days. The quickest species are *Eucalyptus* species because it takes about 5 days to produce seedlings.

Output and Distribution

The respondent said that customers are very difficult to find, he has only three customers. The customers come from the neighbouring village and they knew him because of the extension worker for forest. He sells the seedlings at K5 each. To him *Eucalyptus* species are a very important species and total number of seedlings he sells depends on the three customers. An example of how he sells was taken from last year's stock. Customer number one bought 1,500 seedlings, Customer number two bought 400 seedlings and customer number three bought 350 seedlings. He has never sold new species, in the past years he was not selling his seedlings and selling has only began two years ago. (Note that he does not do anything on his own to find customers).

Nursery Management Options

When he wants to prepare for his nursery work he said, *'choyambilira ndi choti ndimagalanla pa nazale panga ndi kuphwanyaphwanyanya zigulumwa zija ndiye ndimakadula mapesi kumunda ndikuwotcha paja tagalanla paja kuti pakhale chonde'*. Then he collects potting soil from his *'dimba'* where he planted *Faidherbia*

albida. He also collects polythene tubes from the extension worker forest. The soil collected is called “*makande*”; this soil is collected in a bag and is never mixed with anything. To him the soil is fertile enough and does not need any mixture. He produces bare root seedlings because of lack of containers and sometimes the containers are given to him when he is very busy in his garden and cannot be able to fill the containers as a result the seedlings are left like that. Kozzerani Banda does not use shade and he does not use vegetative propagation. He does not treat seed in anyway to improve germination.

Customers

It is 70 m to the nearest tarmac road and 800 m to the nearest forest. He has three individual customers who come from a distance of 2 km.

General Opportunities and Constraints in Nursery Management

He is in contact with two nursery owners and the only benefit is that he is able to get new knowledge from them when he visits them, he admires what they have done and he tries it on his nursery. The main opportunity is that he can sell his trees and at least get something to eat for his family. (I tried to probe for more opportunities but he insisted that he has only one opportunity), the respondent failed to explain how this can be fulfilled. The main constraint is no market and he has no solution as to how this can be overcome. He said ‘*njira yeniyeni yoti tingathane nazo ndiyosowa, sindikudzwa kuti tingatani*’.

SALIMA

Respondent: Joseph Machado

Gender: Male

Introduction

Mr. Joseph Machados' nursery is an old nursery in Mtsekwe village, Traditional Authority Khombeza. The nursery is not very big. It is located within Mr. Machados home yard. This nursery has been in existence since 1988. The owner Mr. Machado says, he has not had any formal training on managing nursery, but in 1987 he was a member of a village club that by then was raising tree seedlings. He then decided to start raising seedling for himself for sale. He depends mainly on farming for day-to-day living. The nursery is well fenced and protected from entry of goats and chickens. The species that are being raised are: - *Eucalyptus* species, 2000 seedlings *Eucalyptus* species, mango seedlings 11 and *Senna* species. The most important species in the nursery are *Eucalyptus* species and *Senna* species.

Deciding on Species to Collect and Mother Tree

The species that he has locally collected are:- *Eucalyptus* species, *Senna* species and mango. The most important species according to Mr. Machado are *Eucalyptus* species and *Senna* species He said these are highly demanded by customers. He said he always raised *Eucalyptus* seedlings each year. To decide on which species to collect and raise in his nursery, he said he first of all considers his customers choices, i.e. *Eucalyptus* species and *Senna* species. He said he also plants these seedlings for his own purposes, such as providing

fuel wood, poles and timber. Later he added that '*ndimafuna ndiziphunzitsa anthu kufunika kokhala ndi mitengo powawonetsa anthu momwe ndikudzalira*'. Meaning he wants to be example in the village on the importance of planting trees of his own.

For *Eucalyptus* species, he said he looks for the tree with physical features like, straightness of the main stem and few branches. To find the mother trees for collection he said, the trees should have the preferred characteristic. The mother tree should be an old tree and producing seeds or fruits. Sometimes preferred species cannot be found locally, he said, 'I always seek assistance from the forestry extension advisor for he may get it from his office'.

Number of Trees and Flowering Trees around

For this study, the site visited is a home garden. He has planted 2 big *Eucalyptus* trees within the boundary of his maize field, about 1km from the nursery from which he obtains seed for sowing in the nursery. The mother tree he collects seed from each year since 1989 is one tree. He said, 'all those years I have been planting and sowing *Eucalyptus* species trees from this tree'. As to why he collected from a single tree, he said this tree is a bit different from the other tree in terms of shape. The other tree is not straight but this mother tree is. That's why he said he collected from this source. The species are similar (*Eucalyptus* species). He said he planted these trees a long time ago, the trees are solitary. They are not surrounded by tree species of Eucalypts. Around and near are *Senna* species trees and *Faidherbia albida*.

Collection of Seeds

To collect the seeds, he said he was all-alone. He said 'I usually cut branches each year when collecting *Eucalyptus* species seeds' from observation, the mother tree has now been left with only a single small branch protruding from the sides, showing that he actually collects seeds from the particular mother tree every year. The equipment he carries with him on collection is a *phanga* knife and empty sugar plastic bag. He said he cuts the branch of 'matured seeds' by climbing the tree. On the ground he plucks the fruits and puts them in a sugar plastic bag. He sometimes knows when to collect the seeds by observing the sowing calendar. He said he starts collecting in May up to June, he also checks for seed maturity in these months. On maturity, the *Eucalyptus* species fruits will crack at the ends and also will change colour from green to black. To collect the required seeds, it takes just one day. The collected fruits placed in a plastic material are transported to his home. He said he leaves the plastic full of collected fruits in the sun for sun drying for at least one week. The seeds will come out of the fruits and collects in the plastic bag or packet.

To clean the seeds, he said he removes the empty fruits and throws them away and leave the seeds only. To store the seeds, he said he puts them in a cloth bag but if he does not have it, he said he puts in a plastic bag and keeps in at a cool place. (He showed me some seeds in a plastic bag kept on the roof of thatched house). He said he was keeping the seeds out of reach of children. He normally does not store seeds for more than one month.

For the seedlings in the nursery that he used it took him one week from collection to germination of the seeds.

To germinate the seeds, he said, he first of all constructs a seedbed, Sows the seeds by mixing sand with seed onto the seed, on sowing, he uses very fine sand. He said he covers the seed with sand and waters, he then covers the seed bed with what he called '*chika*'. This he said is a shade. It protects the seedlings from sunshine. He said he finds no problem to germinate *Eucalyptus* seeds now. But he said one year, he collected green fruits and processed the seeds. He said, "I thought I had collected the matured seeds, but managed to obtain just few seedlings germinating". Most of the seeds did not germinate.

In Machado's nursery, the species that take the longest time to produce seedlings is *Eucalyptus* species; it takes about 7 days to produce seedlings. The quickest species is *Senna* species that takes about 3 days of the pre-treated to germinate.

Output and Distribution

To get customers, he used sometimes customer's book or order seedlings they would wish. The nursery manager produces these seedlings, he said he approaches them to inform them that he has raised the seedlings and need to be collected. He said he has not advertised the seedlings in any way, but customers just come to his nursery after hearing from friends or neighbours. For important species like *Eucalyptus* species, he could estimate the number of individuals that buy his, seedlings, he said 15 to 20 customers come to buy *Eucalyptus* species seedlings. Each customer may buy ranging from 10-30 seedlings per trip. The biggest customer bought 1000 seedlings at one time. For *Senna* species he said at least 10-15 individuals, but buys between 2-10 seedlings. He said he sales at K4.00 per seedlings now. I tried to inquire if he sometimes sells the species, but said he does not raise new species. He said people in the village are used to common species such as *Eucalyptus* species and *Senna* species so they cannot buy these new species.

Nursery Management Options

To prepare for nursery work, he said he most importantly looks for pots, soil and construction of the nursery fence. The potting soil used in this nursery is obtained from the banks of river Lipindi, its black soil. He said he does not mix the soil with anything. Mr. Machado uses containers. He uses mainly 'improvised' containers made from the empty sugar plastic packets. He modifies the sizes according to his interests. For potting, he also obtains polythene tube from forestry department though very few. He said a forestry extension advisor gives him just 200 pots. He said this is not enough, as he needs at least 4,000 pots each year. For the empty sugar packets, he buys at K1.00 each packet. He said he does not produce bare rooted seedlings. The whole nursery fence has been covered on top with a shade; the shade is to protect seedlings from the sun. He does not produce grafted or budded seedlings; he said he would wish to learn these methods of propagation. He said he treats some of the seeds species to improve germination. The species that he treats he said is *Senna* species. The procedure for the treatment is as follows:- The collected

seeds are poured or placed in a pot. Water is also added in the same pot. The water and seeds (*Senna* species) are put on fire to warm.

To ensure that seeds are rightly treated (he said) he is to dip a finger in the water whilst on fire to check the level of heat. He said if the water is warm (with finger inside) continue heating until when the finger cannot withstand the heated water he removes the seeds and water from the fire and Then put in a plastic bag the seeds and water and tie. Leave the seeds and water for 2-3 days, he continues checking everyday to see the swollen seeds. The seeds will swell on the centre. '*Kutukumuka pa mtima*'. This means that the seeds are treated and can now be sown in polythene tubes. 'The untreated seeds fail to germinate', he said, he therefore re-does the treatment. He said he does not find problems in germinating *Senna* species, the water source is a borehole and is about 50 m from the nursery.

Customers

The distance to the nearest tarmac road is 70 m (just along the Salima – Mzuzu road). The distance to the forest is about 8 km from the nursery and it is next to the trading centre, It is a government forest. Customers are mostly individuals, they can in total be estimated at 20. Most customers are from within Msekwa village and the surrounding villages. The furthest customer came from Salima Boma, 25 km away.

General Opportunities and Constraints in Nursery Management

He is contact with other nursery managers. He said, '*ubwino wake ndi wokumbutsana zochita, komanso kudziwitsana makasitomala*', meaning the benefit is to try and remind each other on some nursery practices, also is to inform each other available markets. The main opportunity that he can see for the nursery business is that the sale of seedlings in good quantities will be providing necessities need at his home. To fulfil this, he said, '*kukwaniritsa ndi koti ndiyenera kupitiliza ntchitoyi*', meaning he has to continue raising these seedlings to fulfil the opportunity mentioned.

The main constraints to the nursery business he can see are:-

Lack of ready markets for the seedlings and also he said he is brought down by diseases affecting him.

To overcome some of these constraints he said, the government should help nursery owners to find markets for these seedlings. Relevant officials should come and see what they have done and possibly find market for the seedlings and he needs advice on how to control the termites that are attacking *Eucalyptus* species seedlings.

The other major problem he said is hunger. He said family members help him in managing or working in the nursery but fail to assist at times because of hunger so he needs free food for him to remain healthy all times. On polythene tubes, he said the number of these tubes should increase when he is being issued or given.

SALIMA

Respondent: Mr Gift Ntauchira

Gender: Male

Introduction

Gift Ntauchira's nursery is in Traditional Authority Kalonga, in Kambwiri village. The nursery has been established in his home yard, it is a new nursery.

The owner of the nursery is a secondary school student, schooling at Kapatenga Community Day Secondary School and he is 17 years old. The mother to the nursery owner is a small-scale farmer. She depends on maize farming. She is a poor farmer because she has a small farming area.

In the nursery there are six species raised. These are:- *Khaya anthotheca* 5000, *Annona senegalensis* 300, *Faidherbia albida* 660, *Senna* species 699, papaya 910. The total number of seedlings raised is 3,069 seedlings. Many of these are papaya, *Senna* species and *Faidherbia albida*. Inputs such as polythene tube and some seed species were obtained from forestry extension advisors (Alangizi). The other seeds were locally collected. For the daily nursery work, such as watering and weeding, he does it together with his mother. For technical advice on how to carry out particular nursery operations, the forestry advisor is approached on difficult seed species.

Deciding on Species to Collect and Mother Trees

The species in the nursery that were locally collected are: *Senna* species and *Faidherbia albida*. He decided to collect these species upon hearing that these species are on demand. He overheard this from the forestry extension advisor that MASAF, a Governmental Organisation, wants to purchase a lot of these seedlings. He also said, the seedlings he is producing such as *Senna* species will be also for home planting. He mentioned that *Senna* species are important for poles and timber. For *Faidherbia albida*, he said he will also sell some of the seedlings and leave some to plant in the maize field. He said *Faidherbia albida* trees are important in the growth of maize whilst in the field. On how to find mother trees, he said '*pofuna kupeza mitemngo yotolelako mbeu, timayang'ana mitengo imene ili ndi mbeu. Mbeu ikhale yokhwima bwino, ikhalenso pafupi ndi nursery*'. For the species that he would want to raise but cannot be found he said, he goes to the forestry extension advisor to seek assistance.

Number of Mother Tree and Flowering Trees around

The seeds of *Senna* species were collected from two trees. He said '*tinatolela ku mitengo yonse imene ili pano itatu, koma mtengo wina unali ndi mbeu youma koma ndi mphwephwa zokha zokha, ndiye tinaitaya mbeu inayo ya mphwephwayo*'. Meaning he collected from three trees which are about 35 m apart, the trees were planted. The seedlings produced in the nursery are from two trees. The mother trees are about 100 m from the nursery. He said the seeds from these two trees were enough for sowing or planting the wanted number of seedlings. He also mentioned that he had even some extra seeds that he has stored for next years sowing, he collected from this mother of trees because they are the only trees available and also he wanted to have plenty of seeds for sowing and storage.

For *Faidherbia albida* he said he collected from one mother tree. The mother tree is in the maize field 500 m from the nursery. There are five big trees of *Faidherbia albida* in the maize field and all these produce seeds. He said he collected from one tree the seeds used in establishing seedlings in the nursery. He said he has to collect from one tree because he has to sow just a few seeds and also the tree had plenty of seeds on the ground

Collection of Seeds

To collect *Senna* species, he had one axe and a *phanga* knife. Collection of *Senna* species was by cutting branches to make the pods easily available on the ground. He said '*timasadzwa mtengo uliwonse*'. He said he had to prune branches with mature seeds/pods only. While on ground, with the help of friends, he said he plucked the pods of *Senna* species that were dry from the fallen branches. The pods were immediately split open to release the seeds. These seeds were put either on a shirt or in the pocket after extracting from the pods. He said '*poti timatolera choimilira, timangoika m'matumba ndi pamalaya basi*'. To decide on as to when to start collecting *Senna* species, he said he noticed this when the fruits pods turned to brown from green and also they should be dry. He said '*njere zwa Senna species zikankhwima zimauma, ndiye nthawi yofunika kutolera*'. To collect *Senna* species, it took two days to finish collecting. He said, he at least had to collect one tree per day and spent almost an hour on each mother tree. To transport the seeds from collection to storage, he said we were putting in pockets or folding on shirts or T-shirt. To store *Senna* species seeds, he said he had to put in a plastic bag for at least one day.

To clean the seeds, he said he had to remove smaller seeds only. These he said are empty seeds, '*mphwephwa*'. He said they are the immature seeds. It took him 3 days from collection to sowing. The main problem on collecting *Senna* species is that there are too many '*mphwephwa*'. He said it laborious to remove these smaller seeds from good seeds. To collect *Faidherbia albida*, he said he had to pick the fruits on the ground in the maize field. He said he collected alone all these seeds. On collection, he had to put in a sack for easy carrying. The fruits were put to sun-dry for one full day. To process the seeds, he said he had to pound in a motor. '*Mu mtondo*', he said, '*tinasinja mu mtondo ndi kupeta*'. Also had to winnow to remove other crushed fruit materials and he said, to collect or pick the fruit it had not taken long, just 30 minutes and to pound it took just 2 hours. He said he had to store in a plastic bag (sugar packet) for one day. From collection to sowing, he said it took about 3 days. The problem he found on collecting *Faidherbia albida* is that seeds are being attacked by insects. He said '*njere zina zinali zofumbwa*'. He removes the insect attacked seeds on processing he said. The other problems encountered are seeds being crushed on processing. The pounded seeds were sometimes unknowingly crushed or broken. To germinate the seeds, he said, for *Senna* species he treated the seeds in hot water. He had to sow treated seed and continue watering two times every day, morning and afternoon.

For *Faidherbia albida*, he said he treated the seeds and had to sow in pots also. He watered every day two times, morning and afternoon. The problem encountered on germination is that not all seeds germinated. For *Senna* species, he had to come and re-sow seeds in filled pots that had seeds not

germinating. He suspected that maybe he had over heated the seeds in water. For *Faidherbia albida* the seeds are just starting to germinate, he said. In this nursery, species taking long to germinate are: *Khaya anthotheca*, it took 17 days to germinate *Khaya anthotheca* seeds. Also is *Senna* species, it took almost 13 days to germinate *Senna* species. The quickest species to germinate he said is *Senna* species. He said it took 5 days to notice a seedling emerging. But he said he has sown many seeds, almost 1000 seeds but only 19 have germinated. He said this is very difficult.

Output and Distribution

He said this is the first time he has raised seedlings, he was told that MASAF wants many tree seedlings that's why he was encouraged to raise these species but he will advertise his seedlings on the roadside. He said he will welcome any customers who want to buy the seedlings. The only customer he has now is MASAF but does not know how many seedlings they are going to purchase from him. He said he will try to raise new species in his nursery for sale.

Nursery Management Options

To prepare to sow seeds in the nursery, he said, he ensured he has a nicely fenced nursery, and then asked for polythene tubes. The fence said had been protected from damage by goats since he had thrown or tied thorn twigs all round the grass-thatched fencing. The potting soil used is from the maize field. He said, he got this soil under a *Faidherbia albida* tree, the soil is very good, it's a sandy loam soil. The soil is not mixed with anything. He is using polythene tubes obtained from the forestry extension advisor. He said he does not produce bare rooted stock.

The nursery has been constructed with a high shade. This, he said is to protect seedlings from the sun. He also said at school, he learnt about how to do a grafting and cuttings, but he has not tried this in his nursery. He said he would try them some other time. To sow seeds, he treated the following seed species:- *Senna* species and also *Faidherbia albida*. He said he treated all the three species with the same treatment. The procedure for treatment is as follows:-

First boil water to look warm. (*Kuwiritsa madzi moti kuwika chala osapysa*). Pour seeds in the warm water and let the water cool together with the seeds either on a plate or pot and then transfer the seed and water in a plastic material and tie. This time water is not too much, After one day, the plastic is opened and water is removed. Place back the seeds for 3 days and tie in a plastic bag and after three days, the seeds will swell, showing signs of being treated. Sow the seeds in polythene tubes directly.

The water for watering the seedlings is very close, it is about 10 m from the nursery and within the home yard. The water source is a shallow well.

Customers

The nursery is along the Salima – Lilongwe tarmac road, it is almost 30 m from the road. The distance to the forest is about 1km. Since he has just started, no individual or organisations have come to purchase seedlings.

General Opportunities and Constraints in Nursery Management

When asked if he makes contacts with other nursery managers he said he does not but said one nursery manager who stays at Kapatenga Trading centre (1 km away) came to ask for free seeds of *Senna* species he collected and he gave him. He said he is only in contact with the forestry extension advisor. For the main opportunities foreseeable, he said if the seedling were bought, he said they can help pay for school fees and alleviate the money issue in the family. He also said there might be high opportunity for him to buy food for the entire family just from sale of seedlings. The main constraint to this business is lack of enough food at home. He said 'we are poor, and in most cases spend time cultivating other people's gardens for us to find food'. Secondly he said he lacks communication or contact with big organisations doing tree planting i.e. MASAF, for he said would be able to supply them with seedlings of their choice.

To overcome such problems, he said he does know what to do but ask for assistance in terms of food to alleviate hunger and also wanted to have contacts of NGOs or organisations doing tree plantings so that he may find market for his seedlings.

NKHATABAY

NKHATABAY

Respondent: Ms. Lucy Nkhoma

Gender: Female

Introduction

Kapalapata village is 24 km north of Nkhatabay district, traditional authority Timbiri. Lucy Nkhoma is a Tonga, an original inhabitant of the area and she is married with four children. She did her primary education at Mukondes primary school, which is far away from village. Her main source of livelihood is farming; she grows cassava (*mpuma* and *chaima*), maize (MH 18 and local) and groundnuts (CG7, and *kasawana*). Skills of running a nursery were learnt from her husband who is a patrolman for forestry; her nursery was started in the year 2002.

Deciding on Species to Collect and Mother Trees

There are two species in her nursery these are *Adina microcephala* and *Eucalyptus* species. *Adina microcephala* was locally collected from Chikwina River and *Eucalyptus* species was given to her by the extension worker for forest department. She only collects two species thus *Eucalyptus* species and '*Min'gona*' (species not identified) but for this year she decided to collect '*Min'gona*' only because last year *Eucalyptus* species did not germinate because of termites. The availability of seeds locally is what determines what species she collects. The mother trees are found along Chikwina River, which is about 800 meters away from her household. Normally if she cannot find the species she want, she depends greatly on the available seedlings but sometimes she asks for assistance from her neighbours and forestry department. An example was given that once, she

wanted pine and when she did not find the pine from her friends and forest department she stopped there and nothing was done there after.

Number of Mother Trees and Flowering Trees Around

Approximately 15 trees were used to collect the '*Min'gona*' that she has in her nursery. This number of mother trees was determined by the availability of good wildlings and also she stopped collection on the fifteenth tree because the wildlings were enough for her requirement for this season. The trees are surrounded approximately by 50 trees of the same species, mango and a few *Gmelina arborea*.

Collection of Seed/ Wildlings

For this season seeds were not collected but she collected wildlings which were pricked out from the *Adina microcephala* mother trees that she used. After pricking, she puts the wildlings in a basin and collects to her household. The husband told her that collection of *Adina microcephala* is done from August to September, so she just knows that in August *Adina microcephala* starts to germinate and she waits for two weeks so that the wildlings grow. Collection of Mg'oma is done immediately when the mg'ona grows a bit. It was very easy for her to collect the wildlings, as there are a lot of mother plants, it took her 2 days to finish collection. The wildlings are stored in a basin of water for about 3 days.

Eucalyptus species. Last year she collected *Eucalyptus* species seeds, she uses a tree to pluck a branch of *Eucalyptus* species, which contain mature fruits and afterwards removes the fruits only from the branch. The fruits are carried home in a basin and dried on the sun for 2 days or more until the fruits burst. She said, '*ndimathyola nthambi ya bluegum imene ili ndi zipatso kenako zik-agwa pansi ndimathyola chipatso chokhabhija ndikunyumulira basin kumapita nazo kunyumba. Ndimayanika Kwa masiku awiri kuti mpaka zipatso ziphulike*'. When the fruits burst she separates the fruits and the seeds, the seeds are dried on the sun for a day. The seeds are kept in a light plastic bag, which allows air to penetrate to avoid the seeds from rotting.

The collection of seeds is done in end May or early June because the seeds at this time are mature. The fruits change colour from green to brown, which is now a sign of maturity. It takes her a day to collect the seeds. From collection to germination of seed it takes her a month and sometimes two months, seeds are collected from end May or early June but they wait to sow in August and September to avoid overgrowing of seedlings. There are no specific methods followed to clean the seeds, when the seeds are separated from the fruit they are just stored until sowing day. The problems that are faced with the collected seeds are: Lack of germination of the seed if the mother plant was not healthy. Immature seeds sometimes take a long period of time to germinate and sometimes they do not germinate. Drying up of wildlings if collection was not all that good. Bigger wildlings need to be collected but sometimes-smaller ones are collected and they do not grow.

Eucalyptus species are just watered three times a day for eight days to germinate the seed; from the 9th day she waters twice in a day to help the germinated seed to grow healthy. For the wildlings she also waters twice in a day

until planting out. The problems in germinating the seeds are that *Eucalyptus* species sometimes takes a long period of time to germinate and lastly, there is too much work during germination due to lack of implements e.g. lack of watering cans. I use the local methods of watering, (use of a tin with holes at the bottom), but this method is long and tiring. According to Lucy, *Eucalyptus* species takes a long time to produce seedlings as it takes about seven days. 'Min'gona' (species not identified) takes the quickest time because as they just collect the wildlings. She said ' *sindimadzijwa kuti mg'oma amatenga nthawi yayitali bwanji chifukwa ife timatolera omeramera kale. Ngakhale zili choncho ndimawona kuti Adina microcephala umamera msanga chifukwa njere zake ukaziwona kuti zigwa ngati lero, pakapita masiku awiri upeza kuti zamera* '.

Output and Distribution

She has got no customers since she has never sold, in future she wants to sell but she can't tell at the moment how she will get customers.

Nursery Management Options

On raising seedlings in the nursery she said, '*choyamba timatolera Adina microcephala ku msinje ndikusunga kapena kutolera mbeu ya Eucalyptus species ndikusunga, ndiye timalima mu nursery mwathu ndikutipulatipula kenako ndikuwotcha. Timatipula dothi kumbali, pafupi ndi nursery loyika ma tube, tikatsila dothi lija muma tube timakayala ma tube aja mu nursery mwathu muja ndikumadzalamo m'ma tube muja kumbaliku nkumatsiliranso*.'

Potting soil is taken just close to the nursery and it is not carried, she fills the pots right there. The pots are carried to the nursery in a basin and the containers are taken from forestry department. The potting soil is not mixed with anything, she does not know the name of the soil she uses but she just calls it '*dothi la khandu*'. She does not produce bare root seedlings and she does not use shade. She does not use vegetative propagation. No treatment is done to improve germination. She just waters the wildlings and for *Eucalyptus* species she sows the seeds. The water source is only 2 minutes walk (uses Makwezo stream) to water the nursery.

