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Domestication of medicinal tree species in the Victoria lakeshore region

B.M Katumba[1], J.M Boffa[2], G. Abigaba[1], J. Okorio[1]
[1]Forestry Resources Research Institute (FORRI) P.O Box 1752 Kampala, Uganda
[2]World Agroforestry centre (ICRAF) P.O Box 26416 Kampala, Uganda

Abstract

A survey was conducted in the Victoria lakeshore region of central Uganda to identify tree/shrub species that are used and sold by traditional medicine practitioners. A workshop for stakeholders in traditional medicine was conducted. The purpose was to develop criteria for prioritising the tree/shrub species for on-farm growing. These criteria were then used to rank the tree species generated from the survey. Eighty-nine tree/shrub species were identified in this survey, others were mentioned but were not readily available on the market or farms because of scarcity. Several criteria were chosen for prioritising the tree/shrub species for on-farm planting. These were: the demand (local and international), scarcity, level of domestication, socio-cultural attitudes and adoption potential. The tree species in the survey were ranked using the above-mentioned criteria on a scale of 1 to 5 (1 very low and 5 very high). Total score for each of the species was calculated and the following species were highly scored: *Milicia excelsa, Syzygium cordatum, Moringa oleifera, Dracaena steudneri, Albizia coriaria, Harungana madagascariensis, Alstonia boonei, Tamarindus indica, Senna floribunda, Ficus sur, Rhus vulgaris and Prunus Africana.* The above listed species, including many others such as *Warburgia ugandensis, Kigelia africana, Rauvolfia vomitoria,* recommended by specialists and traditional medicine practitioners were included in our priority medicinal tree species for domestication. This study serves as a foundation for identifying, documenting, propagating and domestication of these multipurpose tree/ shrub species.

Key words: Domestication, priority, tree/shrubs and traditional medicine

Introduction

Traditional medicine is becoming increasing popular in the world today. The global market for traditional therapies estimated to be at $60 billion a year and is steadily growing. About 80% of population in Sub-Saharan Africa use traditional medicine solely or as a complement to "conventional" medicines in their primary health care systems (WHO, 2002).

There has been an increasing interest in herbal medicines not only because of their curative ability but also their popularity in treating a number of diseases. The increase has also been attributed to the limited resources available for Uganda's health sector. It's estimated that Uganda's total per capita health expenditure is about $57 and the ratio of western-trained medical practitioners to Ugandans is about 10,000(urban) and 50,000 (rural) areas (WHO, 2002). Both the financial and human resources are inadequate; and this leaves many Ugandans with traditional healers as the only option. Traditional medicines are more accessible and affordable than the conventional "modern" medicines. In Uganda, there is at least one traditional healer for every 290 people (World bank, 2003) Traditional healers are easily accessed because they live in the same community with their clients. The fees charged by traditional healers are negotiable and can be settled slowly since the healers know the patients. The traditional healers can be paid in form of goats, chicken, maize, clothes, piece of land and so many other affordable ways. This makes the provision of health services more friendly and attractive.

In Uganda, traditional medicines are deeply embedded in our belief systems; therefore, there is a psychological advantage when traditional medicines are used as compared to conventional "modern" medicines. There is also increasing concern about the adverse side effects of chemical drugs. This has consequently led to increased use of medicinal plants therefore the need to conserve and domesticate them.

There is limited knowledge on propagation of some of these medicinal plants. that will lead to conservation of rare medicinal plants should be developed to ensure that the wealth of knowledge and products are maintained. Ninety species out 254 (35.4 %) were identified as having medicinal value in a study conducted around Mabira forest (Boffa et al., 2002). Therefore, use of local knowledge, skills and materials will ensure the sustainability of the domestication initiative since farmers are already knowledgeable about some of these tree/shrub species. The main objective of this study was to identify tree/shrub species used by

traditional healers around the lakeshore region. These were then ranked using predetermined criteria by a group of stakeholders to come with a list of priority species for domestication.

Materials and methods

Study area

The study was conducted in Mukono and Kampala districts of central Uganda. The districts have high population densities, (180 persons per km^2) and this is because of their proximity to Kampala. The economy is dominantly small-scale subsistence agriculture largely dependent on human labour and use of simple tools such as hoes and machetes. However, there are peri-urban and urban areas where commercial agriculture is done as well as commercial sales of goods and services as a means of generating income. Therefore, there is high potential of marketing forest products by the subsistence farmers. Growing medicinal plants is one great opportunity for raising household incomes in this area.