Customers

It is 9 km to the nearest tarmac road and seven kilometres to the nearest forest. As already discussed respondent has no customers because she has never sold her seedlings.

General Opportunities and Constraints in Nursery Management

The respondent is not in contact with other nursery managers because she has never thought of visiting any nursery manager, as this is only her second year in her nursery work. The main opportunities that were mentioned are:

The planted trees help them with firewood.

The trees are also used for timber

Addition of soil fertility (Some trees like *Faidherbia albida* adds fertility to the soil)

Prevention (controlling) of soil erosion because the roots help to hold

together the soil and when the rains come, soil cannot be washed away.

The opportunities can be fulfilled by working extra hard in planting more and more trees.

Main Constraints	How they can be overcome
No markets	She said there is no solution
Termites eating the germinated seed	Forestry department should buy pesticides for farmers
Discouragement by a lot of people since Nkhatabay has got a lot of trees	Avoid what people have said by planting more trees regardless to what people are talking

NKHATABAY

Respondent: John Kondowe

Gender: Male

Introduction

Kango Village is 20 km north west of Nkhatabay district, traditional authority Timbiri. John Kondowe is thirty-one years old; he is currently married and has five children. He never went to school because he was not interested and there was nobody to force him to go to school as his father died when he was only a few months old. His main source of income is farming; he grows cassava (*mpuma*, *chaiya*, and *kuloweke*), Maize (MH 18 and local). Groundnuts (*kasamaya*) and sweet potatoes. He has four seedlings of *Eucalyptus* species and thirty-seedlings of *Adina microcephala* in his nursery. John started his nursery last year and he mainly depends on local collection for both species. He does his nursery work with the wife who is also thirty-one years old.

Deciding on Species to Collect and Mother Tree

The nursery has two species, *Adina microcephala* and *Eucalyptus* species, both were collected locally but for mgo'na he collected wildlings and not seeds. The respondent said that he decided to collect these species because these are the only mother trees that they have in the area. He said, '*njere kuno ndizosowa zedi, mitengo ndiyambiri koma yotoleramo njere ndi mitundu iviri basi*'. The mother trees are many, for *Adina microcephala* they have a lot of mother trees close to Chikwina River and for *Eucalyptus* species he has a lot of mother plants in the village he explained. There is completely nothing done if he cannot find the species he wants the respondent explained, '*ife kuno tinazolowera njere ndizosowa ndiye tikapanda kupeza njere zomwe tikuzifuna timangokhala ndikumadalira zimene tili nazo kale*'.

Number of Mother Trees and Mother Flowering Trees Around

One tree was used to collect *Eucalyptus* species and approximately four trees were used to collect the wildlings for *Adina microcephala*. He said, '*tinagwritsa mtengo umodzji kutolera Eucalyptus species koma Adina microcephala tinagwritsa four (mongoyelekezera) chifukwa timakhala tikumayenda ndikumazula zimene zikumwoneka zazikulu*'. Ndiye nambala yake yomwe tinatolera *Adina microcephala* ndiyovuta kuyitchula'. One tree was used for collection of *Eucalyptus* species because the

mother tree had enough mature seeds for him to collect for this season. He used four trees of *Adina microcephala* because the four trees meet his requirement for the season. He collected bigger wildlings from the mother trees of mg'ona and soon as he collected 30 seedlings he stopped because that's what he wanted to grow for this season. The mother trees are surrounded by njana, matatani and katope trees; there are about four trees of njana, seven trees of matatani and 2 trees of katope.

Collection of Seed

Wildlings of *Adina microcephala* He collects wildlings from Chikwina river and Luwawa river and this is what he said, '*timapita ndi ndowa ku mtsinje ndiye mundowamo timathiramo madzi a pamtsinje paja ndiye timazula ma wildlings ndikun-manyika mu ndowa muja kuwopetsa kuwuma chifukwa 'min'gona' umafuna madzi ambiri?*

Seeds of *Eucalyptus* species. The respondent said, '*timagwetsa mtengo wa Eucalyptus species, tikagwetsa timathyola zimene zankhwima zija* (the fruits that have turned brown from green). *Tikayoyola timayika mu carton ndikunyamula kupita nazo kunymba?*

He decides when to collect *Adina microcephala* wildlings when they are big. He said, '*ndimayendera kumtsinje nthawi ndi nthawi kukawona ngati Adina microcephala yayamba kumera; tikawona kuti yayamba kumera timadikira kwa masabata avrir ndiye timadzivanso kuti nthawi yakwana yokatolera?*' The *Eucalyptus* species he said, he checks the mature seedlings as they turn from green to brown. It takes him two weeks to finish collection of *Eucalyptus* species if he wants a lot, but for the stock he has in his nursery it took him a day only to finish collection. *Eucalyptus* species are collected in a carton and is stored in a plastic paper (empty sugar plastic paper), whilst wildlings are collected in a bucket and they are stored in the same bucket at home. Sometimes the wildlings are stored along the river that is if the household wants to use the bucket.

To clean *Eucalyptus* species he said, '*ndikabweretsa zipatso zanga zija kunyumba ndimazimanga mu jumbo ya sugar ndikumayanika zili zomanga choncho. Zimathethke-ea chifukwa cha dzuwa ndiye timachotsa zoyipa zakunja zija ndikusunga njere zabwino zija mu chikwama zili ndi jumbo yomwe ija?*' For wildlings he said there is really nothing done as he just keep the wildlings in the same bucket, waiting for him to fill the polythene tubes. Some of the polythene tubes are filled with soil and sometimes on the same day he plants the wildlings.

It does not take him a long period of time for *Adina microcephala* from collection to germination of seeds. As already explained above he sometimes plants on the same day but sometimes he plants on the next day depending on pressure of work. For *Eucalyptus* species it takes him 2-3 months from collection to germination. He said he has no problem at all with the collected seed. He said, '*palibe vuto linali lonse pa ma wildlings kapena njere zimene ndatolera?*' To germinate the seeds and the wildlings he just waters using a watering can twice in a day. One problem was mentioned on problems in germinating the seed. He said, '*Bluegum ndiwovuta kwanthu kuno umatha kumsefa bwini bwino koma tsoka ndi ilo osaphuka kuyesa yesa kuthilira komabe zosagwira*

komanso tizilombo takuno (chiswe) timakonda Bluegum zedi; akamamera ito timadula ndi kudya. He doesn't know which species takes the longest to produce seedlings but he said the quickest species is *Eucalyptus* species, when it is very hot it takes 3 to 4 days to produce seedlings but when it is cool it takes one week.

Output and Distribution

He has never sold his seedlings hence he has no customers. He has never thought of selling his seedlings because his main aim is to plant more trees for himself for future use. (e.g. *kumangira ma phaso*).

Nursery Management Options

When he want to raise seedlings in his nursery he said, *choyamba ndimamanga fence pamalo paja kutetechapo, kenanaka ndimatipula ndikupanga timabedi, ndikunyika zinyalala pa nursery paja ndikuwotchapo ndimoto, kwotcha tizilombo. Pamwamba paja ndimayika mchenga pang'ono. Kumbali kwa nursery kuja timakumba dothi la katondo ndikumathira ma tube ndikumakathira paja tasalaza paja*.

He uses polythene tubes that are taken from Mpamba forestry department, the potting soil is dug just close to the nursery. The potting soil is filled into the tubes just straight from where the soil was dug and carrying of polythene tubes is done in a basin or bucket to the nursery. This soil is not mixed with anything. He does not use bare root seedlings, he uses shade to protect the seedlings from too much sun, which can dry up the seedlings. He does not use vegetative propagation. The seed is not treated in any way to improve germination; he just waters as already explained.

Customers

It is eight and half Kilometres to the nearest tarmac road and 6 km to the nearest forest. (Has no customer already discussed).

General Opportunities and Constraints in Nursery Management

The respondent is in contact with other nursery owners. He said, *ndimakambirana ndi a manazale ena ndipo ndibwino chifukwa umaphunzirako nzeru zina zimene sumadziva*. The main opportunities that he can see are: The trees provide poles for building houses. The trees provide timber. *Mitengo ndiyabwino chifukwa imatipatsa matabwa amene timatha kupangira zitseko, mipando etc*, the respondent said'. The major constraint is lack of implements, which makes nursery work to be very difficult. This can be overcome if the government bought watering cans, shovels (all implements) for all communal and individual farmers.

Conclusion

The interview was not all that good as the respondent seemed not to know what he is doing, he had to be pushed to answer most of the questions.

NKHATABAY

Respondent: Mr. Charles K. Gondwe

Gender: Male

Introduction

Mr. Charles Gondwe lives at Chintheche trading centre, Group village Head Msundu in Malanda Village. He is 44 years old and owns a private tree seedling nursery, started in 1998. He said he once worked for Kawalazi estate as a nurseryman. To earn a living, he says mainly depends on farming. He grows crops of cassava, maize, and pineapples. Besides farming on a small scale, he also works on part-time basis as a builder and he is famous for raising tree seedlings of *Eucalyptus* species. He is not a well to do farmer. He is a small-scale farmer. The species that he raises in his nursery are; *Eucalyptus* species, *Senna* species and oranges. The total number of seedling currently in pot is 200 *Eucalyptus* seedlings. Most of the seedlings are on the seedbed not pricked out. He is lacking polythene tubes. Some seedlings have been washed away by heavy rainfall.

Deciding on Species to Collect and Mother Trees

The species that are in the nursery and were locally collected are *Eucalyptus* species, he has 200 seedlings in pots only. To decide on which species to collect, he said this mainly depends on what customers prefer. He said most customers are looking forward to planting *Eucalyptus* species with a white stem. Also he said wants to plant *Senna* species trees and fruits trees around their homes. He also has an own woodlot. He plants each year *Eucalyptus* species seedlings and citrus fruits in his woodlot. He has also planted around his plot boundaries two *Eucalyptus* species'.

To find the mother trees, he says he looks for old matured trees that are producing seeds. He said, the trees should be straight and of the right species wanted. He said for *Eucalyptus* species, he found the tree species growing at Chihame Primary School. (They are the white *Eucalyptus* species stems wanted), 600 metres from the nursery. For species he cannot find, he said he wants several species that he cannot find locally, i.e. pine species and other agro- forestry species. He said he has gone several times to the forestry office to inquire. If they may obtain such seeds from anywhere, he said they just promised him, but up to now they have not given him.

Number of Mother Trees and Flowering Trees Around

For *Eucalyptus* species he has collected the seeds from one tree. There are three big trees growing together and all are flowering. They are of the same species and fruit abundantly. Around the collection area is *Gmelina arborea* trees. As to why he collected from one tree, he said each year; he collects from one different tree of the three trees, he said he alternates each year. This he said is out of own interest.

Collection of Seed

To collect the seeds, he collects from a felled branch on the ground at Chihane 1 Primary School. The branch had fruits and he quickly decided to pick them. He usually collects from these trees while standing. He mentioned that he hooks branches within his reach and collect the fruits of

the trees from the branches. He has no one to help him on seed collection. He said sometimes good seeds are on top of the tree, so he said he finds it difficult to collect most of the time. On collection he carries with him a phanga knife and a plastic bag to put in fruits. Fruits he said are plucked in a plastic bag. He said good cleaning of the *Eucalyptus* species seeds is to remove all immature fruits immediately on collection and also removes the leaves and twig and leave only matured fruits. To decide when to collect the seeds, he said seeds or fruits should be matured. Mature fruits are a bit bigger than immature fruits. The colour of the fruits changes from green to a bit blackish. To collect the seeds of *Eucalyptus* species, it takes one day. The collected fruits are put in a plastic bag and taken home. They are left in the sun and overnight for approximately 24 hours from collection. The fruits will crack and release seeds in a plastic bag. The seeds are not stored but sown the same day. He said to complete his nursery requirement; he collects three times and sows separately. This he said was to ease pressure of work on pricking-out. He also does it three times (pricking-out). Problems on collection of seeds, he said, he collected immature seeds. They were smaller cones and the seeds failed to germinate. Trees are very tall and hence fail to collect from the crown of the tree. To germinate the *Eucalyptus* species seeds, he said:

"I made a seed sowing bed and burnt the surface
Put manure on the bed (manure used was goats and chicken droppings)
To sow the seeds, he mixed the seed with sand and sprinkle
When enough, he covered the seed bed with sand.
He said he waters with a sprayer and does this twice every day until germination."

On germination, he said he found problems. He said '*Pomeretsa ndinakumanapo ndi mavuto monga tizilombo, kumadula mbande*'. He said he also tried to collect seeds from around his newly planted trees. He said the seeds have failed to germinate. It's the first time he has tried to collect from these trees. He said they have been fruiting since last year. The other problem encountered is seeds failing to germinate on a seedbed due to high rainfall recently. Most of the seeds have been washed away he said. The species that take the longest time to germinate or produce seedlings are oranges. Takes 10-12 days, *Senna* species. The species that take the quickest days to produce seedlings in Mr. Gondwe nursery are *Eucalyptus* species, it takes 5–6 days.

Output and Distribution

He said 'to obtain customers, he advertises himself with the seedlings'. He usually carries samples of seedlings that he advertises in the village and at the trading centre. He also mentioned that *Eucalyptus* species seedlings are also produced on order from interested individuals. Most people buying seedlings from him are individual farmers. Customers for *Eucalyptus* species are about 40 per year, buying at least 3-100 seedlings each. He said he sells new species i.e. oranges, which he tried to raise. Some are being bought at K10.00 per seedling. The selling price for *Eucalyptus* species is K5.00.

Nursery Management Options

The potting soil is used from a 'mound' (*dothi la pachulu*), The soil is a bit of clay, the soil is mixed with manure (goat and chicken dropping). These are mixed as follows: - three tins of chulu soil, three hand palms of manure. This mixture will make potting soil for use in Mr. Gondwes nursery. The containers used are polythene tubes; he got these from forestry department offices. He does not produce bare rooted seedlings. He said he uses shade, the shade is made out of bamboos and it is used to protect seedlings from the sun. He said he does not treat any seeds to improve germination physically but he said 'he believes that manure put in polythene tubes in the soil helps in fermenting the orange seeds hence will speed up germination. He said he learnt about vegetative propagation when he was at Kawalazi estate. He said, he would be happy to do grafting in his own nursery. He said he lacks plastic sheeting for a grafting shed so does not produce any of the vegetative propagated seedlings. The water source is about 50 metres from the nursery.

Customers

The nursery is situated 500 m to the tarmac road, the nearest forest is an own woodlot created from his nursery seedlings. It is 20 m from the nursery and has about 530 trees of *Eucalyptus* species and fruit trees. It has been well planted and cared for. Customers buying seedlings in total can be around 45, Customers buying seedlings sometimes come from a distance of two and half kilo from the nursery.

General Opportunities and Constraints

He said he is in contact with other nursery managers. The main benefit is that they sometimes share polythene tubes. He said, 'sometimes we even give each other seedlings for free'. They do not sell each other seedlings. For the main opportunity that Mr. Charles Gondwe foresees on nursery business is that there is potential market for *Eucalyptus* species seedlings around Chintheche. He said '*inyo mitengo sijinayambe yagonerapo munazale*'. Meaning since he started in 1998, he has always been selling all tree seedlings he raised until today. He said to fulfil this opportunity he would wish to have a big nursery. He also said, '*ndikofunika kupanga kasinthesintha wa mbande kuti anthu athe kuzepza mbande zonse akufuna mu nazale yanga*'. The main constraint he said was; Lack of seeds and polythene tubes, He said he also lack equipment like a bicycle for selling and advertising seedlings also a wheelbarrow for lifting potting soil. To overcome such problems, he said, 'only needs assistance on the seed problem and polythene tubes'. The given tubes are not enough, he also said he would be comfortable if one of the two equipment is provided.

NKHATABAY

Respondent: Evans Zulu Mwale

Gender: Male

Introduction

Evans Zulu is an individual owner of a tree nursery, he is an orphan aged 18 and he is a standard eight pupil. He lives in Ziyamu village in Traditional

Authority Malenga Mzoma. He started his nursery in the year 2000. The nursery is located at his uncle's home yard. The nursery currently has a total number of 18 seedlings already potted in "Chibuku packets". Some seedlings over 2000 have germinated on the seedbed and wait transplanting to the pots. The species in the nursery are *Eucalyptus* species (4), *Uapaca kirkiana* (2), oranges (4), and *Senna* species, on the seedbed is *Eucalyptus* species, locally collected. Evans Zulu is also a facilitator on seedling raising courses that are held jointly between villages. The nursery is not fenced so face animal problems grazing or feeding on the *Eucalyptus* species seedlings. The most important species in the nursery are *Eucalyptus* species.

Deciding on Species to Collect and Mother Trees

To decide on which species to collect and raise, he said he looks at what tree species are important firstly to human health. He said, 'I raise fruits because I know they are important to human beings'. The fruits can help to alleviate hunger problems. He also mentioned that he collects and raises tree species that can easily generate income. He said *Eucalyptus* species selling could generate income or money, selling of poles as well as selling of seedlings. The past season, he said he sold 7000 seedlings at K5.00 each but this year he intends to plant and sell the seedlings, but mainly said will concentrate on planting. He said *Eucalyptus* species poles are fetching high prices near the lake, each pole cost K50.00, so has thought it to wise to plant *Eucalyptus* species this year.

To find the mother trees, he said he looks for tree species that has mature seeds only. Previously, he said, could go to the nearest forest, 5km away, but said this year, he raised from seeds collected at home yard. For species he cannot find, he said he does nothing. He, some years ago, went to the forest advisor to ask for seeds, but kept on promising him until he gave-up. He said he saw an interesting tree at Kavuzi estate and he wanted to try to raise it but he did not know where to get the seeds.

Number of Mother Trees and Flowering Trees Around

He collected from one tree by felling, he actually mentioned that it was the only tree that had mature seeds and that's why he collected from this tree. There are other trees around of *Eucalyptus* species. Most of these are young regenerations and do not produce seeds. Some regeneration has started producing seeds/fruits, they are small regenerations but on collection they had not matured yet to collect from.

Collection of Seed

To collect the seeds, he had to cut the mother tree with an axe to collect *Eucalyptus* species fruits. The fruits were then plucked with hands from the branches and placed in a 'Kachibikili' by himself. He said before collection, he had decided on whether to collect the seeds or not. He said, the ripe fruits were yellow or grey as compared to the green fruits before maturing so decided to collect the mature fruits. The collected fruits were dried 2-3 days in the sun in the 'Kachibikili'. He said he used a sieve to separate seeds from empty fruits and twigs. On collection, he had tried to collect seeds from the forest about 7km from the nursery, he found out that the seeds

were not germinating. He said he noticed differences on the size of fruits or capsules. The ones collected from the forest were too small and hence maybe were not matured and that's why they did not germinate. Generally, on collection, he said had no problems. Seeds collected were immediately sown after collection. He said sometimes could store for up to 10 days before sowing but said he normally sow immediately. A seed from the recently collected mother tree was enough to be stored. He said he would keep the remaining seeds for next years sowing. He mentioned that on storage for long term, he keeps the seeds on the shelf under room temperature. The seeds he tries to keep the past season when sown could not germinate too. To germinate the seeds, he prepares a seed sowing bed from soil (he uses a big tinned basin as a bed), add manure and ashes on to the soil. (He said, '*payenera kukbala magulu atatu*'. Meaning 3 elements; good soils, Ashes and manure for a sowing bed. On the surface of the bed, add grass and leaves for burning the surface. After one week, sows the seeds by broadcasting seeds on the surface of the cooled seedbed. He said he had no water can but uses a cup to water the seedbed. He said on watering with the cup, he keeps the cup very close to the seedbed surface and waters gently; he said he waters every morning and afternoon. On germination of *Eucalyptus* species seeds, he said if the surface is not adequately burnt, pests locally termed '*majufuzi*, '*zimang'ambang'amba* (Cracks the seedbed surface) *pa seedbed* (*zimaoneka ngati mphusi*). Sometimes ants eat the seeds or take the seeds deep down the holes. The quickest species to produce seedlings in Evans Zulus nursery is *Eucalyptus* species, it takes 3-4 days and Tomatoes also takes 3-4 days. The species to produce seedlings are tangerines, they take 7 days.

Output and Distribution

To obtain customers for the seedlings, he said seedlings are not produced on order or advertised but the nursery is at the middle of the village and near the village's main road. Customers within the village see the seedlings for themselves, its self advertised. He said there is demand for the seedlings in the village. Customers purchasing particular seedlings species are as follows:- *Eucalyptus* species:- 15 customers, buying at least 20 – 250 seedlings each, tangerines: - at least 2 customers buying 1- 2 seedlings. He said he raises new species but do not sell because they are too few so he just plants them.

Nursery Management Options

Soil for pot filling is obtained from the *Eucalyptus* species trees. He said, '*dotbi limeneli ndi la chonde*'. The soil is sandy loam; he does not mix the soil with anything. He used polythene tubes given by forestry extension advisor and to a large note uses "*Chibuku* packets". He was complaining that "*Chibuku* packets" consume too much soil unlike the polythene tubes. He puts shade onto the nursery; this is made out of reeds (*bango*). He said to do some labour work; he employs children cheaply by buying them bubble gums at task work. Costs are one bubble gum to 10 pots filled. He does not produce bare rooted seedlings. He has tried vegetative propagations but said he would be eager to try that when chance comes out right. He said he has treated seeds before; the five species he has treated before are:- Citrus fruits species - Removes the seed coat before sowing only. The distance for the water source borehole is 200 metres from the nursery.

Customers

The distance to the nearest tarmac road is one and half kilometres (Nkhatabay – Dwangwa). The distance to the indigenous forest is 4km from the nursery. He said, he has sold to at least 17 customers for the period, December 2002 to December 2003. The people coming to buy seedlings are mainly from within the village, the furthest customer came from Malaza trading centre, 7 km away from the nursery.

General Opportunities and Constraints

He said he is in contact with other nursery managers. They benefit manually by teaching each other experiences on seed treatment and how to overcome pests in the nursery. The main opportunities foreseeable in the nursery business is how much he will raise in the nursery for both own planting and selling. He said he will maintain the nursery so that he plants a lot of *Eucalyptus* species seedlings. He said there is a high potential market for *Eucalyptus* species poles. The market for these poles lies along the lake for shed constructions, fences and temporary buildings. He also mentioned that on a smaller note, he would continue selling seedlings. To fulfil the above, he said would need some people to assist him or someone to closely work with him. He said his uncle will assist him, the main constraints to his nursery business he said is that, people are jealousy when they see him producing seedlings and making money out of them. He said they come to destroy his seedlings in the night and also stealing seedlings, he said this year they have stolen over 200 seedlings. To overcome this he said he would just continue raising these seedlings.

The other constraint to his business he discussed to length was inadequacy of seeds and polythene tubes. He said, he would want to raise many species, but he does not know where to obtain seeds. Forestry staff keeps on promising him but not honour their promises. He said he needs assistance from organisation to supply him with these items. He also said he needs chemical to treat spiders and other pests destroying seedling and he also mentioned that he needs at least a water can to help him water his seedlings effectively.

NKHATABAY

Respondent: Washington S.C. Banda

Gender: Male

Introduction

Mr. Washington S.C. Banda's nursery is mainly situated along the Kawiya River. Some seedlings are also raised around his home yard. His house is near Kawiya river bridge, Chintcheche. The owner is about 60 years old, and at one time was a District commissioner. His highest qualification is a degree certificate. The nursery near the stream is not fenced. It is situated in a banana field. At home, there are a few seedlings. They are also not fenced. All the seedlings are placed under shade from trees. The seedlings being raised are *Khaya anthotheca* (6), *Eucalyptus* species 220, *Senna* species, *Erythrina abyssinica* 3, and *Senna* species (4). Some seedlings have already been distributed amongst other villagers in Kawiya. The total number of seedlings left

is 263 seedlings. Most of the seedlings raised each year are *Eucalyptus* species seedlings.

Deciding on Species to Collect and Mother Trees

The seedlings raised are for own planting in his woodlot and also at his yard. He has a very big woodland of both indigenous and exotic trees and also, seedlings are raised for free issued to other village members. Species locally collected are; *Eucalyptus* species, *Senna spectabilis* and *Erythrina abyssinica*. The reason as to why they decide to collect these species is for;

Planting for the purpose of replacing tree felled from the woodland. Providing for essentials such as construction of poles, firewood, shade trees around the home; timber for doors and door frames.

He also said, '*chimapangitsa china kuti atole mitundu imeneyi ndi choti siimavuta pakameledwe, komanso ina imafulumira kukula*'. Meaning they decide to collect some of these species because they are easy to produce seedlings from seed and also they grow very fast.

Other species are grown to protect soil erosion along the river bank (Kawiy river).

Trees being raised such as *Erythrina abyssinica* is to beautify the home yard and also to provide enough shade and fruits around the home.

For species not easily found, he said they try their best to get the seeds. But he admitted that they cannot find the seeds mostly of the wanted species. Sometimes he goes to forestry offices nearby and also agriculture offices to seek assistance.

Number of Mother Trees and Flowering Trees Around

For *Eucalyptus* species, he collected from one mother tree. The tree was meant for other purposes; it was a big tree collected from. It was meant for brick burning. The tree is around the home yard. He said, sometimes when they want to sow, they climb the trees to obtain seeds. Near the felled mother tree, there are other big trees producing seeds, underneath are 16 smaller trees of *Eucalyptus* species, but not fruiting. For *Erythrina abyssinica*, Seeds were collected from one mother tree. There are no other trees of the same species around, it is solitary. The other species locally collected is *Senna spectabilis*, it was collected from one tree. Around the collected tree were other trees, there are three other *Senna spectabilis* trees. The reason why they decide to collect from only one tree is that the seedlings wanted to be raised were very few. He said he just picked one pod of *Senna spectabilis*.

Collection of Seeds

To collect *Eucalyptus* species seeds, he said he did the following; felled the mother tree on collection, plucked the fruits from the mother tree branches, placed the fruits on a plastic sheet of paper to sundry. When collecting, the fruits are placed in a water cane. They find no problem on collecting *Eucalyptus* species. To decide on when to collect the seeds he said, '*Chimene timadzivira kuti njere zakhwima, kukachita mphepo zimagwa ndiye zisanathe tiyenera kutchola*'. He had problems on the collected seeds, for example lack of germination. This was due to the seedbed not being adequately burnt. He also mentioned that if seeds are not properly covered with sand, fail to germi-

nate. It takes about one week collecting *Eucalyptus* species seeds within that week, he collects only 3 times. He breaks for a day each time he collects seeds. He said if they want plenty of seeds, that's when they collect more than once. To clean the seeds, it is done when shaking the seeds off the pods, he assures that twigs and leaves do not fall in the seed of container. The seeds are stored for five days to prepare for sowing on a seedbed. For left overs in seeds sown, he said they store in a plastic paper and places in a carton.

To germinate the seeds; seeds are sown on a seedbed. The bed is constructed by digging a basin, and leaving the constructed seedbed for 3 days and then burn the surface of the seedbed with grass or leaves. On the fifth day he sow the *Eucalyptus* species seeds. Water the seedbed; continue watering each day every morning and afternoon. The problems on germination are that if seeds are not well watered, they collect on one point and fail to germinate properly. He also said sometimes chickens around the home yard feed on the germinated seedlings. The species that takes the longest time to produce seedlings is: *Erythrina abyssinica*. The species that takes the shortest period to germinate is *Senna* species, it takes one week (*Senna* species).

Output and Distribution

Seedlings produced are not necessarily for sale, but for planting in his own woodland and around his home yard. He has a large forest of his own and also plants a lot of trees in home yard. Seedlings produced sometimes are distributed to the village community for individual planting. He said this season, they have already distributed to 30 individual families *Eucalyptus* species seedlings. They sow new species in the nursery, but not for sale. Only for own planting and tree distribution.

Nursery Management

The potting nursery soil is from Kawiya riverbank. The soil is black and rich in nutrients, the soil is mixed with manure (cow dung). The mixing ratio is one water of soil to one shovel of manure. (The manure used is not direct from the cattle kraal. It should have been removed 3 days before mixing with soil. He said this allows for cooling of the cow dung normally it is hot when directly obtained from the cattle kraal. The potting materials used are polythene tube acquired from Agriculture officers and he also uses "Chibuku packets" and sacks. The nursery does not produce bare rooted stock. Shade is used on the seedbed; this is made out of thatch grass. They do not know how to graft seedlings, and do not produce the grafted seedlings. Seeds are treated on germination this is only on: *Senna* species, it is nicked before sowing 'kupungula pang'ono'. The rest of the seed raised are not treated.

Customers

The nursery is 30 m from the tarmac road and own forest is 100 m away from the nursery site. Basing on free distributions of seedlings, individual's collecting these seedlings this season are 30. The furthest person or individual collecting seedlings is 77 km from the nursery. Some seedlings have also been issued to relatives in Lilongwe 263 km away.

General Opportunities and Constraints

He is in contact with other nursery managers. He said 'if you have little or inadequate seeds or tubes, you can go and beg some from friends and they might assist if they have some'. He said '*mwayinso oyendetsa nazale ngati business ndi wauklulu poti anthu amaifuna ambiri kuno ku Chintebeche koma Ife kwachulukira ndi kuvapatsa. Mvai oyendetsa nazale tidakali nawo chifukwa mitengo tikudula ndiye nazale izifunika kuti tithe kubwezeretsa mitengo momwe adulamo. Chofunika kuti tikwanilitse zimenezji ndi kulimbikira kuti tikhale ndi mitengo yambiri.*

The main constraint he said was:- the lack of knowledge to raise some seedlings from seeds and as well as grafting. He said he wanted to learn much on grafting and building and the other problem mentioned is the lack of seeds such as pine species, *Khaya anthotheca* and other species. To overcome these constraints, he needs help from other institutions to provide on short trainings. He said he does not know where he can find these seeds apart from the forestry office in Nkhata-Bay.

General Comments

He said CPAR gave him some seeds to raise, such as *Faidherbia albida* and *Acacia species*. He raised these species and all of the seedlings were given to villagers nearby to plant their gardens, he said they improve soil fertility in the garden. When the trees grow, he will go and collect seeds from there and plant in his home gardens.

NKHATABAY

Respondent: Hastings Nyirongo

Gender: Male

Introduction

Hastings Nyirongo started raising seedlings in the year 2002, the main objective of raising the seedlings was for own planting and the rest are kept for sale. There are 150 seedlings in his nursery and the nursery is located at his home yard. The species being raised are *Adina microcephala* (100) and '*Mkuru*' (50) (species not identified). All these are riverine tree species and they were all collected as wildings in the Chikwina River.

Deciding on Species to Collect and Mother Tree

To decide on which species to collect, he said he had problems fetching for tree species that can provide for poles and timber in construction of window frames.

The species chosen last for a very long time in a constructed building and do not rot. The timbers used are termite resistant. They said they are planting a lot of these species around the farmland, which is a very hill farmland/place. The species of *Adina microcephala* is being planted on the slope edges of the farmlands because of its fibrous roots that it shall be holding soil and thereby prevent soil erosion. He said he is raising '*Mkuru*' (species not identified) for timber and for future fuel wood supplies. If farmers

come this year for purchase, he may sell some. To find the mother trees he says he looks for the species along the river, he said the trees produce seeds early October but it is difficult to obtain seeds. He said it is laborious handling seeds than handling *Adina microcephala* wildlings. For species he cannot find such as pine, previously he could find them at Forestry offices but now he finds none. So he just stay-put.

Number of Mother Trees and Flowering Trees Around

The wildlings of *Adina microcephala* were collected in Chikwina river. There are two *Adina microcephala* trees that produce seeds around the four-collected area and also 30 m from the collected area are four other similar *Adina microcephala* trees that are also producing seeds and being washed away in the river. The 'Mkuru' species were collected also in Chikwina River, the wildlings were collected near the same site where *Adina microcephala* seedlings were collected. There is one big Mukuru tree on the collection area, other 'Mkuru' trees are small trees (three) but said they also produce flowers. The wildlings are actually from the big tree only.

Collection Of Wildlings. To collect the wildlings for *Adina microcephala*, they are commonly found growing on cracked rocks in the river and for Mukuru wildlings; they grow on the edge of the river and under the tree. To collect the wildlings, he was alone, he had a carton with him on to which he placed or put his collection. He was uprooting the seedlings of *Adina microcephala* on rock and some growing on sang patches in the river. He said he has to use bare hands to uproot the wildlings.

To collect the wildlings, collection is usually done in December when the wildlings are a little bit bigger. For *Adina microcephala*, the mother trees usually flowers in September – August, and fruits in October and releases the seeds. It is a problem collecting wildling in October or early November when the rains are not enough. He said it is laborious watering the seedlings in the nursery and also it is difficult to uproot some seedlings/wildlings. He chooses bigger wildlings on collection. He said smaller ones may stay up to one year in the nursery.

To collect enough wildlings, it might take at least one week. For the seedlings in the nursery, he said he collected in one hour. To transport the wildlings to the nursery uses a carton and to store the wildlings he had to put some water in a tin and dip the root ends in water. He could only store for one day. To put the wildlings in the pots, he holds the wildling gently and insets the roots in the big hole at the centre of the polythene tube. He covers the roots firmly with soil and waters immediately. He said 'Min'gona' seedlings do not pose much of a problem as compared to Mukuru seedlings on transporting. For *Adina microcephala*, he showed me the ones he had directly planted in the field. He said if quite big, they are preferred to be planted directly in the field. The main problem is that if water is inadequate in the nursery the seedling die. On transplanting, he said *Adina microcephala* recovers quickly as compared to 'Mkuru'. (Period not certain).

Output and Distribution

The seedlings are not produced on order or advertised. Last year, the district forestry officer bought 200 *Adina microcephala* seedlings from him, this year he said he will plant all seedlings in the farmlands and riverbanks around his banana field. He does not sell new species.

Nursery Management Options

The potting soil used is from the dambo area, he said he obtains this type of soil because it has nutrients for tree growth and seedlings grow fast. Containers used are polythene tubes that were issued to him for free from world vision offices at Chikwina. He does not produce bare rooted seedlings and he does not use vegetative propagation techniques in the nursery. The seedlings produced are not shaded, no seeds are treated to improve germination in any way and the water source (river) is 50 m away.

Customers

It is 6km to the tarmac road and the nursery is 500 m to the forest. They have only one customer, the district forestry officer at Chintheche. The customer comes 60 km from the nursery and purchases *Adina microcephala* seedlings.

General Opportunities and Constraints in Nursery Management

He says he is in contact with other nursery managers. He benefits through this contact by learning how to take care of the seedlings, how to plant them in polythene tubes and general care of the seedlings. The main opportunity he foresees for the nursery business is that he will have a lot of trees to harvest if he continued planting. He said if he had raised about 500 seedlings, he would have had big number of tree to harvest from. To fulfil the opportunity at hand, he would have to work hard to continue planting seedlings every year. The main constraint he said there is no market for these tree seedlings. To overcome this problem the government should help in finding market for seedlings to encourage nursery managers continue raising these species.

BLANTYRE

BLANTYRE

Respondent: Mr. Joseph Mawala

Gender: Male

Introduction

This respondent is married with four children. He is living in his mother's village together with his family. His main occupation is farming. He mainly grows maize, cassava, pigeon peas and onions. He is in possession of sixteen chickens, twelve pigeons and ten guinea fowls. His nursery is located within his home yard. It has to be noted that Kuntanja village is located along the Chileka road. In his nursery, there are 250 *Eucalyptus* species and 300 *Senna* species seedlings. He also stated that he had sown *Khaya anthotheca*, *Faidherbia albida* and *Terminalia sericea* but they all failed to germinate. The only locally collected species is *Eucalyptus*. It also has to be noted that he started having a tree seedlings nursery in 1999. All these years, the nursery has been located in the homeyard.

Deciding on Species to Collect and Mother Trees

The respondent reported that he decided to collect the seeds of *Eucalyptus* species because this species grows well in his area. He indicated that himself and other people have been growing *Eucalyptus* species in the area. On a similar note, he said that he identifies trees that have been growing well in the area to be mother trees. In this case, he identifies the *Eucalyptus* species trees, which he had planted in 1995 around his home to be the mother trees. He indicated that it has never happened that he failed to get the species that he wanted. However, he explained that if he cannot find the species that he wants, he can go to forestry extension officers to ask for a supply of such seeds. He said.... 'There is nowhere elsewhere I can go other than the forestry people. In fact was persistently going to them for *Terminalia sericea* seeds until a time when they gave me some. I can do the same....' He also stated that he decided to get the mother trees because: 'They are his own trees. He noted that these particular trees grow fast.

Number of Mother Trees and Flowering Trees Around

There were four *Eucalyptus* species trees around his house from which he chose two as the mother trees. The four trees are of the same species. However, he said that he chose the two trees as mother trees because of the following reasons: They grew faster, outgrowing the others. They grew straight.. Because of these reasons, he is of the hope that the seedlings from these mother trees would be straight as well as fast growing.

Collection of Seed

In order to collect the seeds, he said that he actually climbed the trees and removed the small branches that were bearing pods. After collecting these small branches, he spread an empty sack on the ground where there was some sunlight. He spread the branches on this sack where they stayed for two days. After two days, he saw that seeds had dropped off from the pods

onto the sack. He took away the branches and the pods. He collected the seed (by wrapping the sack) and put them inside the house. While inside the house, he did not cover them....” to avoid that they may be heated....” Inside the house, the seeds were put in an empty, unsealed envelope. This envelope was placed on a shelf. He reported that he collected the seed in October. When asked why he decided to collect in October he said...” Initially, I wanted to be in the village natural resource management committee (VN-RMC) but my daughter was ill at the time when the committee was being established. When my daughter had recovered, I went to meet the VNRMC members and asked to join them, even if it meant being punished for late registration. They refused because I was late. Then I decided to collect my own seeds immediately. Although it was in October, I hoped that the seedlings would be ready for planting in January...” He also added that he knew that the seeds were ready because he had observed that, while in the trees, the pods were bursting open and seeds were spreading down the tree. He suspected that the seeds that had fallen to the ground were damaged.

The respondent reported that he did not have any problems with the collected seed, they also germinated well. He further explained that he collected the seed in four days. The pods were transported from the mother trees to the spreading location by using an empty sack. The seed itself was stored for one week. After the week, they were spread/broad-casted on a nursery bed. The bed was prepared using black-sandy riverside soil. The bed was first burnt to kill any organisms that may affect the germination of seedlings.

He also acknowledged that when the seed was collected, he cleaned them by using a sieve, which they use in their household for sieving maize flour. The sieving was done in an attempt to get rid of the dirty that had gotten itself into the seed. Commenting on the duration for producing seedlings, he said that seed that have relatively harder shells/cover take long to produce seedlings. He cited such seeds as that of *Khaya anthotheca*, *Afzelia quanzenis*, *Faidherbia albida* and *Terminalia sericea*. He reported that *Khaya anthotheca* takes 20 days, *Faidherbia albida* takes 15 days, and *Afzelia quanzenis* takes 30 days while *Terminalia sericea* takes 12 days to produce seedlings.

On the other hand, he said that the seed that take the quickest to produce seedlings have light covers/shells. He gave such seeds as *Acacia* species, *Eucalyptus* species, *Azadirachta indica* and *Gmelina arborea*. He said that all these take seven days to produce seedlings.

Outputs And Distribution:

The respondent pointed out that his only customers are fellow villagers /farmers from within his villages. He said that “...I have less than thirty customers may be more than twenty but less than thirty. These customers buy seedlings in tens or twenties. No one has ever bought more than twenty seedlings at a time.....” He then expressed regret at two institutions, MASAF and JICA, which he reported that they urged them to produce more seedlings which they were ready to buy but they failed to buy. He also indicated that some of his customers hear from the forestry extension offic-

ers (including patrolmen and forest guards) that he has seedlings. He added that some of the customers actually see him working in the nursery. He also explained that 2002 he was selling each seedling at K3.50. He further reported that he has never tried to sell new species because “.....people here like *Eucalyptus* species because it is fast growing and does not require much attention.....”.

Nursery Management Options

As already indicated, the respondent (and it was observed) stated that he uses riverside black-sandy soil for a nursery bed. He uses black soil from a small hill nearby. He removes small stones from the soil. This soil is loam “... is loose...” 'loyoyoka'. He uses an iron sheet (a flatone) with holes created by nails, to sieve the soil, in order to get rid of sand and grass. He uses a household shovel to mix the soil. He uses black polythene tubes as containers. He does not produce bare root seedlings. He also uses a grass shed so that only light sunshine and heat get to the seedlings. He also indicated that he only uses seed for propagation. He indicated that there is no treatment that is done to the seed. However, he said that he applied a pesticide (Seven) on to a nursery bed through a watering can to kill any pests. He also applied animal droppings as manure. He uses water from Chileka River to water the nursery. Water for cooking and drinking is drawn from a borehole, which is about 300 meters away.

Customers

The nearest forest to the respondent is chilangoma, which is about 1km away. The nearest tarmac road is at chileka, which is at a distance of 10 km away. As already indicated the respondent has about 20 customers who came from a radius of about 1 km. He added that “.... these people usually buy seedlings to plant in the boundaries of their gardens.”

General Opportunities and Constraints in Nursery Management

The respondent reported that he is in contact with members of Chikana natural resource management committee whose nursery is supported by JICA. He pointed out that it is through contact that he learnt that manure could be used in place of fertilizer for the seedlings. He said, “...I am a poor person but used to apply fertilizer to my seedlings now I learnt to apply manure which is very convenient for a poor person like me.” He also added once in contact with other nurseries, one may learn of where he is going wrong if he is failing to successfully raise seedling of particular species while others are succeeding. He observed that they're no disadvantages with being in contact with other nurseries.

Commenting on the opportunities that are in the business he said “..As you can see I am doing this (nursery business) right at my house. I do not bother to carry the seedlings. People came to buy right here. These days, people have realized that it is good to have trees. This is clearly seen by the coming in of MASAF and JICA projects in our area. So, trees will always be needed. Besides, I am already enjoying the fruits of having my own trees. I have a woodlot from which people are buying trees. So, this will continue in the future....”

He then stated that the only constraint in the nursery business is the inadequate supply of polythene tubes by the department of forestry. He complained that instead of getting the tubes in thousands, he is given five hundred or seven hundred tubes. He then reported that in order to overcome this problem, he uses the following strategies:

He asks his customers to remove the tubes carefully so that he can re-use them. Some follow this instruction while others ignore it.

He collects empty “*Chibuku* packets” or sugar packets as containers.

BLANTYRE

Respondent: Mr. Lewis Kaliati

Gender: Male

Introduction

The respondent is a teacher who is teaching at Chilangoma Community Day Secondary School. Apart from teaching, he is also farming. Samama village is home to his wife. The village lies to the west of Blantyre district headquarters, about ten kilometres from Chileka airport. It was learnt that the respondent has just established a tree nursery this year, 2003. He reported that he established the nursery with an aim of producing his own seedlings. He intends to plant these seedlings in his family’s woodlot. In his nursery, he has a total of 752 *Eucalyptus* species seedlings and 144 *Acacia* species. For the *Eucalyptus* species, the seed was locally collected. The seed for *Acacia* species was given to him by an extension worker from the department of forestry. It was learnt later, towards the end of this interview, that the respondent collected few *Acacia* seed to supplement what he got from the department of forestry. The *Eucalyptus* species seed was collected from *Eucalyptus* species trees that are in a small woodlot behind his house.

Deciding on Species to Collect and Mother Trees

The respondent reported that what he had been wanting are tree seedlings to plant in his woodlot. He noted that the area is hot and requires trees that can withstand heat. He identified *Eucalyptus* species to be a tree that is suitable for the area. He further explained that he did not know any type of *Eucalyptus* species, but he wanted the *Eucalyptus* species whose bark is easy to peel/remove. He noted that weevils do not attack such *Eucalyptus* species. However, he could not tell by the looks, which *Eucalyptus* species met these qualities (from his existing woodlot). The wanting of seed coincided with the wanting of firewood to burn bricks. He cut four *Eucalyptus* species trees as firewood for burning bricks. Of the four, one had the required qualities. He immediately took away the small branches that were bearing pods. He also said that the seed that he collected was enough for the intended scale of production. He said that if he cannot find species he wants, he would ask Forestry extension staff for seeds.

Number of Mother Trees and Flowering Trees Around

The respondent used one mother tree. This tree was cut in a woodlot of

fourteen *Eucalyptus* species trees. As already indicated, four trees were cut (for firewood) but only one met the preferred qualities of “easy to peel-off bark”. He indicated that...”seed from one tree were enough for my scale of production...” Within the woodlot, the mother tree was located on the edges or boundary of the woodlot. The mother tree was planted in 1992.

Collection of Seed

The respondent reported that he used a worker to cut the mother tree. It was cut using an axe. However, he collected the seed capsules himself because “... anyone else would carelessly collect the capsules and spill the seed.

Commenting on the timing of seed collection, he stated that he first took a forestry extension worker to his woodlot and asked if it would be right to collect seed at that time (in May 2003). The extension worker approved it, so he was confident that he was doing the right thing. When collecting the seed capsules he collected them while they were still attached to their branches. He placed these in a carton with the capsules facing downwards. The carton was put under a shed “...to prevent the seed from heat...” The seeds fell into the carton by themselves. These seeds were stored for two months in his house. He said, “... I kept the seeds for two months because I was waiting for an extension worker from the department of forestry to teach me on how to sow the seeds...” He further indicated that the seeds were sown in August because of extension officer (forestry) once told him that *Eucalyptus* species needs to be sown in either August or September. It was also reported that the seeds were carried from the woodlot to the storage place in a carton.

The respondent reported that the seed germinated within seven to ten days of sowing. He reported that “... 98 percent of seeds germinated ... “ He pointed out that seeds were not cleaned as such. He said that he removed any non-seeds particles with a free hand (*zitsotso*). The seeds were sown on a nursery bed, which he prepared. He said, “...I prepared a sunken bed, then I collected grass and burn it on the bed to kill any organisms. Then I took river sand and spread it on top of the nursery bed...” He explained that after this, he had to sow the seeds. He pointed out that the idea behind the spreading of river sand was to make sure that the seedlings germinate while loosely spaced. The nursery bed was prepared on a riverbank whose soil is black and kind of mixture of loam and clay. He said that he did not have problems in germinating the seed. But he complained that the watering can that he was using had big holes on watering rose. He said that this resulted in the seeds being washed to one part of the bed. In this case, many seedlings grew on one corner of the bed.

Commenting on seedlings that take long as well as short to produce seedlings, he said that *Eucalyptus* species are the quickest species in producing seedlings because it takes seven to ten days to produce seedlings. On the other hand, he said that *Acacia* species take longer to produce seedlings. He noted that this species takes twelve days to produce seedlings if the seed are soaked in water before sowing while if they are not soaked in water, they take fifteen days to produce seedlings.

Output and Distribution

The respondent indicated that he has never sold any seedlings and does not intend to sell any seedlings. He said, "... my plan is to plant one thousand seedlings in my woodlot. I will not sell anything.

Nursery Management Options

The respondent uses polythene tubes as containers. In order to fill these containers, he used soil from a compost heap, which is black-loam-alluvial soil. He also explained that he uses polythene tubes because they require relatively smaller quantity of soil than "*Chibuku* packets". He also stated that he does not produce any bare root seedlings. He also reported that he just mulches the nursery (seed) bed to retain moisture and to protect the germinating seedlings from the sun, which can kill them. He added that when the seedlings are in tubes, he puts them under a guava tree where there is a little shade and a little sunshine. He said, "I do this so that the seedlings can have enough chlorophyll and they should be hardening off..."

He also emphasized that he only uses seeds to produce seedlings. He does not use any other vegetative propagation. He also stated that he does not treat *Eucalyptus* species seeds in order to improve germination. However, he said that the *Acacia* seeds which he got from department of forestry were first soaked in water before sowing in order to enable the seed to quickly produce seedlings.

Customers

Water for watering the seedlings is drawn from an unprotected well, which is about 300 meters away. But for domestic use, water is drawn from a bore-hole, which is about 400 meters away. It has to be noted that the nearest tarmac road is about 12 kilometers away. The distance to the nearest forest, which is Namisu, is 5 kilometers away.

General Opportunities and Constraints in Nursery Management

The respondent stated that he is not in contact with other nurseries. He said, "Being a teacher, I am usually very busy. But I wish I visited other nurseries. I know where other nurseries are located, I am just too busy. This other day, the forestry extension worker told me that he was going to a certain nursery, and I wished I escorted him there but, again, I was busy. I know that when you visit other nurseries, you either learn from your friends or you share ideas from your experiences..."

When asked about the main opportunities that he sees in the nursery business, he said:..."Having four own nurseries is of great benefit. You see, last year I bought seedlings to plant in my woodlot, I spent a lot of money. Actually, I could not afford to buy the desired quantity of seedlings due to lack of money. But once you have your own nursery, you can produce seedlings to any scale that you want. Last year I only managed to buy one hundred and twelve seedlings but this year I have over eight hundred seedlings. When you have your own nursery, you spend less, produce a lot and have a lot of trees and money in future.

He reported that the only constraint that he has faced is theft. He said that thieves stole fourty-seven seedling from his riverbank nursery. In order to overcome this problem, he decided to bring home all potted seedlings so that they can enjoy the safety of his compound. There are brought home on a wheelbarrow. It is the same wheelbarrow that he uses to transport potting soil.

BLANTYRE

Respondent: Mr. Kanifa Nursery

Gender: Male

Introduction

Kanifa tree nursery belongs to Mr. Christopher Kanifa located in Chinkhandwe village, traditional authority Kunthembwe in Blantyre district. It is about 2.5 km from his home in the dambo where water source is perennial. Mr. Kanifa is a Form 3 student at Chikuli Community Day Secondary School and gets assistance from forestry department both technical and material. He inherited this nursery from his late grandfather who was a village headman in 2002 but he does not know when the late village headman started the nursery. Apart from nursery work he also cultivate agricultural crops such as maize, tomato and millet. The GPs readings at for the nursery are S 15°39.565' E 034°54.018' and altitude 704 meters \pm 18 meters.