A survey was conducted among herbalists living around the Victoria lakeshore region. Questionnaires were administered through formal interviews and information on medicinal tree/shrub species obtained from vendors and herbalists. Thirty-eight vendors of medicinal plants in Kampala were interviewed. This was because Kampala had well designated markets where medicinal plants are sold and only this number was available at the time of the interview (table 1). Twenty practising herbalists in Kampala and eighteen in Mukono were interviewed (table 1) in this survey. This was mainly from two of our focus sub-counties of Nagojje and Najjembe in Mukono district where agroforestry activities were going on to buffer the encroachment on Mabira forest.

A workshop for stakeholders in traditional medicine was held. The main objective was to come up with criteria for selecting priority tree/shrub species for domestication and participate in a priority ranking exercise of the medicinal plants species generated during the survey.

Both the scientists and traditional medicine practioners suggested the criteria. Each of the criterion suggested was clearly debated and defined by all stakeholders and by consensus, all the criteria were passed and adopted. The species generated from the survey were evaluated, against the criteria of: demand, resource availability, socio-cultural attitudes, level of domestication and adoption potential. This was done on a scale of 1 to 5; 1 being the lowest (negative) and 5 the highest (positive).

Data analysis

For each category of respondents, the type and number of species recorded was entered in Microsoft Excel computer package. The percentage of respondents who mentioned a particular species was determined using descriptive statistics. The criteria were generated from contributions from stakeholders, who later discussed and formally agreed on it. Data was then summarised and tabulated in form of frequency tables after ranking.

Table 1: The number of respondents interviewed during the survey in the two districts

District	% Respondents		
	Practising herbalists	Plant vendors	Total
Mukono	18	-	18
Kampala	20	38	60
Total	38	38	78

Results

Medicinal tree/shrub species

Both vendors and herbalists identified several tree/shrub species that have medicinal value. Eighty-nine species were identified during the survey and plant vendors in Kampala markets were selling 67 species and herbalists identified 45 species they were using in the treatment of their clients. Table 2 shows the most common species sold by vendors in Kampala's local markets, while table 3 shows the most common species used by herbalists for treatment.

The species commonly sold in Kampala markets were *Vernonia amygdalina, Leucas calostachys, Warburgia ugandensis, Albizia coriaria, Garcinia buchananii, Myrica kandtiana, Hymenocardi acida* and *Momordica foetida* (Table 2). The herbalists on other hand commonly used the following species (Table 3) for treatment: - *Vernonia amygdalina, Rhus vulgaris, Markharmia lutea, Syzguim cordatum, Prunus africana, Garcinia buchananii* and *Acacia hockii* (Table 3). The herbalists were using a combination of trees, shrubs and herbs because they are usually combined with each other in treatment. In addition, many herbs can be used as substitutes to treat a number of diseases.

Criteria for selection of priority tree/shrub species

Five criteria were identified for prioritising medicinal tree species for domestication and on-farm planting. These were: demand for product, resource availability, socio-cultural attitudes, adoption potential and extent of domestication. However, these criteria were not weighted because each criterion varied depending on the user of a given plant species or product and this was one of the shortcomings for this study.

The demand of the tree product was based on the quantity of material used and sold on the local regional and international markets. The number of customers who buy and/or use the species on the local and international market was considered. In addition, the price of the plant parts sold was compared to that of other plant species and it was

Table 2: Twenty most common medicinal tree/shrub species sold by vendors

Local Name	Scientific Name	% Respondents
Mululuza	*Vernonia amygdalina*	31.7
Kakubamusulo	*Leucas calostachys**	29.3
Mukuzanume	*Warburgia ugandensis*	29.3
Mugavu	*Albizia coriaria*	22
Musaali	*Garcinia buchananii*	22
Nkikimbo	*Myrica kandtiana**	19.5
Mbaluka	*Hymenocardia acida**	17.1
Bombo	*Momordica foetida**	17.1
Mubajjangalabi	*Alstonia boonei*	14.6
Omwoloola	*Entada abyssinica*	14.6
Mukondwe	*Securidaca longipedonculata*	14.6
Ntaleya-ddungu	*Zanthoxylum chalybeum*	14.6
Omuyonza	*Carissa edulis*	12.2
Jjirikiti	*Erythrina abyssinica*	12.2
Naloongo	*Justicia betonica**	9.8
Omusa	*Kigelia Africana*	9.8
Muyembe	*Mangifera indica*	9.8
Kigaji	*Aloe vera**	7.3
Kabayekera	*Aristolochia elegans**	7.3
Naligwalimu	*Balanites wilsoniana*	7.3