Deciding on Species to Collect and Mother Tree

The nursery has only *Eucalyptus* eedlings in total of 900, which half of the seeds were collected locally. The owner decides to collect this species locally when forestry department fails to supply the species that are required or not available in required quantities. The mother tree where seed was collected is within the area where the nursery is, about 400m. It was collected from a single tree because the tree looked health and was the only one in the area, which fruited close to the nursery. When the wanted species are not found, the nursery owner tries to enquire from other nursery managers who have surplus either seed or seedlings on seed bed. Or go for an alternative species, which could give similar objectives after getting advice from forestry department extension worker and if all fails the owner opt to abandon the species.

Number of Mother Trees and Flowering Trees Around

The *Eucalyptus* seed was collected from one mother tree and collected seed was mixed with previous season's leftovers issued by forestry department. The owner does not know that *Eucalyptus* is of different species but fortunately the mixed seed was of same species. The mother tree was the only one that was healthy and could produce seed enough for his requirements since the trees are scare in the area and if to collect from other people's gardens he has to pay for that. The mother tree, which was cut for seed and firewood, was in isolation. In the past the trees were many but now felled for agriculture.

Seed Collection

Eucalyptus species were collected by using axe and panga knife to cut down the tree. Matured capsules were collected from the middle branches of felled tree using hands. The capsules are taken home to be dried on metal sheet on sun covered on top with either plastic or another sheet for about 3 days during poor sunshine or 1-2 days on good sunshine. The capsules open to release seed on sheet, which are later, removed and leave seed only. Collection time is decided when the tree leaves turn yellow and rough and also by observation when the capsules starts opening. It took Mr. Kanifa 2 hours to collect the seed. The collected fruits are put in a plastic bag either K5 or K2 jumbo to drying place and stored in a dry tin e.g. NIDO for a week after processing / cleaning. After the capsules release the seed, no further processing is done apart from removing empty capsules and twigs if any. The seed took one week from collection to germination. The problem with collected seed are presence of a lot of chaff, immature seed and difficult to store. The seed is germinated by first burning the prepared seed bed, let it cool for a day or two, put fine sand from river and level it, pour water and spread the seed on the bed, cover with litter fine river sand and water. Continue watering in the morning and evening. Shade is provided to protect seed and seedlings from being scorched by sun. The shade is gradually removed to allow sunlight pass through for the benefit of the seedlings and part of hardening off.

The problems with germinating the seed are insect attack, poor germination and pre and post emergency damping off. Since this is the only species raised, it is difficult to compare with other species. The one present takes 7-14 days to germinate and 4 months to reach plantable size without applying fertilizer.

Output and Distribution Per Mother Tree

The nursery owner mostly sells the seedlings and takes *Eucalyptus* species as the most important species. He gets customers by displaying seedlings in markets and at times by order. Currently there is only one customer on order of 500 seedlings and the second customer has just cancelled his order. Last year he sold 200 seedlings out of 451. He has never tried to produce new species and this year there was the intention of raising *Faidherbia albida* and *Senna spectabilis* but forestry department has not issued the seed up to this time.

Nursery Management Option

Mr. Kanifa gets prepared for his nursery by making sure that potting soil, grass for shading, tools and tubes are available. Potting soil is collected from the garden about 380 m from the nursery. Type of soil collected is sandy loam and is not mixed with anything during pot filling. Polythene tubes containers used and are issued free by forestry department but not enough for the target and some are bought from plastic product at K100 per thousand tubes. He does not produce bare rooted seedlings. Shade is also used in the nursery to protect seed and seedlings from being scorched by the sun and other animals and retain moisture. Mr. Kanifa has never used vegetative to produce seedlings. The water source from the nursery is about 150 m and he does not know that something is done to seed in order to improve germination.

Customers

The area is about 11 km from tarmac road and is about 4km from forest. Presently there is one customer who comes from about 2 km to buy the seedlings. The price per seedling is K5.00.

General Opportunities and Constraints in Nursery Management

The nursery owner is in contact with other nursery managers but not very serious. The benefits from this contact are that they share customers by directing them to where they can get seedlings which are not available in their nursery, seedlings are shared for pricking out into pots in case one fails to germinate on the seedbed or seed was not available for sowing in the nursery.

The main opportunities are income that can be used to pay fees, food, construct houses and protect environment. This can be fulfilled by exploring good market and work hard and identify a proper way of advertising with assistance of forestry department and Non governmental organizations. The main constraints in this nursery business by Mr. Kanifa are lack of inputs such as polythene tubes, seed, hoes, watering cans and late issuing of seed by forestry department. These can be overcome by timely issued of seed, tubes and open market for seedlings with assistance of forestry staff and other NGOs.

BLANTYRE

Respondent: Mr. John Saidi Nursery

Gender: Male

Introduction

This nursery is within Kanjedza and the owner stays in Macheso village, TA. Kapeni in Blantyre district, it started in 1994 and the owner formerly worked with Malawi Housing Corporation from 1974 to 1990. As a nurseryman, he survives on nursery business and managed to buy a dairy cow with money realized from the business and is hopeful next year will start producing milk. GPS reading S 15°49.455', E 035° 03.04' and Altitude 1138m. ± 72 m.

Deciding on Species to Collect and Mother Trees

The species that are in the nursery are *Eucalyptus* species, *Leucaena leucocephala*, *Melia azadarach*, *Senna* species, *Khaya anthotheca*, *Toona ciliata*, *Duranta ripens* and *Cupressus lusitanica* with 5,000, 1200, 1600, 1300, 500, 80, 1000 and 215 seedlings respectively. All species were locally collected. He decides to collect the species that can do well in the nursery, can meet customers demand and make more money. The mother trees are found by moving around and observe those that are flowering until their fruit are ready. When the wanted species are not found, Mr. Saidi abandons the species or asks for alternative species from forestry department staff, which can meet similar objectives, and he can manage to collect locally.

Number of Mother Trees and Flowering Trees Around

Khaya anthotheca seed was collected from 18 mother trees. He collected this

number in order to meet his target. The trees are close together along Kanjedza River about 4-5 m from the nursery.

Seed Collection

Khaya anthotheca seed is collected from the ground. Mr. Saidi decides to collect the seed when the actual seed is seen on the ground underneath the trees and the seed looks brown colour. It takes one week in the afternoons only to collect the seed. The seed is collected in a plastic bag and stored in nursery shade ready for sowing. No special cleaning is done but only at a dry place. The problems with collected seed are poor germination, attack by caterpillars and at times collected seed is empty. It takes about 2 weeks from collection to germination especially because of lack of polythene tubes. When tubes are available it takes one day only.

The seed is germinated by directly sowing the seed into the polythene tubes after watering them; cover the seeds with the potting soil and water. This species does not require shade. The problem in germinating the seed are sporadic germination, insect attack especially caterpillars and rotten seed in pots. The longest species to produce seedling is *Khaya anthotheca* about 5-6 months while the quickest is *Eucalyptus* species in about 2-3 months.

Output and Distribution

Mr. Saidi gets his customers by physically visiting them and use posters along roadside. The most important species are *Eucalyptus* species and *Senna* species; *Eucalyptus* species have about 20 customers and *Senna* species about 100 customers buying 500 seedlings and over 10,000 seedlings at K10 respectively.

Customers

The distance from nursery to tarmac road is about 6 m and to the indigenous forest is 20 km but *Eucalyptus* plantation is about 1 km. He has approximately 100 customers. They come from distances of over 90 km like Zomba, Chikwawa and Thyolo.

General Opportunities and Constraints in Nursery Management

Mr. John Saidi is in good contact with other nursery owners/managers. The benefits he sees in these contacts are sharing of ideas, knowledge, skills and techniques, it encourages nursery business as they discuss ways of improving their nurseries and market, they share seedlings/seed and customers when he has or hasn't seedlings /seed in his nursery with those that have. The main opportunities in his nursery business are good income that assists him acquiring things he misses in his life like dairy cow, fees for his children, soap, food etc. Afforestation is also enhanced in this way. Working hard can fulfill these opportunities and government has to intervene in exploring market and providing capital to smallholder farmers.

The main constraints in this business are discouragement from other people in the village who sometimes steal his seedlings or even destroying, lack of inputs such as enough tubes, seed and market of the seedlings is lacking. Technical advices from offices around him on how get seed for new species in the area. The constraints can be overcome by provision of training and

exchange visits with other nurseries, provision of capital to buy inputs such as seed as well as opening good market with assistance of government and non governmental organizations.

BLANTYRE

Respondent: Mr. Austin Samson Tree Nursery

Gender: Male

Introduction

Mr. Austin Samson has a nursery in Malunga village, T.A. Kapeni in Blantyre District. The nursery started in 1994 at a different site benefit moving to the new site two years ago in 2001. It is about 1.5km away from the home of the nursery owner in search for perennial water. The position of the nursery is S 15°31.921, E 035°00.739 and 601 meters \pm 18 meters using GPS.

Deciding on Species to Collect and Mother Trees Around

The species in the nursery that were collected locally were *Ecaulyptus* species 3500 seedlings; *Annona senegalensis* (100 seedlings) papaya (35 seedlings) orange (29 seedlings) and *Faidherbia albida* (10 seedlings). Decisions to collect species locally come in due to availability of market and species that can meet the objective of the owner such as woodlot planting. The mother trees are found by moving around in the village looking for anyone who has for instance *Annona senegalensis* trees and buy fruits from the trees. This is because the mother trees are not available in his garden of the species he wants.

When the wanted species are not found, the nursery owner asks forestry department extension worker's advice or collect the seed locally wherever the mother trees are available even from a single tree. If all this fails, he abandons the programme of raising the wanted species.

Number of Mother Trees and Flowering Trees Around

The *Annona senegalensis* seed was collected from single mother tree, which produced 100 seedlings. The tree fruited well and it is the only one close to the nursery. The tree is surrounded by 9 trees of the same species planted on homestead but all did not flower.

Seed Collection

Mr. Samson first bought the fruits while in the tree. He collected the fruits by plucking only ripe (ready) fruits, which were standing on the ground without the use of any equipment. He decided to collect the fruits when there are small cracks on matured fruits and fruits start yellowing. The fruits are put in a basket and carried home. Those that are ready, the seed are extracted by using hands or eating the pulp and keep the seed. The seed is stored in a plastic for one week. The seeds are dried after being extracted from fruits for a day or two and when the fruits are not ready they are put in a plastic to let them ripe for a day or two as well. The problem with collected seed is poor germination, there is a lot of empty seed and other seeds have abnormal colour like yellow. It takes about one week from collection to germination of seed.

Germination of seed is through direct sowing into the polythene tubes. Pots are filled with soil, watered and one seed is put in each pot/tube. Then little soil is used to cover the seed and water. There is poor germination, caterpillar attack and takes long time to germinate about 3 months. *Annona senegalensis* takes a long time to germinate and produce plantable size in about 10 months while *Eucalyptus* species takes about 3 months.

Output and Distribution

Mr. Austin Samson gets customers by taking some of his seedlings to markets such as Lunzu and at times get orders after market displays. Of all the species in the nursery, *Annona senegalensis* and *Eucalyptus* species are the most important. *Annona senegalensis* has about 5 customers and *Eucalyptus* species has only one. They buy 500 and 100 seedlings of each of the species respectively. The species tried are *Afzelia quanzenensis*, *Azadirachta indica* and *Senna* species by raising/producing them very close to tarmac road.

Nursery Management Options

This man gets prepared for his nursery work by making sure that potting soil, grass for shade, tubes, seed are available. Potting soil is collected from arable land about 10 m from the nursery. Type of soil used is sandy loam not mixed with anything. Polythene tubes are containers used for potting and are issued by forestry department but not enough. Some are bought from poly pack at K199.04 per 1000 tubes. He has never produced bare rooted seedlings. Shade made of grass is used to protect tree seeds from heavy sunshine and animals that can disturb the seedbeds. Mr. Samson has also used vegetative propagation. *Annona senegalensis* is soaked in water for 2 days before sowing in order to improve germination other species, which are treated, are *Faidherbia albida* also soaked for 3 days. Water sources from the nursery are about 4m and his wife assists him in watering using watering cans.

Customers

The nursery is about 1.5 km from tarmac road, which is Zalewa Road to Lilongwe, and the forest is about 11 km from the nursery, which belongs to the community. He does not have customers yet but the past two years he had about 12 customers who could come from longer distance of about 50 km.

General Opportunities and Constraints in Nursery Management

Mr. Samson is in contact with other nursery managers and the benefits from the contact are that new skills and techniques are shared amongst nurseries, sharing of seedlings and customers when the needed species are not available in their nursery.

The opportunities in nursery business are a good source of generating income, which is used to buy fertilizer, food and others, and also promotes tree planting which reduces deforestation. This can be fulfilled by exploring a good and stable market, good technical advice from forestry staff, working hard and from nurseries association, which can voice out views and problems of nursery business people.

Capital is the main constraints to nursery business, which can assist to pur-

chase inputs such as poly tubes equipment, also market and good quality seed is lacking. The constraints can be overcome by provision of inputs enough and timely with the assistance of other bodies such as forestry department and NGOs such as seed, tubes etc.

BLANTYRE

Respondent: Mrs. Senate Elias nursery

Gender: Female

Introduction

Mrs. Senat Eliyasi nursery is in Chibwana village, TA. Kuntaja in Blantyre district. She started the nursery in 1997 and survives on nursery business. She stays about two to three meters from the edge of the nursery. GPS reading for the location is S15°45.414', E034°58.488' and altitude 1009 meters \pm 19 meters.

Deciding on Species to Collect and Mother Trees

The species she has in the nursery are *Cupressus lusitanica*, *Eucalyptus* species, *Duranta ripens*, *Delonix regia*, *Jacaranda mimosifolia* which she collected herself locally and managed to produce 1, 100, 2012, 2,500, 4 and 11 seedlings respectively.

She decides to collect species which can have good market and their seeds can be locally found. She finds mother trees by moving around in other people houses or in Michiru forest after getting permission from the office. When the species she looks for is not found, she decides to collect the alternative species, which can give similar objective or abandon the production of the species.

Number of Mother Trees and Flowering Trees Around

The *Cupressus lusitanica* seed was collected from 3 trees. It was only 3 trees because they were difficult to collect due to heavy branching as well as climbing for a woman. There are 21 trees surrounding these mother trees.

Seed Collection

Cupressus lusitanica seed was collected by a woman climbing and hook branches for her friends to pluck the cones/fruits. She decides to collect the seeds when it is in March. The matured seed is determined by brown colour and the fruits show demarcations. The other sign is also when some fruits are seen open while in the tree. It took about 2 hours to collect the seed. The collected fruits are put in a basin and taken home for drying. They are then put in a sack and put on a sun. It took 2 days for the fruits to release the seed. The third day open fruits are removed with other chaffs. The seed is thereafter stored in a plastic bag ready for sowing. The seed takes 3 days to one week from collection to germination. There is no problem with collected seed. The seed is germinated by putting nursery soil on seedbed and leveled, then he burns the bed and let it cool over night. The following morning she removes the ash and spread the seed on bed, cover the

bed with little fine river sand and use smooth plant to press the sand gently. Normal watering follows. The problem with germinating seed is insect attack on roots which lead to death of most the seedlings. *Duranta ripens* seed takes longer time to germinate about 2 months and 4-5 months to produce plantable size seedlings and the quickest are *Eucalyptus* species taking 3-7 days to germinate and 3 months to produce plantable seedlings.

Output and Distribution

Customers come to the nursery but few. Mostly the seedlings are taken on the head in a bathing basin to the market or move door by door. Most important species she considers are *Eucalyptus* species and *Duranta ripens* with 200 and 98 customers buying 7000 and 4,000 seedlings respectively. She tried to sell new species by negotiating the customers who come to buy other seedlings and species tried are *Azizelia quanzenensis* and *Faidherbia albida*.

Nursery Management Options

The lady gets prepared for her nursery by making sure that tubes, potting soil, sources of water and seed are available. Potting soil is collected from natural forest, which is black in colour along Mulunguzi River, which is about 0.9 km from the nursery. The containers used are polythene tube bought from Poly Pack, empty milk and yogurt packets, which are holed on the sealed side collected locally from rubbish pits. Bare rooted seedlings are not produced and shade is not used due to lack of poles. She does not know that small shades are made without using big poles. Vegetative propagation has never been used to produce seedling. Water to the nursery is channeled to the nursery from Mulunguzi river using channel which makes watering easy. She does not even know that seed is treated before sowing.

Customers

The distance from nursery to tarmac road is about 3.5-4 km and 2 km to forest. She has a lot of customers that she cannot remember their number but about 120 nearby customers travel a distance of about 25 km but most she travels herself to customers.

General Opportunities and Constraints in Nursery Management

Mrs. Eliyasi is in good contact with the nursery managers close to her nursery. The benefits she sees in these contacts are sharing of skill/techniques lacking in either of them and sharing seedlings as well as market. Opportunities she sees in nursery business are income that can be used to alleviate her poverty and reduces deforestation rate. They can be fulfilled by working hard and government interaction in getting market.

Main constraints in this business are lack of inputs such as seed, tubes forestry technical advice and above all market. They can be overcome by exploration of good market, timely availability of inputs such as seed, tubes and equipment through assistance from government.

BLANTYRE

Respondent: Mrs. Kambewa Tree Nursery

Gender: Female

Introduction

Mrs. Kambewa nursery is situated in Michiru in Chibwana village, T.A Kuntanja, Blantyre district. This nursery started in 1986 on the site. She stay about 0.2km from the nursery. She earns her living on tree nursery business and GPs location of the nursery is S15°45.408', E034°58.495 and Altitude 1006^m + 17 m

Deciding on Species to Collect and Mother Tree

Species that are collected locally in the nursery are *Eucalyptus* species, *Cupressus lusitanica*, *Eucalyptus* species, *Duranta ripens* (hedge) with 2000, 600, 1500 and 500 seedlings respectively making total of 4,600. Mrs. Kambewa decides to collect species which are on demand by their customers and cannot manage to get their seed from other sources as forestry research because of lack of enough money.

She finds the mother trees by just moving around in Chilomoni location and ask for permission to collect the trees which have the wanted seed regardless of the appearance or health of the tree. When the wanted species cannot be found, she goes for seed for any species, which can keep her nursery surviving and forget the wanted species.

Number of Mother Trees and Flowering Trees

There is only one tree where the *Eucalyptus* seed sown in the nursery was collected. She collected from single tree due to scarcity of big trees within the area that can fruit like tree. The tree is in isolation within the nursery.

Seed Collection

Eucalyptus seed is collected by employing boys together with other nursery owners close to her nursery to climb the tree and cut branches, which fruited heavily and have matured fruits/capsules using panga knife. The women pluck closed capsules from cut branches. Capsules are put in basin or pail and taken to drying place within the nursery.

The decision to collect comes in when it reaches August end is when she thinks the fruits/capsules are matured and no any other indicators are used apart from that. It takes an average of 2 hours to collect the seed and transported to a drying place in a sale or plastic sheet/bag. The capsules are dried on sun until they are open releasing the seed, then capsules are removed from the plastic sheet. She experiences pre and post emergency damping off, insect attack and poor germination with the collected seed. It takes about 3 days from collections to germination.

The seed is germinated by putting black soil collected underneath old *Khaya antboteca* on seedbed levelled, burn the seedbed and water to cool for about 1 hour after removing ash from the bed. She spreads the seed on seedbed, cover with Fine River sand and water them.

Problem in germinating the seed are pre-emergence damping off and insect attack on roots. *Eucalyptus* species is the quickest to germinate about 4-7 days and takes 3 months to produce plantable size and *D. Repens* takes longest time to germinate about 1 month and about 4 months to produce seedlings of plantable size.

Output and Distribution

This woman gets her customers by carrying some of her seedlings on head in a basket for a distance of about 13 km as vegetable sellers do in town. Nearby customers come on their own about 3 km. She considers *Eucalyptus* as the most important species of all she has in the nursery and has about 50 customers individuals buying about 500 seedlings. She has never tried to sell new species.

Nursery Management Options

Potting soil is one of the most important things she gets prepared before starting nursery working. This soil is collected from along Mulunguzi river which is about 250 meters from nursery. The type of the soil is loamy black soil and is not mixed with anything when filling the tubes. Polythene tubes are containers used to fill the soil bought from Poly Pack. Since they are expensive to purchase in large numbers, she also uses 500 ml packets of sugar, cut into halves and sealed using fire. She uses empty yoghurt packets by making holes on sealed side. These are collected from rubbish pits free of charge. Her nursery does not produce bare rooted seedlings and does not use shade of any sort on all the species produced in the nursery. No any other vegetative propagation technique is used. She does not know that seeds are treated in any way to improve germination.

Customers

The nursery is about 3.5 meters from tarmac road at Nthukwa in Chilomoni Township. It is also about 2 km from forest. The lady has 50 customers but currently none has promised. Normally they are found when rainy season starts and she moves with the seedlings. Customers come to buy seedlings from 1-2 km away.

General Opportunities and Constraints in Nursery Management

Mrs. Kambewa is in contact with other nearby nursery managers and the benefits of the contacts, are, that they at times collect seed together, share customers in the sense that customers buys almost equal number of seedlings from the two nurseries, share skills and techniques of managing a nursery. The main opportunities she can see in nursery business are income and promotion of afforestation programme throughout the country. These can be fulfilled by identification of potential market and timely availability of inputs such as tubes and seed. Main constraints in this business are no market, capital to purchase inputs, technical skills and seedlings transportation and can be overcome by working hard, opening of markets, provision of loan facility to nursery owners, formation of nursery associations and training to improve capacity.

BLANTYRE

Respondent: Mr. James Kwenje Nursery

Gender: Male

Introduction

Mr. James Kwenje's nursery is in Mtusa village, Traditional Authority Lundu in Blantyre district GPs reading S 15°26.288' E 035°01.832' and Altitude of 523 meters ± 150 meters. His nursery started in 1983 after getting advice from forestry department extension worker to cure his tobacco using *Eucalyptus* firewood. He survives on tobacco farming, maize and tinsmith. The nursery is about 2 km from his home along Linjidzi River on borrowed land in search for water for watering.

Deciding on Species to Collect and Mother Trees

There are only 400 *Eucalyptus* seedlings in this nursery which was collected locally. He decides to collect locally species which are marketable, grow fast and their mother trees are locally found. The mother tree where *Eucalyptus* species was collected is found within his home yard, which he planted himself with seeds given by forestry department in exchange with Carlsberg bottle tops in 1992. When the species he wanted are not found, Mr. Kwenje collects or goes for species, which are found locally, e.g. he wanted *Tamarindus indica* and *Khaya anthotheca* species, which are not locally, found instead he opted for *Eucalyptus* species.

Number of Mother Tree and Flowering Trees Around

The seed was collected from one mother tree of *Eucalyptus* species because it was well matured and fruited better than the surroundings trees. The tree, which was cut, was surrounded by 6 trees of the same species.

Seed Collection

He collected the seed by using axe, panga knife to cut the mother tree down. He plucked capsules from cut tree using hands and panga knife to cut branches for easy collection and put in a jute bag. The nursery owner decides to collect seed when the capsules turn brown and some start opening releasing the seed down the ground. It took about 25 minutes to collect the seed, which produced 400 seedlings. The seed is carried in a sack and put under shade at a dry place. Since during this time it is hot, capsules open releasing seed. Then open capsules, other chaff is removed from the lot and then the seed is put in a plastic bottle or bag ready for sowing in the nursery. The problems with collected seed are germination, ants and insect attack (*Mnunkhadala*). Ants destroyed the first lot sown and the one in nursery now was second lot. It took him about 1 week from collection to germination.

The seed was germinated by first of all preparing seedbed and burn it, which is well leveled. The bed is let to cool overnight and ash is removed from it. The seed is spread on the bed using hands and fine river sand is used to cover the seed. Normal watering is done till the seed germinates. Shade made of grass is put to protect seed/seedlings from sun scorch. The soil used on the seedbed is ordinary soil found on the site. The problems in germinating the seed are poor germination due to ant's attack and other

unknown factors. He only raises *Eucalyptus* species and to him it takes short time about 3 months to produce plantable seedlings.

Output and Distribution

Customers are got by displaying samples by roadside at his home. He also gets orders from schools; Food for work programme and others come by themselves since he is known for this business. *Eucalyptus* species is important and is the only one raised in this nursery. Over 90 customers come to buy over, 4,000 seedlings. This man tried *Melia azadirach* and customers chose themselves when they come to the nursery. Fortunately, all the seedlings were sold about 150.

Nursery Management Options

When getting prepared for the nursery Mr. Kwenje makes sure that tube, seven (chemical) seed, hoes and potting soil are available. The potting soil is got from a place close to Linjidzi river within nursery area about 4 meters. This “*makande*” soil is mixed with sand naturally and is not mixed with anything. Polythene tubes are containers used for potting the soil supplied by forestry in the past but now he buys from Poly Pack. He also used tubes from forest department after planting exercise. He produced bare root seedlings in 1993 because of lack of tubes but now he is not producing them. Grass shade is used to protect seedlings from sun and to keep moisture on seedbed as well as in polythene tubes. Mr. Kwenje does not produce vegetative seedlings or treating the seed in any way in order to improve germination. Water source is from Linjidzi River, which is about 4 meters from the nursery.

Customers

It is about 8 km from tarmac road and about 2.5 km from the forest. He says he has 80 customers and these customers come from an average distance of about 6 km to buy seedlings.

General Opportunities and Constraints in Nursery Management

The nursery owner is in contact with other nursery owners and the benefits are that they share seed and seedlings, getting information on how to run the nursery and assist each other in finding the market.

Income is the main opportunity that he sees in nursery business followed by big participation in planting more trees. These can be fulfilled by working hard and produce healthy seedlings and exploration of reliable market. Good market, limited tree seed, tubes and good place for nursery since the space being used now is borrowed due water scarcity. The main constraints, which can be, overcome by provision of reliable market for seedlings, technical advice in time and boring borehole close to the house to reduce water scarcity. forestry department should also issue tree seed for species, which they value most, and government to provide capital.

BLANTYRE

Respondent: Mr. Mkwichi Chisale

Gender: Male

Introduction

Mr. Mkwichi Chisale's nursery is in Mtelera village, TA Nsomba in Blantyre district. He started the nursery in 1986 in order to plant trees in his garden as well as have some for sale. He works with Mpemba Boys home in Blantyre. The GPs reading is S 15°52.919,' E034°56.469' and Altitude of 859 m + 22 m.

Deciding Species to Collect and Mother Trees

The locally collected species in the nursery are *Senna* species and *Albizia lebeck*, which have 900 and 90 seedlings respectively, and other species, which their seed were issued free by Goal, project and forestry department are *Eucalyptus* species (200 seedlings) and *Gliricidia sepium* (100 seedlings). He decides to collect species that can meet his objective of seedling first and in large number and at the same time can control erosions and add fertility to the soil. The mother trees are found by looking for trees that are within his garden and produce seed. When wanted species cannot be found, he goes for anything that can keep him going e.g. he wanted to produce 'Tsamba' but this species was not found, it is when he opted for *Gliricidia sepium* to fill prepared tubes.

Number of Mother Trees and Flowering Trees Around

One mother tree was used to collect the seed that produced 900 seedlings of *Senna* species because it was only one fruited. He planted the tree in 1988 with seed issued free by forestry department. The tree is in isolation.

Seed Collection

Mr. Mkwichi used a stick to pluck the fruit pods from a tree that he thinks are matured. He decides to collect the tree seed when the pod colour turns brown and when opened the seed colour also looks brown showing or indicating its maturity. It took him about 3 hours to collect the seed producing 900 seedlings. The collected pods were put in a bamboo basket and taken home where they are put or dried on sun in a plastic bag. The pods burst in the plastic releasing seed. Then open pods and other chaff is removed after shaking well pods. No further cleaning is done after this and seed is put in a plastic bag or a paper of sugar, stored at a dry place ready for sowing. Problem with the collected seed are immature which are empty when split, insect holes, seed rot in the tubes resulting in poor germination. It took 2 weeks from collection to germination.

Germination of the seed was done by putting 3 seeds in a tube since some seeds showed no sign of life. In tubes where more than one seed germinated were removed to those tubes where nothing germinated. The seed was sown by pressing the seed deep into the pot soil with a finger and cover with soil later on water using cane. The pots are put under shade with little amount of light passing through. Staggered germination, damage by livestock and pests on the seedlings are the problems faced in germinating

the seed. *Albizia lebbek* takes longer time to germinate about 2 weeks and 4 months to produce plantable seedlings and *Eucalyptus* species is the quickest to germinate about 7 days and 2½ months to produce plantable seedlings.

Output and Distribution

He gets customers by carrying the seedlings on wheelbarrow to roadside and he also tries to sensitize people within his village or outside the importance of planting trees who after satisfied with facts, buy the seedlings. To him the important species are *Eucalyptus* species and *Senna* species with 20 orders and *Eucalyptus* species to be planted in his garden. *Senna* species order is for 250 seedlings. It has also been difficult for him to seed or produce new species due to back of seed of the required species for example *Terminalia sericea* and *Brachystegia* species.

Nursery Management Options

Potting soil is got from *dimba* (black loamy) within the nursery. Polythene tubes are used as containers for potting the soil, which are issued free by forestry department. Grass shade is used to protect seed and seedlings from sun. Neither vegetative propagation nor treatment to the seed is done to improve germination. Water source from the nursery is 6 meters in Matope River.

Customers

The tarmac road is about 6 meters from the nursery and about 10 km from nursery to forest. He has about 50 customers who buy in sound quantities. Most of the customers come from within the village of about 1 km radius but mostly he carries the seedlings to roadside where customers buy about 5 meters.

General Opportunities and Constraints in Nursery Management

Mr. Mkwichi Chisale's is in contact with other nursery managers and the benefits he sees in these contacts are helping each other in looking for market exchange of seed and seedlings in case one fails or does not have and learn nursery management skills from each other. The opportunities he can see in nursery business are a good source of income which can be used to purchase things necessary for his family life and protection of environmental degradation. The opportunities can be fulfilled by exploring potential market with assistance of government and Non-governmental organizations. The main constraints in this business are: no market for seedlings, tree seed is limited and capital is limited. They can be overcome by looking for good market for the seedlings, timely issue of inputs such as required seed and provision of even on loan for a start in nursery.

CHIKWAWA

CHIKWAWA

Respondent: Mr. Thomas Khonje

Gender: Male

Introduction

Makwiza village lies to the eastern bank of Shire River, near Mitando Trading Centre. The village is about 35 kilometers southeast of Chikwawa district headquarters. The respondent is a young man who has just been married and has no children. He stopped schooling when he was in standard three due to a broken leg. He said that one morning he just found his leg broken, without committing any accident or injury. Apart from farming, he also relies on carpentry and sharpening saws, panga knives and ordinary knives. He does not own any livestock. The nursery is located right behind his house. In the nursery, there were twenty *gmelina* seedlings and two hundred *Milicia excelsa* seedlings. Both are locally collected species. However, the focus was on *Milicia excelsa* because it is the respondent's most important species.

Deciding on Species to Collect and Mother Trees:

The respondent reported that *Milicia excelsa* was chosen to be collected after looking at the following factors:

It is fast growing. As such, he is very hopeful that soon, he will get timber from the trees.

It does well in his area.

It is locally available, making it easy for collection of seed.

He stated that he used his own trees as mother trees. He also pointed-out that to get a mother tree was a process of trial and error. He said, "I collected *Milicia excelsa* fruits from various trees but they were not germinating. Then the fruits from one tree managed to give seed that produced seedlings. I came to realize that the fruits that gave seeds that never germinated came from male trees (*mitengo yampbongo*) while those that germinated came from a female tree (*mtengo waukazi*). Later, "... I realized that the female and male trees differ in appearance. Female *Milicia excelsa* trees are very smooth on the surface while the male trees are rough; they have cracks on the surface so, to get what you want requires time. It took me two years to know this..."

Number of Mother Trees and Flowering Trees Around

There were five flowering *Milicia excelsa* trees that mark a boundary of the respondent's compound. Four of these trees were discovered to be "male trees" because their seed failed to germinate. Only one mother tree was used to collect seed because it is the only "female tree". He got seed from one mother tree because:

It is his own tree.

The collected seed was enough for his scale of production.

Collection of Seed

The respondent reported that he collected the seed on his own. He said that the ideal time for collection of *Milicia excelsa* seed is from November to January. On collection, he gave the following explanation; "...I waited for the fruits to ripen, they turn red to indicate that they have ripened. Then, they fall to the ground on their own. I was picking these fallen fruits. I did this for almost one month. After I had collected the quantity that I wanted, I took the fruits and smeared them on pieces of timber and left them for two days to dry on the timber / plants. After two days, I removed the stuff that was on the timber. The stuff was now flour-like. I removed the stuff with bare hands. Soon after removing, I went straight to the nursery to sow the seeds..."

He indicated that there was no storage of the seed. Only the fruits were on top of a roof soon before being smeared on planks. He also said that the seeds were sown in December"... so that the seedlings can have time to grow and be sold at least by the end of January..." Transportation of seed was done using bare hands. He stated that the seed took one week (from sowing) to germinate on the nursery bed. He reported that he did not have any problems with the collected seed, be it during collection, preparation, sowing and germination. He said that the germination "was very good, almost all the seeds germinated..." On storage, he added that..."sometimes I store the seed to be used in the following year. In this case, I winnow the seed stuff that is collected from the planks, to get rid of unseen stuff. The winnowing is done in a small plate then I put the seed in a small tin and close it. I place the tin at a cool place in the house, like at a corner..."

The respondent stated that the nursery bed was also prepared behind his house using the soil that is already there. The soil is locally known as "mseti" It is black sandy loam soil (*Gombwa okhala ndi mchenga*). The bed itself was a sunken bed..."to prevent the seed from being washed away when watering..." He said that the nursery bed was not burnt and no sand was applied. He said, "I only burn the bed and apply sand if I am going to sow *Eucalyptus* species seeds..." He also reported that there was no seed cleaning that was done. He then cited *Delonix regia* as the species that the longest to produce seedlings. He said that this species takes about 25 days to produce seedlings. On the other hand, he said that *Milicia excelsa* is the species that takes the quickest to produce seedlings because it only takes one week. He said that *gmelina* is neither quick nor long in producing seedlings.

Output and Distribution

The interview reported that his customers come from within his village as well as from neighbouring villages. He also said that the customers know of the availability of seedlings by seeing for themselves. He said, "... There are many people that come with their saws, panga knives and knives for sharpening. While I am working on the knives and saws, they have a look at the seedlings, so they see for themselves and later come to buy. These people also spread the news that I have seedlings for sale..." He reported that he has never produced seedlings on order. He also indicated that he has about one hundred *Milicia excelsa* customers who buy in tens or twenties. He also stated

that he only sells *Milicia excelsa*, *Eucalyptus* species, *gmelina*, *Delonix regia* and orange seedlings because they are the ones that people like in the area.

Nursery Management Options

The respondent raises seedlings by using both containers and bare root seedlings. He reported that he uses the same soil behind his house as potting soil. As already indicated the soil is black sandy loam soil. He said that he does not mix the soil with anything. He uses plastic tubes, which he locally produces in order to produce the plastic tubes. He buys one kilogram of black plastic sheet at Mitondo market, which will in turn produce 1,500 tubes. The plastic sheet is folded in half. A wire is placed on fire. Once it is heated, the wire is used to cut the folded plastic sheet at a width equivalent to that of a polythene tube. The same hot wire is used to heat the edges of the cut sheet to connect edges, thus turning it into a tube. As for bare root seedlings, he stated that he produces them for his own planting. He uproots the seedlings using a hoe and transports them using the same hoe. He also reported that he used shade both on the nursery bed and on the potted seedlings. "...So that they can only receive mild sunlight which is good for young plants..." He also said that he does not use any vegetative propagation technique. As already indicated, there is no treatment that is done to the seeds to improve germination.

Customers

The nearest forest is about 8 kilometers away while the tarmac road is about 30 kilometers away. Water for both domestic use and watering the nursery is from a local tap, which is about 200 meters away. If the tap is not functioning, water is drawn from Chizimbi River, which is about 400 meters away. He said that he has a total of two hundred customers who come from within a radius of about 3 kilometers. All these are individuals. He sells *Milicia excelsa*, *Delonix regia*, *Eucalyptus* species and *gmelina* at K3.50 per seedling while oranges are sold at K5 per seedling.

General Opportunities and Constraints in Nursery Management

The respondent reported that he has never been in contact with neither any nursery nor any nursery manager. He said "... I do not know where other nurseries are. I think there should be very few nurseries in this district..." However, he is of the opinion that it is necessary that nursery managers are in contact with each other because "... we would share experiences and guide each other properly..." He said that he was once a herd boy and while herding cattle, he was seeing people who were working in a tree nursery. It is from those people that he learnt and developed an interest to raise tree seedlings. On opportunities in the nursery business, he said: "... Nursery business is a profitable business. The good thing is that if you do not get any customers, you can plant the seedlings and harvest the trees in future for firewood, poles or even timber. At the moment, there are many people who are in need of tree seedlings. There is no need to doubt this business..." He also stated that the only constraint that he has experienced in his nursery is the attack of pests, especially ants and grasshoppers. In order to overcome the problem, he sprays cotton pesticide known as cypermethrine. It has to be noted that the area is a cotton growing area.

Steps in the local production of tubes:

1 kg of plastic sheet (paper)

The plastic sheet is spread and folded in half.

It is ensured that the sheet is properly folded on all edges.

A metal rod or a wire is put on fire to get it heated.

The hot metal rod/wire is then pressed on the plastic sheet, observing a width equal to that of a polythene tube. This cuts the sheet as well as seals one end of the sheet.

The hot metal rod/wire is then pressed on the other end of the cut sheet to seal it, forming a plastic cylinder

The plastic (empty) cylinder is cut at a length of a polythene tube.

CHIKWAWA

Respondent: Mr. Amos Masangano

Gender: Male

Introduction

Mr. Masangano is a nursery manager for a nursery that belongs to Mr. Kamandana. Mr. Kamandana has just retired as a scheme Manager for Mkhathle Rice Irrigation Scheme and is now doing private consultancy. He bought some land on which he is establishing a farm. He established a nursery to raise seedlings that he can plant on this farm. He employed Mr. Masangano to run the nursery. It is Masangano that collects seeds and works full time in the nursery. Most of the information in this report was provided by the nursery manager while Mr. Kamandana only provided little information such as the decision on the species to collect. The nursery manager / foreman got knowledge on nursery management during a MASAF Afforestation project in 2000. There are six other people who were also employed to work in the nursery. All the species in the nursery were locally collected. In the nursery, there were *Milicia exelsa*, *Albizia* species, *Acacia* species, *Faidherbia albida*, orange and guava. The study, however, focused on *Milicia exelsa*.

Deciding on Species to Collect and Mother Trees

The respondent reported that the decision to collect a particular species, especially *Milicia exelsa*, was reached after looking at the following factors:

- It suits the climate of the area
- It is a source of timber (once it has grown big)
- The seed can be collected locally.

He also added that the forestry extension officer did not have any seed to give them, so local collection of seed was the only possible alternative if they were to establish a nursery. He also stated that if they could not find this species, they would still have pressed the Forestry extension Officer for seed. If the officer could not get any seed, they would have collected *Acacia* species or *Azizelia quanzensis* seed instead. He also disclosed that he just collected seed from *Milicia exelsa* trees that are around his and his neighbours' house.

Number of Mother Trees and Flowering Trees Around

There are six *Milicia excelsa* trees that surround his neighbours' house while one tree stands in front of his house. The rest are mango, papaya and *Masau*' trees (species not identified). However, only two mother trees were used for the collection of seed. When asked why he used two mother trees, he said..." The decision to collect seed was reached when the other trees had already fallen their fruits. This was after seeing that the forestry department had no seed..."

Collection of Seed

The respondent reported that he was collecting the seed by himself. He disclosed that he was waiting for the fruits (containing seeds) to drop down on their own. This was a sign that they had ripen and mature enough for sowing, so the fruits were collected from the ground. He reported that he collected the fruits for two days. He said that, "..... I made sure that the fruits did not stay long the ground because they would be eaten by goats. Once I collected the fruits, I placed them on (a grass – thatched) roof so that they can dry out. I chose the roof because goats cannot get there..." He said that the fruits were left to dry for five days. All this happened in August. Once the fruits were dry, he said that he softly ground them into sand – like stuff. He then took this stuff and put it in a plastic bag and placed it in the house on a corner where no one can take them away. He also said that he put them in the house because it is cool inside. They were stored there for four days. When asked why the seeds were stored for four days, he said, "...We were working on nursery beds during this time. We prepared nursery beds, placed dry grass on them and then burnt the grass to kill any organisms that might be on the bed..." He stated that there was no seed cleaning that was done. The seed was taken in the same plastic from home to the nursery (about 500 meters away). The plastic paper was put in his pocket. When asked how the seed was germinated, he said, "..... Once at the nursery, we took river sand and sieved it to get rid of any stones and grass, then we mixed the seeds together with the sand. The mixture was then spread on the nursery bed. The sand ensures the seeds should be well spaced on the nursery bed. The sand also helps in making sure that the seeds do not get carried away by wind. The seeds are very light..."

He reported that it took one week for the seed to germinate. He added that he was watering on a daily basis. He reported that he did not have any problems with the collected seed, from collection, preparation, storage and germination. He said that the seeds germinated very well. One of the species that takes the longest to produce seedlings, he cited *Acacia* species and *Milicia excelsa* as examples. He said that *Acacia* species take eight or nine days to produce seedlings while *Milicia excelsa* takes seven days. He observed that *Acacia* species take longer because the seed coat is thick. He expressed ignorance as to why *Milicia excelsa* takes long. On the other hand, he said that the species that take the quickest to produce seedlings are *Albizia* species and *Faidherbia albida*. He said that they both take three days to produce seedlings. He said that the reason for this is that before sowing, the seed is slightly broken on one end (the upper side) to improve germination.

Output and Distribution

The respondent explained that the nursery has just been established this year. He stated that they have not sold any seedlings and they do not have any plans to sell any seedlings. He said that they have never tried to sell any seedlings. He explained that the nursery was established for the sole purpose of producing seedlings for own-planting and not for sale.

Nursery Management Options

The nursery is situated on a riverbank. Potting soil was taken from within this area. The soil is black loam soil. Potting soil was specifically dug from under a mango tree because "...The forestry extension officer advised us that the soil that is under a tree is very fertile and should be used as potting soil..." He reported that he did not mix the soil with anything. He said that the only treatment that was done to the soil was that it was wetted a bit so that it should remain loose. He reported that polythene tubes were used as containers. He said that the tubes were gotten from a communal nursery that produced 5000 seedlings that failed to be sold, some were leftover tubes while the others were re-used. He also stated that they do not produce any bare root seedlings and do not use any other type of vegetative propagation. As already indicated, there was no treatment that was done to the seed to improve germination. The seeds were only mixed with sand to avoid the seeds dispersing elsewhere by air. He also stated that they use shade to protect the seedlings from the sun, which can dry them up. He added that shade also helps retain moisture in the tubes. He also indicated that after the seedlings have grown to a height of about 20cm, the shade is removed so that the seedlings can quickly gain height and grow strong. At the time of the visit, the nursery had 1000 seedlings of *Acacia* species, 2300 seedlings of *Milicia excelsa*, 200 seedlings of *Albizia*, 100 seedlings of *Faidherbia albida* seedlings and one guava seedling.

Customers

He reported that the nearest forest is (Mzongwe) five kilometers away. Water for watering the nursery is drawn from a stream (Mthambala), which is about 15 meters away. The nearest tarmac road is about 25 kilometers away. As already stated, no seedlings have ever been sold from the nursery.

General Opportunities and Constraints in Nursery Management

When asked if they are in contact with other nursery managers, he gave the following explanations; "...As of now, I am not in contact with any nursery but when I was in the village nursery we used to visit a nursery at Mwiza village. The forestry advisor (extension worker) has let us down. He does not visit us. Perhaps because this is not a communal nursery. I have made two attempts to visit a communal nursery at Mwiza village but unfortunately, on both occasions I have not been getting anyone at their nursery.... I can assure you that it is good to be in contact with other nurseries because you exchange ideas on how to best care for seedlings. You share your experiences..."

When asked about the main opportunities that he sees in nursery business, he gave the following explanation, "...Trees are vanishing. We need to replace these trees. Trees are important because they bring timber, shade and

also help bring rainfall. It is very important that forestry advisors (extension officers) should develop extra interest in visiting us (communities) so that they can encourage us to establish nurseries.... From what I see, it will be very difficult to establish communal nurseries here because the advisors lied to us. They once told us that whoever participates in nursery work shall be paid but it never happened that way. They changed the time, they said that MASAF buy the seedlings but this never happened, yet, in some areas MASAF pays people who participate in nursery work. Somewhere, there should be a problem. Communities need a little something for participation, be it money or anything. However, few individuals may continue with nursery business because trees shall always be needed to be planted..’

He finally reported that there are no constraints that have been experienced in the nursery work.

CHIKWAWA

Respondent: Mr. Jackson Saikande Salani Nursery

Gender: Male

Introduction

Mr. Jackson Saikande is the owner of Salani nursery, which is in Kwataine village, TA Maseya in Chikwawa district. He started this nursery in July 2003 with aim of planting in his garden and has surplus for sale. He earns his living by cotton and maize farming. The nursery is on borrowed land about 700 meters from his home in search for water. GPS location of the nursery is S 16° 05.196’, E034o54.061 and Altitude 95 meters + 33 meters.

Deciding on Species to Collect and Mother Trees

The species that are in his nursery which were locally collected are *Albizia lebbbeck* (291 seedlings), *Leucaena leucocephala* (134 seedlings) *Gmelina aborea* (102 seedlings) and *Senna* species (32 seedlings). *Eucalyptus* species (480 seedlings) was given by forestry extension staff, he decided to collect species that can meet his objective of producing good timber, firewood and poles. The species are chosen for his objective of producing good timber, firewood and poles and should be able to survive under weather condition of his area. When the wanted species are not found he goes for any population, which can give him the seed he wants or go for the alternative species in case he knows one. If all this fails, then the species is not raised.

Number of Mother Trees and Flowering Trees Around

Senna species seed, which produced 32 seedlings, was collected from one tree because he was advised by forestry extension worker to collect seed from one tree, which looks the most healthy within a population. The tree was surrounded by six flowering trees of the same species but the tree now was felled for timber sawing.

Seed Collection

The seed was collected by climbing a tree and cutting a branch, which fruit-

ed well using a panga knife. Pods are collected from fallen branch and put in a jute sack. The sack is put on a khonde where there is shade for four days. On fifth day the pods are beaten using a stick to release seed. He decided to collect seed when the pods change colour from green to brown colour. It took him one day to collect the seed. After the pods release the seeds, they are removed from the lot and grading is done during this time taking out empty and rotten seed. This seed was stored for one week before sowing. Germination was done by direct sowing into the filled polythene tubes one in each. A stick is used to make a hole on the center, putting seed and covering using fingers. Watering is done in the morning and late afternoon. Grass shade is provided to protect seed and seedlings from scorch of sun heat. There was no problem in germinating the seed *Albizzia lebbeck* takes longest time about 4 months to produce plantable size seedlings and *Eucalyptus species* is the quickest, about 3 months.

Output and Distribution

Mr. Saikonde does not have customers now since he has just started the nursery this year 2003. *Eucalyptus* species are the most important species of all the species in his nursery. He has not sold any seedling yet and not tried to sell any new species. Selling of seedlings will be done next season.

Nursery Management Options

The nursery owner gets prepared for his nursery work by making sure that grass, potting soil; tools such as shovel, pail are available. Potting soil is collected under old *Senna* species trees about 1 m from the nursery. Type of soil used is “makande” soil with natural mixture of fine little sand. Containers used for pot filling are polythene tubes given by forestry extension worker. Bare rooted seedlings are not produced in the nursery. He used grass shade to protect seed and seedlings from direct sunshine to reduce moisture loss and sun scorching. Vegetative propagation is not used in this nursery and the seed of *Senna* species was scratched on a stone side opposite embryo to allow seed to imbibe water, which improves germination in the polythene tubes. Source of water is the borehole, which is about 800 m from the nursery.

Customers

The nursery is about 10 km from tarmac road and about 2.5 km forest in customary land. No individuals or organization came to buy his seedlings.

General Opportunities and Constraints in Nursery Management

The nursery owner is in contact with other close by nursery managers. The benefits from this contact are sharing of ideas/skills on nursery management, sharing of inputs such as tubes, seed and shovels. Main opportunities he can see in nursery business are good source of income, which can assist him to pay fees for his relatives, food, soap etc, and planting in his garden thereby reducing deforestation rate in Malawi. These opportunities can be satisfied by working hard, exploration of reliable market and provision of good forestry technical advice from extension workers. Lack of inputs such as seed, tubes, no market, insect damage, lack of forestry technical advice are the main constraints in his nursery business. They can be overcome by

timely issue of seed and tube from forestry department, frequent visits by extension workers as well as exchange visits by different nurseries.

CHIKWAWA

Respondent: Mr. Wilfred Mchacha Sintilawo Ubwere Tree Nursery

Gender: Male

Introduction

Mr. Wilfred Mchacha Sintilawo who is village headman of Mchacha village, TA Ngowe in Chikwawa district started his nursery in 1995 with the purpose of planting trees for shelter and other domestic uses as well as for sale. He earns his living by farming maize millet and cotton. GPs reading of the nursery S 16° 31.954', E035° 00.44', and altitude of 108 meters ⁺⁵⁰ meters. The nursery is at his home yard.

Deciding on Species to Collect and Mother Trees Around

He collected locally *Senna* species, *Albizia lebeck* and *Azadarachta indica*. *Azadirachta indica* was given by forestry extension worker producing 109, 100, 22 and 88 seedlings respectively. Mr. Mchacha decided to collect the species, which are commonly found within the area and can produce good timber, poles shelter and firewood. He finds mother trees by moving around in the village looking for a good population of *Senna* species trees which fruit very well. The seed was collected at Lalanje Admarc, planted in 1990. When the species he wants cannot be found, he asks forestry extension worker to assist in providing the seed for the particular species or walk long distances to look for it. For example one species was collected from a distance of 75 km where he spent a night using a bicycle. If the species he wants is still not found then the programme of raising it is abandoned.

Number of Mother Trees and Flowering Trees

The seed of *Senna* species was collected on the ground under five trees planted close together. This is because the seed found under these trees was more than enough for the required amount to be raised in his nursery. These trees are also surrounded by 102 trees of the same species at Lalanje Admarc.