Table 3: Twenty most common medicinal tree/shrub species identified by herbalists

Local Name	Scientific Name	% Respondents
Mululuza	*Vernonia amygdalina*	44.7
Kakwansokwanso	*Rhus vulgaris*	39.5
Musambya	*Markharmia lutea*	34.2
Kanzironziro	*Syzguim cordatum*	34.2
Ntaseesa	*Prunus Africana*	31.6
Musaali	*Garcinia buchananii*	31.6
Kasana	*Acacia hockii*	31.6
Mpewere	*Newtonia buchananii*	31.6
Muvule	*Milicia excelsa*	31.6
Jjirikiti	*Erythrina abyssinica*	28.9
Kifabakazi	*Spathodea campanulata*	26.3
Ennongo	*Albizia zygia*	23.7
Muyembe	*Mangifera indica*	23.7
Musasa	*Sapium ellipticum*	23.7
Mugavu	*Albizia coriaria*	18.4
Kajjo-lyanjovu	*Dracaena steudneri*	18.4
Kalintunsi	*Eucalyptus species*	18.4
Mukuzanume	*Warburgia ugandensis*	18.4
Mulilira	*Harungana madagascrensis*	15.8
Muwafu	*Canarium schweinfurthii*	15.8

agreed that species that fetch high prices had higher demand than those sold at low prices. The type of disease cured by the plant was also considered. For instance, plants that are used in the treatment of common diseases such as malaria were said to be over exploited, therefore, faced a higher risk of extinction. However, rare diseases are expensive to treat, therefore, there is more money involved in processing the necessary medicines. The income generated from these activities is a motivation to many users to harvest and sell more products. This leads to over use and may endanger the availability of the species in future.

Resource availability criterion was used to estimate the extent of distribution of the different medicinal tree species in the lakeshore region. It assess whether the target species was restricted to certain parts in the region e.g. Mabira forest only, or it could be got in other smaller forests, pieces of land or rangelands around in the region. Therefore, the species of interest in this study were the scarce ones that required urgent domestication and on-farm planting. There was need to concentrate on species that are rare and relatively unknown to farmers. Such trees would raise farmers' willingness to plant since they would be purposely for income generation. Species that are widely planted, that is, highly domesticated, would not arouse farmers' interest. This criterion would be used to evaluate to what extent farmers had planted or retained a particular plant species on their farm. Trees that were commonly planted/ retained by farmers scored least on this criterion.

Socio-cultural beliefs make people resent some plant species that are easily acceptable in other cultures. This criterion evaluated the acceptability of the species to the farmers in accordance to their cultural norms. Species that had strong taboos against them ranked lowest in this criterion.

Adoption level of the species evaluated how different tree species could perform in a cropping environment. Some trees out compete crops for water, light and nutrients and this is manifested in stunted growth of the associated crops. This criterion determined whether such trees could be suitable for on-farm planting. Some tree species are easily adopted because they have multiple uses in addition to their medicinal properties. Such species scored highly under this criterion. The farmers consider the growth rate of a tree species as a major factor in determining its acceptability on farm. Species with long rotation periods and had no mid-term benefits to the farmers were also scored lowest under this criterion.

Priority species for domestication

Many species that were readily available on farm were highly ranked because of their multiple uses. Priority species for domestication are shown in table 4 and the most highly ranked were: *Milicia excelsa, Syzygium cordatum, Moringa oleifera Draceana steudneri, Albizia coriaria, Harungana madagascariensis, Alstonia boonei, and Tamarindus indica.*

Table 4: Priority tree/shrub species selected for domestication in the lakeshore region

Local Name	Botanical Name	Demand	Resource scarcity	Extent of domestication	Socio-cultural attitudes	Adoption potential	Total score
Muvule	*Milicia excelsa*	5	5	5	5	3	23
Kanzironziro	*Syzygium cordatum*	5	5	5	5	2	22
Moringa	*Moringa oleifera*	5	5	2	5	5	22
Kajjo-lyanjovu	*Dracaena steudneri*	5	4	5	5	2	21
Mugavu	*Albizia coriaria*	5	4	4	5	3	21
Mulilira	*Harungana madagascarensis*	3	5	5	5	2	20
Mubajjagalabi	*Alstonia boonei*	3	5	5	5	2	20
Mukooge	*Tamarindus indica*	2	5	5	5	3	20
Mutanjoka	*Senna floribunda*	2	5	5	4	3	19
Kabalira	*Ficus sur*	1	5	5	5	3	19
Akakwanso	*Rhus vulgaris*	3	5	5	4	2	19
Ntaseesa	*Prunus africana*	4	4	4	4	3	19
Munyonza	*Carissa edulis*	2	5	5	5	2	19
Kifabakazi	*Spathodea campanulata*	3	5	5	3	2	18
Ennongo	*Albizia zygia*	2	5	5	4	2	18
Mukuzanume	*Warburgia ugandensis*	5	5	5	1	2	18
Enimawa	*Citrus lemon*	3	3	4	5	3	18
Omwolola	*Entada abyssinica*	1	4	5	5	3	18
Muwafu	*Canarium schweinfurthii*	5	5	5	1	1	17
Mukondwe	*Securidaca longipedunculata*	5	4	5	1	2	17