Seed Collection

The seed was collected from the ground using hands by Mr. Mchacha himself under five trees of the same species. He decided to collect the seed when fruits/pods turn brown in colour from green and they fall on the ground. It took him about two and half hours to collect the seed, which produced 100 seedlings, and some were left to be used in the next season. The seed is put in a dry plastic bag when collecting from the ground, carried home in the same bag, graded by removing empty and shrunken and stored at a dry place free from rats and water. After this no further cleaning or processing is done. Poor germination due to insect damage is the major problem with the collected seed especially when it stays for a long time before sowing.

Germination of *Senna* species seed is through direct sowing into the pot. Two or three seeds are put/sown into a pot by using a differing stick to make a hole on the tube center, slot the seeds in and cover the hole using fingers. Then watering follows before putting up a shade with containers everyday in the morning and late afternoon until the seed germinates. The problem in germinating the seed is pre and post emergency damping off, and insect damage by cutting the tender growing shoots. *Senna* species is the longest to produce plantable size seedlings about three and a half months and *Afzelia quanzensis* in the quickest about 2 months.

Output and Distribution

The nursery owner sells some of the seedlings and some are planted in his garden. Customers come themselves to buy seedlings from schools and individuals. Of all the species in the nursery, *Azadirachta indica* is considered the most important because it provides good shade and used for medical purposes. There are currently two customers who have just paid for 100 seedlings of *Azadirachta indica* but not collected. He does not sometimes try to see new species.

Nursery Management Options

Polythene tubes, grass for shade, seed hoes and potting soil are made available when preparing for real nursery work. Potting soil is collected from Lalanje river about 900 Meters from the nursery which is at his home, he puts in a bag and transported on a bicycle. Type of soil used is "makande" with a little mixture of sand carried from uphill by moving water to the river. Polythene tubes and "Chibuku packets" are used as container pot for filling. Polythene tubes are given by forestry extension worker and sometimes uses "Chibuku packets" which he collects from the taverns. "Chibuku packets" are used when they are given insufficient tubes. He does not produce bare rooted seedlings even when the tubes or "Chibuku packets" are not enough. The seed and seedlings are protected from sun's heat by using grass shade, which allows little light to pass through. He uses cuttings for raising mabulosi seedlings as a means of vegetative propagation. Some seeds are treated and others are not in order to improve germination. For example *Albizia lebeck* is soaked in normal cold water for one day before sowing and *Senna* species is not treated in anyway. Water source is from a borehole about 450 meters from the nursery.

Customers

This nursery is about 800 meters from tarmac road and about 7.5 km to forest. There are 12 customers who are individuals travelling on average distance of 2 km to buy the seedlings of various species in the nursery.

General Opportunities and Constraints in Nursery Management

Mr. Mchacha is in contact with other nursery managers close to his. The benefits he sees in this contact are sharing of skills / knowledge in nursery management, sharing of seed and seedlings in case one nursery does not or failed to germinate and encourage one another in nursery business when one meet problems such as insect damage.

The main opportunities seen in this business are more customers potential who can bring more income for personal use as paying school fees, buying food and clothes. These opportunities can be fulfilled by working hard in raising diversity of species of various uses and government intervention in providing loan to smallholder farmers interested in tree seedling raising. Livestock and insect damage, hunger, lack of seed and insufficient tubes and lack of equipment/tools such as wheelbarrow, watering cans shovel are the main constraints in this business. Free issue of seed, tubes, wheelbarrows and watering cans, fencing and spraying to keep animals and insects away from the seedlings and 'ganyu' (contract work) can assist in dealing with these constraints.

CHIKWAWA

Respondent: Mrs. Veronica Harry Nursery

Gender: Male

Introduction

Mrs. Veronica Harry nursery is in Mchacha village, Traditional Authority Ngowe in Chikwawa district. This nursery started in 2002 with the purpose of planting in her garden and for sale. She survives on cotton, millet and maize farming. Location of the nursery is S 16°31.816', E035°00.412', and altitude of 106 meters + 50 metres. She is 48 years old.

Deciding on Species to Collect and Mother Trees

There are 200 seedlings of *Senna* species and 106 seedlings of *Albizia lebbbeck* in the nursery, which she collected locally. This year she was not given any seed from forestry extension worker or organization. She decides to collect species, which can grow fast and produce the desired needs such as poles, firewood, timber and shade. The mother tree for seed collection is found by moving around within the area in her and other peoples' gardens. The one, which fruits well, is identified as a mother tree for that particular species. When the species she wants cannot be found, forestry extension worker is approached for assistance or she travels long distances where a night can even be spent. When all this fails then the species are not raised instead any available species is raised to keep the nursery alive.

Number of Mother Trees

Albizia lebbbeck seed was collected from one mother tree, which produced 106 seedlings. It was collected from one tree because it gave her enough seed for her programme that particular time. This tree is surrounded by trees of the same species.

Seed Collection

Mrs. Harry paid K10 to the owner of the tree where the seed was collected. She then sent her two young daughters of 15 and 16 years old to collect the seed since it is about 900 meters from her home. They collected the seed by picking from the ground under the bought tree using hands/fingers and put in a plastic paper. The decision to collect seed of *Albizia lebbbeck* was made

when the fruits/pods turn from green to light brown in colour. When the pods are very dry they release seed on the ground showing real maturity and easy collection according to Mrs. Harry.

It took about 10 minutes for the two girls to collect the seed. The seed in a plastic bag is taken home for grading, the nursery owner removes rotten and holed seeds since they were collected by young girls who could not bother the type or grade of seed they were collecting. The seed then was kept in an empty packet of sugar and took two days from collection to germination. The problems with the collected seed were presence of rotten and empty seeds, which results into poor germination. Germination of *Albizzia lebbeck* was through direct sowing into the tube by putting 2 seeds in each tube. A differing stick is used to make a hole in the center where the seeds are put in and covered with the same soil in the tube using fingers. She sows 2 seeds per tube in case one fails to germinate, the other takes over or both them fail then where all two germinate, and one is transplanted into that tube. Watering is done which continues every morning and evening. Grass shade is provided which allows little sun light pass through to protect the seedlings from sun scorch and retain moisture for some times. Caterpillar damage by cutting the stems of germinating seedlings is the major problem is germinating the seed.. They have destroyed 33 seedlings of *Albizzia lebbeck* so far reducing its population to 106 from 139 seedlings. Of the species she has in the nursery, *Albizzia lebbeck* took longer time about 3¹/₂ months and *Senna* species about 3 months to produce plantable size seedlings.

Output and Distribution

Mrs. Harry does not sell her seedlings as there are no markets. She plants in her garden and share some to her relatives and friends who are interested in planting. She tried to advertise by taking the seedlings along Nsanje road at Sorijini nobody responded positively. She takes all the species in the nursery as important as they are fast in growth and used for many purposes such as poles, firewood and shade. Currently she has not tried to raise new species, as this is just her second year in nursery work.

Nursery Management Options

The nursery owner takes potting soil as one of the necessities in getting prepared for nursery work. This soil is collected from Lalanje River about 900 meters away from the nursery. It is put in an empty fertilizer bag carried home on head. The type of soil is “*makande*” mixed with little sand carried by running water from uphill. She does not mix this soil with anything. The soil is filled in polythene tube given by forestry extension worker and in most cases they are not enough. “*Chibuku* packets” collected from tavern are then used to supplement polythene tubes in order to meet her target. Children collect the packets at T30 per packet. She does not produce bare rooted seedlings in her nursery and does not even know its existence. Grass shade is used to protect seedlings from direct sun heat raised about 2 meters high from the ground. She does not use any technique of vegetative propagation since the nursery started. Mrs. Veronica Harry treats *Senna* species and *Albizzia lebbeck* in the same way to improve germination by soaking the seed in normal cold water for one day before sowing in order for the seed

to imbibe water faster than sowing as they are. Water source is a borehole about 500 m from the nursery.

Customers

The nursery is about 800 meters to the tarmac road and about 7 km to the forest. She has no customers only last year 11 individuals only asked for the seedlings but did not come to buy. MASAF also promised to buy 1250 seedlings of *Senna* species, *Albizia lebbek* and *Burtdavya nyasica* but did not buy as well, she got disappointed and destroyed all the seedlings. Those people came from an average distance of 25 km to ask for the seedlings.

General Opportunities and Constraints in Nursery Management

The nursery owner is in contact with other nursery managers who are close. The benefits from this contact are that they share knowledge and experience on how to manage the nursery such as sowing techniques, right time for pricking out seedlings and treatment of seeds to improve germination. They also do share seed and tubes in case one does not have or not enough for his/her target.

The main opportunity she can see in this business is availability of seedlings, which can be planted for shade, timber, firewood and poles. When proper market is identified then it can be a good source of income for the betterment of her family in improving her economic status as well as standard of living. This can be fulfilled by working hard and proper coordination with the forestry extension worker in the area as well as exchange visits with other nursery managers.

Limited tree seed and tubes, no market for seedlings, livestock damage, lack of equipment/tools such as hoes, shovels and wheelbarrow and hunger, which encourages her to do piece work in other peoples' gardens instead of working in the nursery, are the main constraints in her nursery business. These constraints can be overcome by fencing the nursery to prevent livestock damage, availability of the seed of the required species by forestry extension worker especially for the species which are not locally found there but can do well under the climatic conditions and provision of loan to nursery owners in order to purchase the required inputs in time but above all government should intervene in identifying market for the seedlings.

CHIKWAWA

Respondent: Mr. Patrick Kusowa Tiyanjane Nursery

Gender: Male

Introduction

The owner of Tiyanjane nursery is Mr. Patrick Kusowa in Labu village, Traditional Authority Ngabu in Chikwawa district. He started his nursery in 2002 with the purpose of planting in his garden and surplus for sale. He earns his living by doing piece work '*ganyu*' in other people's gardens, seedling sale during planting time and maize farming in his small garden. The

GPs location of the nursery is S 16°32.185', E 035°00.057', and altitude of 94 meters + meters and is within his homestead. He is 37 years old.

Deciding on Species to Collect and Mother Trees

The nursery has *Gliricidia sepium*, *Albizia lebbbeck*, *Azadirachta indica* and *Acacia* species with 50, 19, 61 and 14 seedlings respectively totaling to 144 seedlings. Amongst these species *Azadirachta indica* and *Gliricidia sepium* were collected locally while the rest were supplied by forestry extension worker within the area. He decides to collect species locally which most of the people within the area like and grow very fast such as *Gliricidia sepium*, *Eucalyptus* species and *Azadirachta indica* which add fertility in the soil, provide good poles, firewood and shade and good coppicing ability.

He finds the mother trees by looking for healthy trees, which are straight, very tall and fruited very well within his village. When the species he wants are not found locally, he asks forestry extension worker to hunt for him wherever he can get it. When he can still not find then the wanted species is not produced instead he goes for any available species, which can give at least similar objectives. For example he wanted *Khaya anthotheca* and *Eucalyptus* species but failed due to unavailability of the species locally instead was replaced with *Albizia lebbbeck*.

Number of Mother Trees and Flowering Trees Around

The seed was collected from one tree because the tree looked straight very health and fruited very well than the other tree close to it of the same species. To me as FRIM technician, the trees are not different in terms of straightness and healthiness. The tree is close to one tree about 4 meters but other trees of the same species are 80 meters away from it and are more than 11 trees around.

Seed Collection

The seed was collected from the ground after the ripe seed has been shed off from the tree. He collected alone using hands without the use of any equipment. The collected seed was put in a T50 plastic paper. Mr. Kusowa decided to collect the seed when the fruits turns yellow from green in the tree and later fall down to the ground. He makes sure that the fallen seed is collected while fresh because he was told by extension worker that when the fruit overstay on the ground, it dies due to the reasons he does not know. It took about one week to collect the seed because collection was done at the beginning of fruit fall when very few fruit can fall in a day unlike the peak period when a lot can fall within an hour especially when windy. He did this in order to raise seedlings, which can be planted within the same season in 2003/2004 after being collected in November.

The collected fruits are put in a pot from a plastic paper, mixed with sand in the ratio of about one cup, unsieved river sand to one cup of fruits. The mixture is shaken very hard for about 15 minute to remove pulp and remain with seed only. Further removal of pulp from remaining fruits is done using hands at the same time seed is removed from the lot leaving pulp and fruit covers in the pot. The seed is then dried under shade to let moisture out for

a day. The following day they are sown directly into the tubes. The nursery owner makes sure that the seed is sown immediately after processing as it does germinate if stays more than one week.

The problems with the collected seed are poor germination as some of the seeds are rotten and some empty. It may happen according to him that he may collect some seed, which overstayed on the ground after falling from the tree but he could not notice during collection. The seed is kept for a day before sowing into the tubes. The seed is germinated by watering first the filled polythene tubes, makes a hole on the center of the tube using a dibbling stick, two seeds are put in a hole and covered with soil within the tube. The two seeds are sown in case one dies the other will take over or both die then where two germinated one is transplanted into the blank tube. Watering is done before providing shade to the tubes. Grass shade protects the seed and seedlings from damage of heat. Later normal watering is done in the morning and evening. The problems in germinating the seed are pre emergency, damping off which he says due to soil type or heavy watering, insect damage as the leaves start emerging (*mmunkhadala*) and dieback of seedlings, the reason not known to him.

Of the species in the nursery *Azadirachta indica* is the longest taking about 2¹/₂ months to produce plantable size seedlings November end to January while *Gliricidia sepium* is the quickest taking about 1¹/₂ months from early November to mid December.

Output and Distribution

Mr. P. Kusowa plants some of the seedlings in his garden for shade, fire-wood, adding soil fertility and poles and some are sold to customers. Customers are got by putting posters along Chikwawa / Nsanje road and they come themselves to the nursery. He considers *Azadirachta indica* the most important of all the species in the nursery. He has 35 customers buy 120 seedlings at K5 each. This season no customer has shown up since the rains have started. He has not yet tried to sell or plant new species.

Nursery Management Options

Amongst important things he gets prepared for nursery work with potting soil which is collected from Mafume river about 750 meters from the nursery under old *Ficus sycamonus* (mkuyu) tree. The type of potting soil used is 'Inset' which is a mixture of debris forming manure. The 'Inset' soil looses water faster and is mixed with "makande" soil which holds water for a long time are mixed in the ratio of 5 shovels to 1 respectively before being filled into the tubes. The containers used to fill the soil are polythene tubes given free by extension worker, "Chibuku packets" perforated underneath for drainage collected from tavern by children who are given T20 per packet and empty sugar packet cut into half and sown using thread bought from local beer brewer or at times given free. This man does not produce bare rooted seedlings. Grass shade is used to protect seedlings from sun scorch and no vegetative propagation technique is used to produce seedlings. *Albizia lebeck* and *Acacia* species are put in boiled water for about 10 minutes then the water is poured out. Immediately cold water is put in for 30 minutes then seed is directly sown into tubes/ pots. This he says really improves

germination of these species. Water for nursery use is drawn from Mafune River about 750 meters from the nursery.

Customers

The distance to the nearest tarmac road is about 1km and about 35km to natural forest in Lengwe national park. He has about 70 individual customers who come from a distance of 3km to buy seedlings from his nursery.

General Opportunities and Constraints in Nursery Management

Mr. Patrick Kasowa is in good contact with other nursery managers and the benefits, he sees in this contact are they share information, skill amongst each other in nursery management and agrees on seedling prices as they assist each other in finding market. For example he did not know how to make empty sugar packets into a soil filling pot but he learnt it from other nursery manager. This time he does not have big problems when he is given insufficient polythene tubes.

Main opportunities he can see in this business are income to his family during seedling sales period, which assist him in other domestic problems such as food, soap and fees. Planting of trees will be encouraged thereby reducing erosion problems and flooding. These can be fulfilled by government intervention by providing necessary inputs either on loan or gift.

Hunger, insect damage, lack of inputs/implements such as seed, tubes, hoes, wheel-barrows and shovels and lack of radio information are the main constraints in his business. They can be overcome by identification of project which can fund their nursery through 'Food for Work e.g. maize and beans, timely and adequate issue of inputs such as seed, tubes and insecticides for spraying and frequent visits by forestry staff will assist in encouraging them.

CHIKWAWA

Respondent: Mr. Yohane Zing'ando Nursery

Gender: Male

Introduction

Mr. Yohane Zing'ando nursery who is the son of Zing'ando village headman is in Zing'ando village, Traditional Authority Makhwira in Chikwawa district. He started the nursery in 1994 for the main purpose of seedling sales and plant leftovers from the sale. His survival depends on seedling sales, fruits sale e.g. this time mango from his garden, cotton and maize farming. The man is 41 years old married with two children. GPs location of his nursery is S 16°11.564,' E034°59.022 and altitude 76 meters + 38 meters. The nursery is within his homestead.

Deciding on Species to Collect and Mother Trees Around

All the species in his nursery were collected locally. There are 840 seedlings of *Burtdavya nyasica* and two of mango. The species for our case study is *Burtdavya nyasica*. He decided to collect species, which can locally sell fast and

can do well in the area. The species sell fast because it is good for timber and its growth rate is fast. The mother trees are found within the home yard by looking at the big trees, which fruited well. Other things are not looked into provided the tree is big and at the same time is the first to produce ripe seed / fruits. When the wanted species cannot be found, he looks for the alternative species having similar end use through forestry extension worker. When there is no alternative, the species are not raised. For example he wanted *Khaya anthotheca* but seed was not available then he did not raise any species to replace it.

Number of Mother Trees and Flowering Trees Around

The *Burtdavya nyasica* seed was collected from one mother tree on the ground because it was the first tree to shed the fruit off and provided enough for his raising programme. The tree is surrounded by 3 trees about 4 metres each of the same species.

Seed Collection

The tree sheds off its fruits from the tree when they are ready. Collection is from the ground under the tree using hands and put on fertilizer sack. Neither equipment, nor helpers were involved in this collection. He decided to collect the fruits when they turn from green to yellow while in the tree and then shed off the fruits on their own. It took him about 10 minutes to collect the required seed from the ground underneath mother tree. Since the trees is within his home, the fruits on fertilizer sack are little by little taken into hands and preened hard within fingers to remove water from the fruit. The pressed fruit is then dried for 2 days when sunny and about one week on cloudy day. After that the fruit is once again pressed in palms to crash it. Using sieve the seed is sieved to remove chaff and other unwanted particles from the lot. Chaff remains in the sieve and pure seed is sieved down to a dry plate. The seed is then stored in a dry sugar packet ready for sowing. There is no problem with the collected seed; it took him 4 days from collection to germination.

Burtdavya nyasica seed germination was done by first digging area for seed-bed, break big lumps. And level the bed, put grass on top and burn it, left to cool for one week, as is removed from the bed and water it. Fine river sand well sieved is then mixed with the seed about one small plate full of sand, one empty matchbox seed. The mixture is spread evenly on the bed using fingers and later fine sand only is put on top to cover the seed and the mixture assisted to spread the seed evenly on bed. Grass shade is then put after watering on bed and as seed germinates the shade is raised up. Normal watering continues as seed is germinating till prick out time.

The problem in germinating this seed are insect damage as soon as the leaves start showing up and pre and post emergency damping off due to reasons he doesn't know. *Burtdavya nyasica* takes longest to germinate and produce plantable size seedlings about 21 days and 10 months respectively while mango is the quickest about one-week and 1¹/₂ months respectively.

Output and Distribution

He mostly sale the seedlings and plant / share little to relatives and friends. He gets customers by taking the seedlings to market and some individual customers come themselves to the nursery. *Burtdanyia nyasica* to him is the most important species than all even those not raised in the nursery. It has about 81 customers buying about 300 seedlings at K5 each. This man has not tried to raise and sell or share new species.

Nursery Management Options

He gets prepared for nursery work by making sure that seed; tubes hoes, potting soil, grass shade and watering can are available. Potting soil mixture is collected from under banana where there is rubbish pit within home yard about 4 meters from the nursery. The type of potting soil is “*makande*” mixed with soil under banana in the unknown ratio but more of “*makande*” than the other under banana soil. The nursery owner only uses polythene tube as containers for pot filling given by forestry extension worker and sugar packet holed underneath for drainage collected from his and other peoples rubbish pits. He does not produce bare rooted seedlings and grass shade is used to protect seedlings from sun heat. The nursery does not produce vegetative propagated seedlings due to lack of knowledge on how it is done.

Burtdanyia nyasica seed is not treated in anyway to improve germination but some seeds e.g. *Faidherbia albida* and *Albizia lebbbeck* are put in boiled water for one minute and removed to let it cool in cold water before sowing. Water for nursery use is drawn from a borehole about 450 meters from the nursery.

Customers

The distance to the nearest tarmac road is about 10 km about 9 km customary land forest. There are 30 known individual customers who come from a distance of about 1 km around.

General Opportunities and Constraints in Nursery Management

Mr. Zing’ando is in contact with other nursery managers who share seed, tubes when one does not have and they help each other in finding market by putting his seedlings in other nurseries to sell for him when the species are not available in the other nurseries and share information / knowledge / skills on nursery management such as root pruning and hardening off. Main opportunities he can see in this business are income and make your name known to many environmental workers such as forestry research who have come to visit him for his work. The opportunities can be fulfilled by working hard with professional advice from forestry department staff, government to intervene in looking for market for the species raised. No market e.g. *Eucalyptus* species raised last year didn’t sale, lack of required seed and tubes, lack of frequent visits by extension workers and pre and post emergency damping off are the main constraints in his nursery business. He says these can be overcome by frequent visit by forestry staff to help him identify problems and their solution without unnecessary delays, train him on nursery management skills, timely issue of sufficient seed and tubes by forestry department staff, nursery managers exchange visits should be encouraged and government intervention in finding market for seedlings.

CHIKWAWA

Respondent: Mr. Steal Mite nursery

Gender: Male

Introduction

Mr. Stenala Mbito nursery is in Kajawa village, Traditional Authority Mulilima in Chikwawa district. His nursery started in 1999 for planting in his garden and home yard. He earns his living by farming cassava and maize and selling his trees to people who need poles. The nursery is about 300 meters from the makoka riverbank in search for water. GPs location is S 16°00.400', E 034°52.292', and altitude 445 meters + 50 meters. The man is 46 years old.

Deciding on Species to Collect and Mother Trees

The nursery has 709 seedlings of *Eucalyptus* species only which he also collected himself locally.

He decides to collect species, which can grow fast, has coppicing ability and produce good poles. The space to be planted also determines number of species to be collected. The mother species are found by asking permission from plantation committee formerly Blantyre City Fuelwood Project plantation to collect seed from any place with big trees. He does not meet situation where the wanted species are not found. He still thinks that situation will not be met in future since the species is locally found.

Number of Mother Trees and Flowering Trees Around

The *Eucalyptus* seed was collected from one mother tree because the tree produced enough seed for his programme. The mother tree was surrounded by a lot of trees since it is a plantation of spacing of 2 meters by two meters.

Seed Collection

After permission to seed from plantation committee, the tree is felled using an axe and panga knife in order to collect seed. The tip of branches with many capsules are cut and bunched together using a rope carried home in hands. The bunch is then untied small branches spread on an empty fertilizer bag and put on sun the following day. After about 2 hours the branches are mixed to release seed and expose those that are not in contact with sun's heat. After about 3 hours the branches are gently beaten using a stick to release seed on the fertilizer sack. This time matured capsules are open and release seed while not matured ones are closed. The branches are thrown away and chaffs removed from the lot to remain with seed only. The seed is then kept in an empty packet of sugar, ready for sowing.

He decided to collect the species when many capsules show brown colour from green. Few capsules also open while in the trees is also a good indicator of the right time to collect seed. Seed collection itself took him about 45 minutes but movement to and from the mother tree was about 3 hours. No further processing or cleaning is done at this stage. The seed took one month from collection to germination. The problem with the collected seed is poor germination which the nursery owner thinks due excessive heat during the sowing time.

Eucalyptus is germinated by digging the seedbed area first, break big lumps and level. It mostly breaks with hands. Spread the seed directly on bed using hands then smooth black soil is used to cover evenly the seed collected from dambo. Grass shade is provided to protect seed from sun's heat. Finally watering is done on top of shade and continues every morning and late afternoon. The problems in germinating the seed are insect damage as the seedlings are developing up to the extent of finishing up the nursery. He had to resow the seeds after first lot had been finished by the grasshoppers and scarcity of water when the source was dry. Since he only produces *Eucalyptus* species seedlings it is difficult to compare longevity in production of plantable size seedlings. It takes only 7 days to germinate and about 2¹/₂ months to reach plantable size.

Output and Distribution

Some of the seedlings are sold, some are planted in his garden and some are shared to friends and relatives. He gets customers by taking seedlings on the bicycle in a bamboo woven basket to market on Thabwa, Eastern bank road turn off. Other customers follow him to his nursery to buy the seedlings. *Eucalyptus* is the most important species to him because it is strong and makes good poles. He had 4 customers last year that bought 810 seedlings at K1.50 per seedling. Currently no customer has shown up. Mr. Mbito has not tried to raise or share new species due to lack of information on how to acquire them.

Nursery Management Options

When he is getting prepared for nursery works he makes sure that seed, tubes, watering cans and potting soil are at least available. Potting soil is collected from along Makoka River under *Bridelia micrantha* old tree about 5 meters from the nursery along the riverbank. Type of soil used is sandy loam, mixed with nothing. Polythene tubes and empty "Chibuku packets" are used as containers for filling the soil. Poly tubes are given free by forestry extension staff and "Chibuku packets" are bought from taverns at 30t per packet but currently there are no "Chibuku packets" since he was given enough tubes for his target. He has not tried to produce bare rooted seedlings and does not know that it happens especially when the tubes are not available. Grass shade is used from sowing to hardening off period in readiness for planting. No other vegetative propagation technique is used to produce seedlings in his nursery. He does not even know that something is done to seed in order to improve germination. Water source is Makoka River about 5 meters from the nursery.

Customers

The distance to the nearest tarmac road is about 300 meters from the nursery and about 400 meters to plantation forest where he collects *Eucalyptus* seed and about 600 meters to natural woodland. The four individual customers, who came last year in 2002, came from a distance of 50 km by average up to Nchalo.

General Opportunities and Constraints in Nursery Management

Mr. Stenala Mbito is in contact with other nursery managers. The benefits he sees from this contact are sharing of knowledge and experience on seed collection and nursery management techniques such as pricking out, pot

filling and sowing.

Main opportunities in this business are income if the sales are good and rehabilitation of degraded areas by planting more trees. They can be fulfilled by working hard, good technical assistance and availability of capital to procure inputs/implements such as shovels and wheelbarrows.

Grasshopper damage, water scarcity, limited time since he goes to the garden for cassava and maize farming as well as nursery work alone are the main customers in this business. Mr. Mbito thinks this can be overcome by drilling borehole within the village, provision of capital on loan by government or any non-governmental organizations to employ others to assist and exploration of potential market for the seedlings raised in the nursery.

MWANZA

MWANZA

Respondent: Mrs. Chimphonda/Willard Chimphonda

Gender: Female and male

Introduction

Chivuta village lies about 45 kilometers east of Mwanza district head quarter. Mrs. Chimphonda co-owns a nursery with her husband while their son, Willard, helps in carrying out various activities in the nursery. At the time of the visit, Mr. Chimphonda had gone to a seminar. The household is basically a farming household. In their nursery, there were guava, *Delonix regia*, *Azadirachta indica*, *Azadirachta indica*, avocado, papaya and *Eucalyptus* species seedlings. Off these species, *Eucalyptus* species, *Azadirachta indica* and *Delonix regia* had their seeds locally collected. The respondents reported that they carried out the collection of *Delonix regia* seed while the co-participated in the collection of *Eucalyptus* species and *Azadirachta indica* seeds. It also has to be noted that Mr. Chimphonda is also the chairman of Chivuta Village Natural Resource Management Committee.

Deciding on Species to Collect and Mother Trees

It was learnt from the interview that respondents collect species, which are on demand, thus those whose market would not be difficult to get. In the case of the *Delonix regia*, the mother trees were the trees that are owned by the household. The respondents reported that if they could not find a *Delonix regia* tree within their locality, they would look for the tree elsewhere and collect seed.

Number of Mother Trees and Flowering Trees Around

There are five *Delonix regia* trees in front of the respondents' house. All the trees were flowering at the time of the visit. However, the seed was collected from one mother tree. When asked why this was the case, Mrs. Chimphonda had the following explanation; "... At first, one seed case was

collected from each of our five *Delonix regia* trees. Only dry seed cases were collected. These cases were cracked open and the seeds were taken out. We looked at the seeds and checked which ones had a healthy, plump structure. It came out that the seed from one tree met that criteria, then we decided to collect seed from only that particular tree...” When asked what they would have done if none of the seeds met their criteria, she said “...We would still have sown the seeds and see if they could germinate...” At the time of the interview, there were three hundred *Delonix regia* seedlings in the nursery. The respondents also indicated that the seed from one tree was enough to meet their scale of production.

Collection of Seed

The respondents reported that they used a long dry bamboo to bring down seed cases of *Delonix regia*. These were dry seed cases. The cases that were brought down filled up and were stored in a bag that, when full, contains 50 kilograms of maize. It was reported that the seed collection exercise only lasted one day. On the next day, the cases were cracked open and the seeds were removed from them. The collection of seed cases was done by two people (Mr. and Mrs. Chimphonda) while the cracking and taking out of seeds was done by the two plus their three children. In their opinion, dry seed cases indicate that the seed has matured.

The respondents reported that after cracking the cases, the collected seed filled up a nsima plate. Soon after cracking, a pot of water was put on a fire-place. When the water boiled, the seeds were filled into the boiling pot. The pot was taken off the fireplace immediately after the seeds were put in. The seeds remained immersed in the water for two hours. After two hours, the water was drained out from the pot. They were left in the pot. The pot was put inside the house where it stayed for three days so that the seed remained fresh and fully moistened. On the fourth day, the seeds were each put in a tube, which was already filled with soil. The respondents reported that the idea of putting the *Delonix regia* seed in boiling water was learnt from a forestry extension officer. They added that the seeds remained immersed in hot water for hours so that the seeds should fully absorb water. They also reported that they did not have any problems with the collected seed. They said “...The seeds germinated very well. They took only two weeks to germinate. We were putting one seed per tube. It was only *Eucalyptus* species that gave us problems. We wanted eight thousand *Eucalyptus* species seedlings but we have only managed to have four hundred seedlings. The rest have died...”

It was learnt that there was no cleaning of the seed. Thus, the seed cases were collected on one day, cracked on the second day, immersed in boiling water on the same second day, stored in a pot for three days and put in tubes thereafter. When asked about the species that take the longest to produce seedlings, the respondents cited *Khaya anthotheca*, *Azizelia quanzenensis* and *Faidherbia albida*. They said that *Khaya anthotheca* takes four weeks to germinate while *Azizelia quanzenensis* and *Faidherbia albida* takes three weeks to produce seedlings. On the other hand, they stated that *Delonix regia* and *Azadirachta indica* are quick in producing seedlings. They said that they both take two weeks to produce seedlings. However,, they cautioned that the *Delonix*

regia that they were talking about is the one that is immersed in boiling water. They expressed ignorance as to how long it can take for *Delonix regia* seed that is not immersed in water to produce seedlings.

Output and Distribution

The respondents reported that at first Mr. Chimpepo used to take some seedlings to Nkula and Zalewa to sell. Slowly people came to know him as someone that produces seedling. They now come direct to the house to buy seedlings. On average, the customers come from a distance of 10 kilometers. Of course there are some customers within the village. The respondents reported that now they produce seedlings both on order and without any order. Mrs. Chimphonda said, “..Some customers ask which species we are producing that year and press an order. So, they actually ask us to produce a particular species. Luckily it has been orders of *Eucalyptus* species, *Acacia* species and *Delonix regia*. For example, this year we have an order of seven thousand *Eucalyptus* species seedlings which a certain farmer wants to plant on this farm...” When asked what they do when they have failed to meet a particular requisition, she said, “... We are in contact with other nurseries, especially a nursery at Lisungwi. So the other nursery supplies the difference. Like I said this year we have an order of seven thousand *Eucalyptus* species seedlings we only have four hundred at the moment. If we will fail to produce eight thousand, Lisungwi nursery will supply the difference. It also works the other way round, when Lisungwi nursery has an order which they are failing to meet, they come to us and we supply the shortfall...”

She also reported that there are about twenty customers for *Delonix regia* who also buy within the range of thirty to fifty seedlings. She also added that they produce the same species every year because “... other species are not locally found. We produce what is locally found...”

Nursery Management Options

As already indicated, the *Delonix regia* seed is put direct into tubes. The respondents reported that they get potting soil from their family garden. The soil in the garden is black loam soil. They said that they dig this soil and take it to a nursery site, which is on the edges of the garden. Once at the nursery site, the soil is beaten to loosen it. Then compost manure is brought and mixed with the soil. They said that they use compost manure that has remained buried in the soil for twelve months. Once the manure has been mixed with the soil, then pot-filling starts. Mrs. Chimphonda said “..The five of us fill five hundred tubes in a day” She also reported that sometimes they use animal manure (droppings) that has also remained buried for twelve months. At this point, she reported that the household owns 8 cattle, seven goats, 47 chickens and 12 guinea fowls. She also stated that the tubes from an extension officer for the department of forestry.

The respondents also reported that they do not use any vegetative propagation technique. However, Mrs. Chimphonda reported that “... We once planted *Gliricidia sepium* in our garden using cuttings and it worked. But we do not have this in the nursery...” They also stated that they use shade to

protect the seedlings from being heated by the sun. They added that, "... We remove the shade whenever there has been a lot of rain because in such a condition, the seedlings just grow tall and soft. So we remove the shade so that they can grow strong..." They also reported that they usually do not produce bare root seedlings. However, they said in 2002, they produced bare root *Eucalyptus* species, *Azadirachta indica* and *Gliricidia sepium* seedlings because tubes were inadequate. They said that the seeds were first sown on a nursery bed. When they produced seedlings, more beds were made and the seedlings were transplanted to these new beds so that they should not be thinly spaced. After the seedling had gained some height, they were up-rooted using thick sticks and planted in the garden. The seedlings were just taken with the soil without being put in any tube.

As already indicated, the *Delonix regia* seed was soaked/immersed in boiling water to improve germination.

Customers

The nursery and respondents' home are about three hundred meters from the tarmac road. The water source for the nursery is an unprotected well which is at a distance of about fifty meters from the nursery. The household uses water from a borehole, which is about three hundred meters away. The nearest forest is about ten kilometers away. They also reported that they have about one hundred customers. However, they were quick to point-out that "...If the customers are buying few seedlings each, like thirty or fifty, we can have one hundred customers. But if they are buying in hundred or even thousands, we just sell to twenty customers, so, the number of customers varies with quantity of seedlings that they are buying..." They reported that their customers are fellow villagers, employees of various institutions, like ESCOM at Nkhula Falls, and farms (from owners). They also pointed-out that there have been cases whereby a customer has even bought seven or eight thousand seedlings. As already indicated, the customers come from a radius of ten kilometers. It was reported that *Delonix regia* seedlings are sold at K10 each.

As already indicated, the respondents reported that they are in contact with other nursery managers. They explained that they have already been enjoying the benefits of such contact. Whenever they have a shortfall in a order of seedlings, the sister nursery supplies the shortfall. Likewise, when the sister nursery is failing to meet the demand, they also cover the shortfall. They reported that they are in contact with the nursery belonging to their village and another at Lisungwi (the headquarter of Traditional Authority Simon) when asked about the main opportunities that they see in the nursery business, Mr. Chimphonda had this to say; "... If I look back, I can see that things were really moving well. The seedlings were germinating very well. But for now, the germination is very poor. Seedlings are either not germinating or dying as they germinate. Every year we are producing over one thousand seedlings, yet this year we only have four hundred. However, there is no looking back, there is no returning. Together with Forestry officials, we will look at the cause of this. The forestry officials will tell us whether the seed were expired or whatever is killing the seedlings. Looking at customers,

we have more customers now than before. As I am speaking now, there is an order of seven thousand *Eucalyptus* species seedlings, five hundred *Acacia* seedlings and another five hundred seedlings of *Khaya anthotheca*. Therefore, the future of nursery business is very bright.

The respondent identified lack of germination as the only constraint that they have experienced in their nursery. They said that it is mainly *Khaya anthotheca* and *Eucalyptus* species seeds that are facing this problem. They are suspecting that they used seeds that were expired. They were confident that forestry extension staff would identify the actual cause of the problem and overcome it.

MWANZA

Respondent: Mr. Benito Chingwetsa

Gender: Male

Introduction

Kasuzza village is located to the northwest of Mwanza district headquarters, It lies a hilly part of the district and its western boundary doubles as a district as well as national boundary (with Mozambique). The respondent himself is aged 46 years and widowed. His occupation is farming. The front of his house is about two acres of an irrigated garden. The irrigation is aided by gravity. About 100 meters north of his house runs a river whose water is used for the irrigation. He grows maize, tomatoes, eggplants, cabbages, Irish potatoes, cassava, beans and pigeon peas. He also has a tangerine plantation. He also runs a nursery where he produces tangerine, *Uapaca kirkiana*, and *Eucalyptus* species seedlings for sale as well as own planting. It was learnt that he was previously working for the Red Cross in various refugee camps in Malawi. While there, he married one Mozambican refugee. When refugees were being repatriated in 1993 he followed the wife and settled in Mozambique where he started to produce *Eucalyptus* species seedlings. The wife died in 1999 and he returned to Malawi in the same year. He does not own any livestock.

Deciding on Species to Collect and Mother Trees

In the nursery, there were tangerine, *Uapaca kirkiana*, papaya and *Eucalyptus* species seedlings. The respondent reported that he collects species that are quick in germinating as well as growing. He cited *Eucalyptus* species as one such species. He stated that he used *Eucalyptus* species trees that he owned as another trees. He added that in order to get seeds, the mother trees had to be cut down. In view of this fact, he looked at two factors in order to find the mother trees. He said; "...I had to cut down one tree because it was so close to my house. I feared that one day this tree would fall on my house and cause damage. So I cut it and got the seeds.... As for the other tree, it was on the river and the irrigation channel had passed so close to its side. This tree was absorbing alot of water and it had grown to a height of five meters. I knew that this tree was a threat to the irrigation channel. It would eventually either block the channel or dry it up. So I cut it and got the seed..."

He also reported that it has never happened that he could not find the species that he wants. But he said that if such a thing happened, he would go to a forestry extension officer and ask for *Eucalyptus* species seeds. If the extension officer does not have seeds, "... I would go to anyone who owns *Eucalyptus* trees and buy one tree. I would cut it down and get seeds. I would use the rest as firewood..."

Number of Mother Trees and Flowering Trees Around

The respondent used two mother trees to collect seeds. When asked why he used two mother trees, he said that he knew that the seeds from these trees would be more than what he would require. One of the mother trees was solitary on a riverbank while the other was grown together with four other trees around the respondent's house.

Collection of Seed

The respondent reported that he cut the trees using a panga knife. He said "...The panga knife is very sharp that it was used in carrying out all the work..." Thus, after cutting down the trees, he also cut the branches. He added that he then used his hands to pull off the seed capsules. As he pulled off the capsules, they were falling into a plastic paper bag, which he was carrying in his other hand. He then took the plastic paper bag and placed it on the veranda of his house. The seed capsules remained in this bag for two days. After the second day, he observed that seeds were falling off from the capsules into the plastic bag. He physically shook the capsules to help more seeds fall off. He then took out the capsules and threw them away. He took the seeds and put them in a small plastic paper. These seeds were immediately sown on a nursery bed. He reported that this was done in October 2003. When asked about how he decided when to collect the seed, he responded with the following explanation; "...I first saw that the capsules were bursting open and the seeds were falling. The seeds that were falling from the tree that was on the riverbank fell on the riverbank and were germinating. I realized that the seeds were mature. I also guessed that if I would sow the seeds in October, the seedlings would be ready for planting by January..."

The respondent reported that he did not have any problems with the collected seed. He said "...The germination was very good that the seedlings out-numbered the tubes..." so the seeds were collected on the same day that the mother trees were cut, and were transported using a plastic paper bag. The seeds were stored in a plastic bag for two days, on a veranda. After two days, the seeds were sown on the nursery bed. He also reported he used the hands to winnow the seed in order to get rid of all non-seed materials. He prepared a nursery bed on a riverbank. The soil on the riverbank is black and a combination of loam and a bit of clay. He prepared a sunken nursery bed and used dry maize stalks and small tree branches to burn the nursery bed. He said that "... In the past, I once sowed seeds on a bed, which was not burnt. Germination did not take place. So I burn the bed and the seeds germinate very well..." He stated that it took five days for the seeds to germinate. The respondent stated that the species that take long to produce seedlings are peaches and tangerines/lemons. He said that peaches take seven to eight months to produce

seedlings if the shell is not broken but it takes two months if the shell is broken. He added that tangerines and lemons take eighteen days to produce seedlings. On the other hand, he said that the species that is quick in producing seedlings is *Eucalyptus* species, which takes five days.

Output and Distribution

The respondent sells seedlings although he indicated that he has few customers. He reported that his customers come from within his village and from neighbouring villages. When asked about how he gets customers, he gave two ways, as follows:

- “...When I go about chatting with friends, I tell them that I have seedlings...”It has to be noted that the respondent takes beer and the chatting means going on a drinking spree.
- People who already know that he has a tree seedlings nursery tell friends about it.

He also reported that he has about twenty customers. He added that, on average, each customer buys about twenty seedlings. He said that no single customer has ever bought more than twenty seedlings. He sells *Eucalyptus* species seedlings at K5 each while tangerines are sold at a price, which is determined by the height of the seedlings. He said the tangerine seedlings which are thirty centimeters high are sold at K50 each. He also stated that he has never tried to sell new species. When asked why he has never tried to sell new species, he said: “... People here have not yet realized the need to plant trees. They think that once you plant trees you kill your gardens. So, I want to lead the way. I am planting trees so that they can learn from what I am doing...”

Nursery management options

The respondent produces both seedlings in containers as well as bare root seedlings. When asked about where he gets his potting soil, he stated that he just uses soil from his garden. The soil in the garden is red “katondo” soil. He does not mix this soil with anything. He uses polythene tube as containers. He gets the tubes from Forestry staff. He also uses “*Chibuku* packets” and sugar packets as containers. However, he complained that these containers do not easily come by. For the “*Chibuku* packets”, he said, :.... Whenever I want to collect the packets, fellow drinker stop me from collecting their packets. They tell me to buy my own *Chibuku* beer, drink it and take the packets...” As for the sugar packets, he reported that he collects them from shop owners. The shop owners unpack the sugar and sell it in loose quantities, not in packets. The packets are then thrown aside. He then complained that whenever he wants to collect these empty packets, the shop owners demand that he pays some money in order to get them. Before using the packets of sugar as containers, he cuts each packet into two, so that he has two containers from each packet.

As already indicated above, the respondent also produces bare root seedlings. He stated that after the nursery seedbed, he prepares another bed. He pricks out seedlings from the nursery bed and transplants them on the new bed, observing spacing of about 15 centimeters. While these bare root

seedlings are growing, he once-in a- while trims the fibrous roots so that they do not grow long. He said that this eases pricking out for planting. But the taproot is not tampered with. Whenever he wants to plant the bare root seedlings, he takes a panga knife and dips it into the soil to a depth of about 30 centimeters and push the seedling upwards with the panga knife. Once the seedling is out, the soil is pressed against the roots so that it (i.e. the soil) does not fall off. Sometimes he puts the seedlings in a small plastic paper bag as a container. In some cases, he uses dry banana stem barks, which he folds and put the seedling inside. The dry banana stem bark is then tied around to keep it intact. The species used for bare root seedlings are *Eucalyptus* species and tangerines.

The respondent does not use any shade. He only uses mulching after sowing seeds “.... so that germination can be quickened....” when asked why he does not use any shade, he said: ‘...I am just lazy to do it, but sometimes I am too busy to do that...’ He also reported that he has even tried vegetative propagation on two occasions, using cuttings. He said that he once cut a young papaya branch and planted it. It started developing but after two months it died. He also took a small peach branch and planted it. It also started developing but it died after six months. He observed that in both occasions, the cutting died due to an erratic watering pattern. He said that they lacked water in most cases.

For *Eucalyptus* species seeds, there is no treatment to improve germination. However, tangerine seeds are peeled (have the seed coat removed) to quicken germination. The seed coat of a peach is also broken to quicken germination.

Customers

The nearest tarmac road is about fifteen kilometers away while the nearest forest is on Makwangwala hill, which is about one kilometer away. Water for both the seedlings and domestic use is drawn from a river, which is about one hundred meters away. The respondent has about twenty customers who live within a distance of about three kilometers.

General Opportunities and Constraints in Nursery Management

The respondent does not go to other nurseries but he said, “.....some people have been coming to me whenever they want to open nurseries . They come to enquire about how to sow seeds and which soil type to use. Most of them are from within the village and from neighbouring villages...” He, however, explained that it is good to keep in contact with other nursery managers “...because you learn and realize where you were doing wrong. You also learn how your friends successfully produce the seedlings that you fail to produce...” When asked about the main opportunities that he sees in the nursery business, he said: “...These nurseries are very important. The population is growing and deforestation is on the rise. Not every person can run a nursery. Some people will have to get seedlings from others. I can foresee that there is big nursery business in future. For instance, there were many trees along this river (a river that runs near his house) but now there are just very few trees left. What are left are either thin trees or trees that

have very bad shapes. So, I am sure there will be people out there who will decide to plant trees...”

When asked how this vision can be fulfilled, he had this to say; “...Village headmen, any leaders as well as Government officials should frequently be holding meetings where they should emphasize on the importance of planting more trees. Then, at such meetings I can be rising to tell people that I have seedlings...” He then outlined a number of constraints, which he has been facing as follows:

- Limited access to seed. He said he fails to get *Kbaya anthotheca*, *Faidherbia albida* and *m'gwinya* (species not identified) seedlings.
- Lack of adequate tubes
- Lack of knowledge on which soil type is best for a particular species.
- No market for seedlings

He suggested that these problems can be overcome through the following ways:

(a) Limited access to seeds:

He said that this would not have been a problem if the species were locally found, so there is need for the department of forestry to supply seeds.

(b) No adequate tubes:

He suggested that the department of forestry should supply tubes or shops should stock them so that they can be bought. He does not know that tubes can be bought.

(c) No knowledge on suitable types for each species:

He asked that department of forestry should train nursery managers on this because “...on our own we cannot learn this...”

(d) No markets for seedlings:

He said, “... on our own we are trying to sell but forestry officials should also help us. They go to many places where they can learn that people need seedlings, so they can advertise on our behalf. In that way, buyers can come and buy...”

In conclusion, the respondent expressed gratitude at the visit and out that it is an encouragement to him to carry on with nursery work.

MWANZA

Respondent: Mr. Steven Maliseni tree nursery

Gender: Male

Introduction

This nursery is in Kachingwe village, TA Saimoni in Mwanza district. This nursery started in 2002 with the intention of raising or producing seedling

for planting in his garden and some for sale. The wife was working with forestry research as a nursery worker in mangochi in 1995. The owner survives or earns his living by producing cotton and maize for sale. The seedlings are just moved to his home from dambo about 1½ km. It was started there in search for water. Location is latitude S15°23.883, longitude E 034°46.435' and altitude 396 meter + 24 meters.

Deciding on Species to Collect and Mother Trees

The nursery has *Eucalyptus* species (2100 seedlings), 2 *Albizia lebbbeck*, which seed was supplied by Wildlife Society of Malawi and 158 papaya and 38 seedlings of *Delonix regia* collected locally. *Delonix regia* was collected because of the spreading canopy as it grows. He found the mother tree by asking permission from the owner of the tree who planted on his home, which is on the way to the nursery. When he cannot find the species he wants, the complaint is launched to forestry extension worker and when he fails, that species is ignored as Mr. Maliseni cannot do anything e.g. this year he wanted *Toona ciliata* but failed because the trees are not available around and forestry department staff and wildlife staff failed to give him seed.

Number of Mother Trees and Flowering Trees Around

Delonix regia seed was collected from tree only because it is close to him on his way from his home to nursery. He did not also want a lot of seed. The tree is in isolation with other 3 scattered trees of the same species.

Seed Collection

The seed was collected by using a hook or stick to pluck dry fruits, which were only three. He decided to collect the fruits/seed when fruits turn brown and dry. It took him about 2 minutes to collect the seed which were in three pods producing 38 seedlings. He decided to break the fruits / pod using a store on the same day of collection. When a pod is crashed a seed is released which needs no further cleaning. There is no problem with the collected seed – all sown seed germinated. It took one day from collection to sowing.

The seed was sown in a big tube where potted soil mixed with khola manure is put or filled. The seeds are covered with the same soil to a good depth of about 2 cm and water the tubes. The tubes are filled on the sowing day. Upon reaching transplantable size they are transplanted into smaller tubes from the big tubes. Till planting watering is normally done two times a day. The problem in germinating the seed, termite's attack especially when sown on seedbed not in big polythene tubes. Of all the species in the nursery *Delonix regia* takes time to produce plantable seedlings about 6 months and only two weeks to germinate while *Eucalyptus* species are the quickest taking about seven days to germinate and about 4 months to produce plantable size seedlings.

Output and Distribution

Since this is his first time or season to produce seedlings in the nursery, he is trying to get customers by asking forestry department extension worker to look for market for him and by negotiating with his friend and people around neighbouring villages to buy seedlings from him to plant in their gardens for use. Of the species in his nursery, *Eucalyptus* species is the most important and

managed to sell 20 seedlings on 4th December. This customer came himself as he was searching seedlings to buy. He has tried to sell new species.

Nursery Management Options

Mr. Maliseni gets prepared for his nursery work by making sure that hoes, tubes, polythene tubes, seed and good water source are available as well as potting soil.

Potting soil is taken fertile soil along Nkhombe river which already mixed with sand which is about 150 meters away from nursery. The river is bear as most of the trees were taken/ washed by napolo. The soil is not physically mixed with anything. He uses polythene tubes only which are issued free by forestry department and society of Malawi. He does not produce bare rooted seedlings. Grass shade, which allowed about 75% of light pass through was used to protect seed and seedlings from sun heat and retain little moisture after watering. *Delonix regia* seeds were treated by putting the seed in boiled water taken out of fire and the water was let to cool for a day before taking the seed out of it. This time the seeds imbibe water. Mr. Maliseni does not use vegetative propagation. This type of hot water treatment is used for *Senna* species, and *Albizzia lebbbeck* etc with hard seed coat and untreated seed does not germinate properly. Water source is about 2 meters from the nursery to Nkope River.