Discussion

Many plant species are used as medicines but information about these plants has been scanty. About 25% of modern medicines are descended from plants first used traditionally (WHO, 2002). Raintree nutrition, Inc (1996-2004) reports that the plant chemical quinine was discovered in a rainforest tree C*hinchona ledgeriana* over 100 years ago. Scientists were able to copy this chemical drug and start manufacturing the drug without using the tree bark. Locally *Vernonia amagdalina*, has been used to treat malaria for a long period and herbalists have started packaging this for commercial purposes. Research has also shown that about 12.5% of the 422 000 plant species documented worldwide are reported to have medicinal value but a few hundred are known to be in cultivation (Rao et al, 2004).

Efforts to document, propagate and domesticate many of the medicinal plants will be useful but a strategy that will ensure sustainable management and use needs to be developed. Farmers have been known to retain and preserve plants that have medicinal value to their farmers. For example, in an on-farm tree diversity survey conducted in 105 farms around Mabira forest, 75% of the respondents retained *Vernonia amagdalina* as a medicinal plant making the species highly rated as a medicinal. However, the species does not feature among the priority species because it's abundant on farm and can regenerate itself. However, 22%, 12% and 11% of respondents retained *Spathodea campanulata, Albizia coriaria* and *Entanda abyssinica* respectively on their farms for medicine. These species are part of the list of priority species and farmers have knowledge about them.

The herbalists use tree species as medicine because they stay near the communities they treat and therefore, have access to these plant species' products. In Mukono for instance, farmers had about 56% of all medicinal trees on farm retained purposely for medicine as the priority use. This implies that herbalists in the rural communities still have some trees from which they can harvest the medicines or get them easily from the forests.

Medicinal species that are associated with negative socio-cultural attributes were very few, while those that thrived in the forest had low compatibility with crops due to their dense canopies and low growth rates. The multiple uses of tree/shrub species range from; wood for furniture, fuelwood to uses such as tannins and resins used for dyes, which have high commercial value. Trees with food or commercial value were found to be socially acceptable to farmers as opposed to those that lacked any of those attributes.

The criteria for selecting of priority species was more inclined to the adaptability of species for on–farm planting but Madhav et al (1993-2004) developed, through group participation criteria that was more sensitive to issues such as biodiversity conservation, drug development and the macroeconomics of trade. This type of research needs to be reinforced with field data collection from potential plant harvesting sites like forests. Mander et al (1997) developed a method of assessing the vulnerability of medicinal plants to harvesting. The method helped to integrate social and ecological data and it was able to capture; density of plant

in collection site, harvesting risk, the percentage of users and diversity of use. This type of approach was not done for this study but it results into more accurate priority species information. The criteria and selection can be used as a focus for research attention, as well as for targeted development action.

Leakey and Simons (1997) observed that systematic priority setting has been beneficial in some cases but less satisfactory in others. For example, this study tried to identify a number of useful medicinal plant species but may have failed to prioritise some medicinal species because they were readily available at the time of the interview.

Conclusion

There many plants that could be used for medicines, but their populations are gradually reducing because of increasing demand, loss of land to agriculture, forestry, grazing, and urbanisation and expansion of rural populations. The farm remains the most suitable habitat for preserving some of these useful plants. Priority efforts should be invested in halting local disappearance of threatened tree/shrub species.

The identified medicinal tree/shrub species offer major opportunities for commercialization and income generation for various actors in the forestry sector. With dwindling supplies from natural resources and increasing global demand, the plants need to be cultivated to ensure regular supply as well as conservation value. The growing demand will make them good commercial enterprises for smallholder farmers.

It's evident that certain trees and shrubs, of which, a few have been documented, can serve man's medicinal needs while assisting in protecting the environment upon which and other creatures depend. The cultivation of such trees whose purpose may be food, fuelwood, fodder and wood for industrial purposes can help reduce the pressure on natural ecosystems.

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