Customers

Tarmac road is about 10 km from the nursery and forest is about 1 km. He has one individual customer who walks distance of 0.6 km within Kachingwe village.

General Opportunities and Constraints in Nursery Management

Mr. Maliseni is in contact with other nursery managers and the benefit he sees are sharing of tools and equipment e.g. he borrowed sprayer from another nursery as well as sharing of ideas and skill.

The main opportunities he can see in his nursery business are as usual income, protection of soil from erosion and availability of poles, firewood and timber. They can be fulfilled by availability of potential market for seedlings, working hard and formation of nursery owners association of Malawi to assist in airing out their views. Damage by livestock, e.g. goats, termite and other insect attack and limited tree seed are the main constraints in his tree nursery business and can be overcome by use of sprays to control other insects and termite, forestry department or Wildlife Society of Malawi to issue inputs on time such as seed and tubes, exchange visits with other nurseries and further market exploration.

MWANZA

Respondent: Mr. Benson Pawindo

Gender: Male

Introduction

This nursery is in Zalewa village, TA Saimoni in Mwanza district which started in 2003. Mr. Pawindo is 28 years old formerly a teacher at Kadansana Junior Primary School at Domasi Teachers College pursuing Diploma in teaching. Nursery location using GPs is latitude S 15°26.550, longitude E 034°51.409' and altitude 410 m + 86 m..

Deciding on Species to Collect and Mother Trees

All species that are in the nursery are collected locally and they are *Eucalyptus* species (426 seedlings) and *Senna* species (8 seedlings). He decides to collect species that are locally available in his area and are marketable and provide good fuel wood. The mother trees found within his homestead planted in 1990 with seed issued by forestry department. When the species he wants are not found, long distances traveled in search for it. When forestry department fails to supply the seed as last resort then alternative species are identified which can give similar objectives.

Number of Mother Trees and Flowering Trees Around

Senna species seed was collected from 2 mother trees because they are only trees present around this area. The trees are in isolation and not surrounded by other trees of the same species.

Seed Collection

Mr. Pawindo climbed *Senna* species trees and plucked fruits/pods by using hands. His child collected the pods together without difficulties. He decided to collect the seed when the pods start spitting on their own in a tree and the fallen seed is brown in colour. It took him less than 10 minutes to collect the seed from two trees. The pods are put in a fertilizer bag and tied for 6 days; the house is at a dry place where sunshine early reaches the place. Later the open pods are removed from the bag leaving only seed. The seed is stored in a dry sugar packet ready for sowing. Collected seed has poor germination due to the reasons, which he does not know.

The nursery owner germinated the seed by burning the seedbed soil first and level it after breaking large lumps. Sowing lines are made on seedbed after watering. The seed is put in the lines using fingers and cover properly with the same soil. No shading is done and after 2 weeks the young seedlings are pricked out into the polythene tubes. Problem in germinating the seed are poor germination and post emergency damping off, which he discovered later on that it was due to water logging caused by unperformed tube underneath. *Senna* species is the longest to germinate and produce seedlings about 2 weeks and 4 months while *Eucalyptus* species is just one week and 3 months to germinate and produce plantable size seedlings.

Output and Distribution

Since this is the first time, he is trying to get customers by putting the seed-

lings close to Zalewa roadblock and asking forestry department staff to look for market. Customers are not known and he considers *Eucalyptus* species the most important species of all in the nursery. Mr. Pawindo does not see new species.

Nursery Management Options

One of the things that he makes sure is available in nursery preparation is available for potting soil. This soil is collected from rubbish pit, which is burnt and mixed with ordinary soil-sandy loam soil. There is no measurement in mixing the soil.

Polythene tubes are containers used, which were given free by two friends and grass shade is used to protect seed and seedlings from sun heat. Neither bare rooted seedlings nor vegetative propagation techniques are produced in this nursery. Seed is also not treated in any way to improve germination. Water source is a borehole, which is about 200metres from the nursery.

Customers

The nursery is about 300 meters from Zalewa tarmac road and about 15 km from forest. He does not have definite customers but four people within the area, a distance of 2 km are approaching him.

General Opportunities and Constraints in Nursery Management

Mr. Benson Pawindo is not in contact with other nursery managers because he does not know the existence of other nurseries. Main opportunities seen in this business are income and availability of firewood, poles etc and can be fulfilled by identification of big market which can buy seedlings at a good price and timely issue of required seed and tubes. The main constraints he sees are limited tree seed, no market for seedlings and capital which can be overcome by issuing seed and tube in time, identification of good market and provision of capital on loan.

MWANZA

Respondent: Mr. Kasapha Nursery

Gender: Male

Introduction

Mr. Kasapha owns a nursery, which is in Chikolosa village, TA Kandulu in Mwanza district. The nursery started in 1999 with an aim of planting in his garden. Until 4th November he was working with post office and now survives on selling “*mandalena*” and seedlings. The nursery was established close to river and bore hole about 400 meters from home. After establishing in the pots, the seedlings were later taken home to avoid theft. GPS reading S15°35.302', E034o30.196 and altitude of 706 m + 17 m.

Deciding on Species to Collect and Mother Trees

Mr. Kasapha has only *Eucalyptus* species in his nursery which he collected locally producing 72 seedlings. Mother trees are found by moving around in

his garden and select a tree that has good fruits in September. He does not meet a situation of not finding the wanted species.

Number of Mother Trees and Flowering Trees Around

Eucalyptus species seed, which he used to produce 72 seedlings and surplus seed, was collected from a single tree. He collected from one tree because it was the only tree, which had matured seed. The tree where seed was collected from was in a single line with other trees of the same species about 8 trees and 6 tree on the left and right respectively. Almost all trees are flowering trees.

Seed Collection

The seed was collected using axe to cut down the identified tree for seed collection. He decided to collect the seed when it was in September when the capsules looked bigger than the previous months, the colour of the capsules also turn brownish. It took about a day to collect the seed and carried in a plastic bag to his home. The bag was put on the sun to dry the capsules on the same day. The following day almost all capsules were open and removed from the bag together with other chaff. This time actional seed is put in a sugar packet ready for sowing. There is no problem with the collected seed. It took him 4 days from collection to germination. The seed is germinated by preparing seedbed well leveled, burn the bed and let it cool for 3 days. Remove ash on third day and water it, mix seed with fine river sand and spread on the bed, water again. Reeds shade is used to protect the seed/seedlings from direct sunshine. Later normal watering is done. The only problem he faces in germinating the seed is livestock damage especially goats. It is difficult for him to compare longevity in seedling production since he has only *Eucalyptus* species in the nursery.

Output and Distribution

He gets customers with the assistance of Forestry officers who direct them to the nursery. He also uses wheelbarrow to take seedlings to the market about 2 km and other come on their own from within the village. *Eucalyptus* is the most important species and has over 80 customers buying over 2,000 seedlings at K5 per seedling.

Nursery Management Options

Mr. Kasapha gets prepared for his nursery by gathering potting soil, seed, tubes, hoes and grass for shading and fencing. Potting soil is collected from rubbish pit about 800 m to the nursery, crashed and sieved using iron sheet with reasonable holes. The soil is not mixed with anything. Polythene tubes are the only containers used to fill the soil, given free by forestry office. He does not produce bare rooted seedlings and no other vegetative propagation used to produce seedlings. Nothing is done to improve germination apart from watering in the morning and afternoon. Water to the nursery is drawn from a borehole about 100 meters.

Customers

The nursery is about 500 meters from the tarmac road and about 30 km to the forest. He has now over 85 customers who just booked, who are indi-

viduals. People come to get seedlings from within Mwanza about 8 km from the nursery.

General Opportunities and Constraints in Nursery Management

Mr. Kasapha is in contact with nursery managers and the benefit in this is sharing of ideas/skills in nursery management. The main opportunities in this business that he can see are good income for daily living and promotion of tree planting. They can be fulfilled by working hard, availability of potential and treadle pump availability. Main constraints are low income as customers buy seedlings at low prices compared to labour and inputs used to produce the seedling, theft and lack of skills in vegetative propagation techniques in order to produce seedlings without using seed. This can be overcome by forming nursery owners association which can voice their view, government to assist in finding market and training in other techniques that are used to produce seedlings without the use of real seed plus exchange visits.

MWANZA

Respondent: Mr. Lackman Patrick Nursery

Gender: Male

Introduction

Mr. Lackman Patrick has a nursery in Jonathan village, TA Mlauli in Mwanza district. It started in 2002 with the intention of planting in his garden. He is a Form one student at Chifunga Community Day School. He does the nursery work with his brother who is 18 years old. GPs location of the nursery of the nursery is S15:35.920', E034:42.210', and altitude 351 meters + 22 meters.

Deciding on Species to Collect and Mother Trees

There are five species in the nursery *Gmelina arborea* (77 seedlings) and *Eucalyptus* species (68 seedlings) were given free by forestry department and he collected locally *Delonix regia* (82 seedlings) *Senna* species (242 seedlings) and cassia nuts (70 seedlings). He decides collecting species that assists in providing shade e.g. *Delonix regia*, fruits e.g. cashew and poles e.g. *Senna* species. He finds the mother trees by moving around looking for trees that fruited well for the wanted species. When the wanted species are not found especially from forestry department, he decides to collect himself and if he can't then an alternative species are collected which give similar objectives.

Number of Mother Trees and Flowering Trees Around

Senna species seed, which produced 242 seedlings, was collected from 3 mother trees. He collected from 3 trees because they produced enough seed, which he wanted. The trees are surrounded by 8 trees on all sides of the same species, which was planted by forestry department.

Seed Collection

Mr. Lameck Patrick collected the *Senna* species seed by climbing the tree;

pluck the seed pods and later opens them to release seed. He had no difficulties in collecting the seed and nobody assisted him. He decided to collect the seed when the pods start showing brown colour and when shaken produce a sound indicating that the actual seed is detached from the pod. It took him 3 hours to collect the seed. The seed was taken in a plastic bag to his home where he put it on the sun. He opened the pods using hands to release the seed. During this process he was able to remove empty seed and rotten ones. The seed was then stored in a schoolbag in a plastic paper. The problem with the collected seed was sporadic germination after sown indicating that some of the seeds were unripe or rotten or empty (aborted). He collected the seed and germinates it in two weeks time. The seed was germinated by using direct sowing method into the tubes where 2 to 3 seeds were sown in tube after watering filled tubes. A hole was made in the middle using a stick and put in the seed and cover. Grass shade is used to protect seedlings and seeds from direct sunlight and to keep moisture for longer period. Insect damage livestock is the main problem in germinating the seed. *Delonix regia*, *Senna* species and cashew are the longest to produce seedlings about 4 months while *Gmelina arborea* about 2 ½ months after sowing.

Output and Distribution

He does not know how he can get customers and is intending to put a poster at Chifunga Trading Centre. Of the species he has in his nursery, *Eucalyptus* species is the most important. Currently no customers available and has never tried to sell new species.

Nursery Management Options

The nursery owner tries to make sure that water source, potting soil, seed, tubes poles for fencing and grass are available in preparing for his nursery work. Potting soil is collected along Golden River about 250 meters from nursery. The soil is “makande” and is not mixed with anything since there is nothing that he can mix with. Polythene tubes are the containers used, given free by forestry department at Lisungwi station. He does not produce bare rooted seedlings. Shade made from millet stalks is used to protect seedlings from direct sun heat. No vegetative propagation is used to produce seedlings. To improve germination the seed is cut at the edge opposite embryo side to allow it to imbibe water faster and sow directly. This is done on species with hard seed coat such as *Senna* species, *Delonix regia* and *Gmelina arborea*. Water for watering is drawn from river, which is about 50 meters from the nursery.

Customers

The nursery is about 400 meters from the tarmac road at Chifunga Trading Centre and about 300 meters from forest. He has no customers yet, but three individuals came to ask from a distance of about 0.6 km.

General Opportunities and Constraints in Nursery Management

Mr. Lackman Patrick is in contact with other nursery managers that are closer to him. The benefits of this contact are, he learns ideas and skills on nursery management from other, borrow each other equipment/tools e.g. he borrowed sprayer from Liyenda nursery to spray insects damaging his seedlings and share seed.

Main opportunities he can see in this business are income through sales and availability of poles, firewood and timber to many populations. These can be fulfilled by working hard to produce healthy seedlings, protecting from livestock damage and provision of capital to smoothly run the business. The main constraints are limited time since he is a student, livestock damage, and equipment/tools and insect damage. They can be overcome by fencing the nursery strongly, forestry department to top up on what he has in terms of inputs such as seed, tubes etc.

MWANZA

Respondent: Mr. Henderson Chaphankhani Nursery

Gender: Male

Introduction

Mr. H. Chaphankhwani nursery is in George village, TA Ngozi in Neno district about 5 km from Neno Boma. He was a village club chairman that had been raising various species. He moved out due to misunderstanding with the village headman. His own nursery started in 2003. He earns his living by selling sugarcane and '*mandalena*'. The man has 54 years old and the nursery is about 2km from his home looking for reliable water source from Nankhombe River. GPs reading is S 15°21.844', E 034° 41.670', and altitude 81 meters ± 28 meters.

Deciding on Species to Collect and Mother Trees

In his nursery, there are 562 seedlings of *Eucalyptus grandis* only which he collected locally. He decided to collect the species which are not common in the area but are useful in everyday life e.g. *Eucalyptus* for poles, firewood and bridge bearers unlike the indigenous trees which are common in the area. He finds the mother trees of wanted species by moving around within the area especially in his garden, which he planted himself. When he does not find the species he wants, he asks forestry extension worker to look for him and if he does not find the species then species are not produced. For example he seriously wanted *Khaya anthotheca* species but the tree species are not found locally to collect even forest staff founded to supply the seed. Eventually he failed to raise the species.

Number of Mother Trees

The seed was collected from only one mother tree on one branch producing 562 seedlings. He collected from one tree because he wanted to try if the seed would germinate since it was his first time to collect and the tree was easy to climb than other surrounding trees. 50 other flowering trees of the same species surround the mother tree. The trees were planted in 1997 with seed bought from forestry department.

Seed Collection

Seed collection was by climbing the tree and cut a heavy fruited branch using a panga knife. Capsules were plucked using hands and put on empty fertilizer sack spread evenly and expose to sun to let them open as capsules

dry. Open capsules release seed, later open capsules are removed from the lot and actual seed is put in an empty sugar packet for storage. He decided to collect the seed when capsules show signs of maturity by turning from green to brown colour. It took him about 2 hours to collect the seed.

When the seed is put in a plastic or empty sugar packet, it is stored at a dry place for 2 months before sowing. The collected seed had no problems. The seed was collected in June and sown in August about 2 months storage time. The seed was germinated by preparing seedbed and burn grass maize stalks on the bed to kill weed seed in the soil, let it cool for one week. The soil on bed is later mixed with ash and leveled. The seed is then mixed with fine sand and spread on bed using hands. Before grass shading the seedbeds is watered. While waiting for the seed to germinate, pot filling was done. The problem with collected seed is poor germination due to reasons not known to him. Since there is *Eucalyptus grandis* only, it is difficult to compare longevity in seedling produce with other species.

Output and Distribution

He gets customers for the *Eucalyptus grandis* through forestry extension worker who advertise for him. There is currently one customer buying 200 seedlings at K5 per seedling. Since he has just started the nursery this season, he has not tried to sell new species.

Nursery Management Options

Mr. Chaphankhwani gets prepared for his nursery by gathering together potting soil, seed, tubes and hoes. Potting soil is collected from garden close to Nankhombe river about 5 meters from the nursery. Type of soil is dambo sand, which looks a bit black and not mixed with anything. Polythene tubes are only containers used, given by forestry extension worker. He once produced bare rooted seedling with 'mandalena' due to lack of tubes. Grass shade is used to protect seed and seedlings from direct sun heat. No vegetative propagation technique has been tried. Seed of *Zizyphus mauritania*, is soaked in cold sugar solution for 2 days when he was in a village club as chairman. Water for nursery use is drawn from Nakhombe River about 3 meters from nursery.

Customers

The tarmac road is about 75 km from the nursery and 400 meters from nursery to forest. There is one individual customer now but hopefully more will come when planting reaches peak. This customer comes from a distance of about 6 km at Neno Boma.

General Opportunities and Constraints in Nursery Management

Mr. Chikaphankhwani is in contact with other nursery managers. The benefits he sees in this contact are sharing of knowledge, experience and ideas in nursery management, easy to get market and sharing of seed. Main opportunities in nursery business he can see are income for home use as well as promotion of tree planting to replace cut. These can be fulfilled by availability of enough land to plant trees, working hard in nursery, production of diversity of species and establishment of promising market.

Main constraints for his business are limited equipment such as watering cans, hoes, lack of required seed (e.g. he wanted *Khaya anthotheca* but failed due to lack of seed) and poor seed germination. These constraints can be overcome by provision of loan or capital for the purchase of inputs, government intervention on control of insect damage as well as providing the scarce seed species which are not found in the area but can grow well on the site.

MWANZA

Respondent: Mr. Peter Beselemu Mwangidzi Tree Nursery

Gender: Male

Introduction

The owner of this nursery is Mr. Peter Beselemu of Tundudze village, TA Mlauli in Neno district. Mr. Beselemu is the village headman for Tundudze village. He started this nursery in 1997 with the purpose of selling some of the seedlings and some for planting in his garden. His life relies on maize farming and tree seedlings sales. Location of the nursery is (GPS) S 15° 28.362', E 034° 37.598', and altitude 658 meters ± 27 meters.

Deciding on Species to Collect and Mother Trees

He collected locally the seeds of avocado, 'mandalena' and *Eucalyptus* species producing 430, 320 and 691 seedlings respectively. Seeds that were provided by forestry extension worker are *Azizelia quanzenis* and *Khaya anthotheca* producing 245 and 229 seedlings respectively. The decision to collect the species was made by looking at species, which can easily do well, collected and marketable to people within the area. The mother trees are found by moving around in his four gardens where he planted *Eucalyptus* trees looking for a well-fruited one. When he cannot find the species he wants, he still goes to further places where they are found and collect from there or buy from any other source. If all this fails then the wanted species are not produced.

Number of Mother Trees and Flowering Trees Around

The nursery owner collected seed of *Eucalyptus* species from one tree because it was the first tree to produce matured seed this season amongst all the trees surrounding it. 8 flowering trees surround the tree.

Seed Collection

Mr. Beselemu uses a tall bamboo with a hook tied on the tip and which is used to hook down small branches for easy collection of capsules. On the ground, small branches are removed at the tip in order to get rid of the immature seed. The remaining part is loaded upright in a big pail until full. He decides to collect the seed when it reaches the month of August; according to his experience when the capsules show brown colour and some have started opening. It took him about one hour to collect the seed. The collected seed is put in a dry empty packet of sugar and stored at a dry place for few days about a week before sowing or if planting kept for the following year. The collected seed is put on the sun while loaded properly in a pail for about 6 hours. The capsules are open and the branches are beaten to release all the seed in the pail. Later on, the seed is put in a plastic plate for further

removal of chaffs if any before put in an empty packet of sugar.

The problem with collected seed is immature seed present in the lot showing lightest brown colour, which does not germinate.

He germinates the seed by firstly digging the seedbed area, break large soil lumps and level the bed. A heap of maize stalks and grass about one meter high is put on top the bed and is burn. The bed is left to cool for 2 days before sowing. On the third day ash and soil on the bed are thoroughly mixed and levelled again. *Eucalyptus* seed is the mixed with dambo sand in the ratio of 2 packets of matches seed to 1 medium place soil. Using hands the mixture is spread on the bed. Later dambo sand is used to cover the seed by spreading like seed. The bed is watered and grass shade is provided which can allow reasonable amount of sunlight to pass through. It took four days from collection to sowing and there was no problem in germinating this seed. Mandalena is the longest species, which takes about a year to produce, plantable size seedling and *Eucalyptus* species is the quickest three months.

Output and Distribution

Customers are got by orders since he is known in nursery business in the area. He takes *Eucalyptus* species and 'mandalena' as important species and have 8 and 5 customers respectively. *Eucalyptus* species customers buy 1,600 seedlings and 'mandalena' customers 1020.

Nursery Management Options

When preparing nursery work, much emphasis is put on water source, potting soil, tubes and seed. Potting soil is collected from along Mwangidzi river about 2-3 meters from the nursery. Type of soil used is dambo, which is mixed with livestock manure in the ratio of 3-wheelbarrow dambo sand to 1 wheelbarrow livestock manure. Polythene tubes are the only containers used for filling the soil. He was given by forestry extension worker free. He has also ever tried bare rooted seedlings on Mandalena and not even vegetative propagation techniques are used to produce seedlings. The seed of different species needed to be soaked for three days as he does on *Delonix regia*, *Faidherbia albida*, *Annona senegalensis* and *Gliricidia sepium*. Water source is about 8 meters from the nursery in Mwangidzi River.

Customers

The nursery is about 18 km from tarmac road and 2 km to the forest. Currently he has 3 customers who are individuals. These come from about 12 km away from the nursery.

General Opportunities and Constraints in Nursery Management

Mr. Beselemu is in contact with other nursery managers. Benefits he sees in this contact are sharing of knowledge, techniques, seed and seedlings as well as equipment. The main opportunities in tree nursery business are income through seedlings, sales and sharing of customers. The opportunities can be fulfilled by working hard, production of diversity of species in his nursery and timely issue of seed to him from forestry department.

Lack of enough tubes, seed, equipment, insect damage and slow seedling

growth are the main constraints in nursery business. They can be overcome by timely issue of seed, and other equipment, provision of capital to boost the production quality and training in different methods of vegetative propagation.

MWANZA

Respondent: Mr. Mavuto Fedsoni Nursery

Gender: Male

Introduction

Mr. Mavuto Fedsoni nursery is in Kajawa village, TA Mulilima in Chikwawa district. This nursery has started in August 2003 and he survives on cassava and tomato farming. The nursery is down hill on S 15°59.953, E034°53.023 and altitude 308 meters + 34 meters and stays uphill about 3 km very steep on S 15°59.591', E 034°52.577' and altitude 530 meters + 41 meters. He is 18 years old. The nursery was established downhill in search for reliable water sources.

Deciding on Species to Collect and Mother Trees

There are 1946 seedlings of *Eucalyptus* species, which he collected locally. He decides to collect species by looking at the end use of it, which can give good poles and firewood and grow fast. Mother trees were found by looking for a big and healthy tree within his home, which can be utilized during the time of collection. When the wanted species are not found in the area, he approaches forestry extension worker to assist and if all fails alternative species is identified. For example he wanted *Khaya anthotheca*, *Faiherbia albida* and *Toona ciliata* but failed due to lack of seed.

Number of Mother Trees

Eucalyptus species seed, which produced 1946 seedlings, was collected from 2 trees because the two trees gave him enough seed for his programme. They were surrounded by 13 trees of the same species.

Seed Collection

He collected the seed from felled trees. His father used an axe and panga knife to fill the tree for brick curing. Matured capsules were collected using hands and put on a cloth. Later on capsules are spread on same cloth on the veranda. After two days capsules open which release seed. They are then removed from the seed lot leaving on the cloth seed only. This seed is finally put in a khaki envelope ready for sowing. He decided to collect the seed when capsules turn from green to brown colour and outer bark removal showing maturity signs. It took him about five hours to collect seed. After removal of capsules from the seed lot, no further cleaning is done and collected seed has no problem. It took a week from collection to germination. The seed of *Eucalyptus* species is germinated by first digging seedbed area, break big soil lumps and burn it. Let the bed cool for three days, mix thoroughly ash fine sand and burnt soil and level. Using hands the seed is spread on seedbed, which is later, covered by fine river sand and water. Termite damage is the only problem in germinating the seed. *Eucalyptus* species takes

four months to produce plantable size seedlings and is difficult to compare with other species since this is the only species in the nursery.

Output and Distribution

Mr. M. Fedisoni has no customers since this is his first time to raise seedlings of *Eucalyptus* species which he considers most important. He has not tried to sell or share new species.

Nursery Management Options

Potting soil is amongst the things he gets prepared for starting nursery work. This soil is collected from along Bilira River about 3 meters from the nursery. The soil is blackish '*makande*', which is not mixed with anything when filling the pot/tubes. Polythene tubes are the only containers used for potting the soil. He has never tried to produce bare rooted seedlings but grass shade is used to protect seed and seedlings from being scorched by sun heat. No vegetative propagation technique is used to produce seedlings. No treatment was done to the seed in order to improve germination. Water source from the nursery is about 4 meters from a river.

Customers

From the house to tarmac road is 9 m but from nursery to tarmac is about 3km, to forest is about 800m. No customer has appeared to ask or to buy the seedlings.

General Opportunities and Constraints in Nursery Management

Mr. Fedsoni is not in contact with other nursery managers since this is his first time to produce seedlings but knows the existence of other nurseries. Main opportunities he can see in nursery business are income, protection of environmental degradation and availability of seedlings for planting. These opportunities can be fulfilled by market exploration and government through forestry extension worker to assist nursery owner in managing forest nurseries professionally.

The main constraints in the business are lack of required seed, tubes, and equipment/tools such as panga knife and water scarcity. They can be overcome by timely issue of required seed, tubes and watering cans and provision of loans in order to purchase these inputs and nursery owners having exchange visits. On scarcity of water, treadle pump is the only solution according to Mr. Fedson.

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