The ethnobotany and ecological status of *Albizia coriaria* Welw. ex Oliv. in Budondo Sub-county, eastern Uganda

John R. S. Tabuti* and Ben Belden Mugula

Department of Botany, Makerere University, PO Box 7062 Kampala, Uganda

Abstract

Useful trees are believed to be threatened. However, most evidence about these concerns is anecdotal. The objectives of this study were to document uses of *Albizia coriaria* Welw. ex Oliv., local harvesting patterns, perceptions about the species population dynamics, as well as local attitudes to its conservation. A further objective was to determine its availability, distribution and population structure. The study was carried out using ethnobotanical and quantitative ecological methods. The species was found to be multipurpose and produced fourteen different products and services. The most frequently mentioned products were herbal medicines, sawn timber and wood for construction. Individuals of the species were sometimes felled to harvest wood. Community responses indicated that the species was rare and was declining in the area. The quantitative inventory supported this community view: the species had a low density (33 individuals, >5 cm diameter at breast height per ha) and a flat size class distribution with a calculated least-squares regression slope of −0.0357. The species population appeared to be threatened by clearing of land for crop agriculture, human population growth, logging and a poor attitude to its conservation. Respondents claimed that they were not interested in conserving it because they had a low appreciation of its true value; lacked land, propagation material and skills; or because the species was slow growing.

Key words: agroforestry, community forestry

Introduction

Albizia coriaria Oliv. is a useful timber tree that occurs over much of Uganda (Katende, Birnie & Tengnäs, 1995; Tabuti, Dhillion & Lye, 2003; Tabuti, Lye & Dhillion, 2003). Important trees such as *A. coriaria* are declining in abundance and are believed to be threatened. However, empirical data to support these claims is lacking. This study was carried out to document existing usage of the species and its ecological status in the local community of Budondo Sub-county eastern Uganda. Specifically, the study objectives were to document all uses of the species, local harvesting patterns for the species, observed changes in its population by the local community, as well as local attitudes to its conservation. A further objective was to determine its availability, distribution and population structure using both an ethnobotanical approach and a quantitative ecological study.

*Correspondence: E-mail: jtabuti@botany.mak.ac.ug

Both authors declare no conflicts of interest

Materials and methods

Study area

Budondo Sub-county is located between 0.0–0.5°N and 33–33.4°E at an altitude of 1140–1200 m a.s.l., 100 km to the north-east of Kampala, the capital city of Uganda. Rainfall ranges between 1250 and 1500 mm per annum. The original vegetation of the area was described by Langdale-Brown, Osmaston & Wilson (1964) as forest savanna and medium altitude moist semi-deciduous forest. But this has now been greatly modified to a landscape of small-scale non-uniform farmland (Forest Department, 1997).

The people of Budondo are rural peasants, whose major source of income is crop agriculture. Other sources of livelihood include livestock husbandry, charcoal burning, timber harvesting and carpentry (B. B. Mugula, personal observation).

Methods used in data collection

Fieldwork for this study was carried out between February and May 2004 using both ethnobotanical and quantitative

ecological methods. The ethnobotanical study was conducted through interviews with 21 respondents: fifteen male and six female of an average age of 30 years.

These respondents were selected by convenience sampling, whereby respondents who happened to be close to the ecological sampling plots were selected. The major questions asked were: what uses were put to the species, how it was harvested, what changes had been observed regarding its availability, what factors were affecting its survival, and what were the prevailing attitudes regarding its conservation.

For the ecological sub-study, six villages, namely Buwagi, Buleeba, Kyomya, Kabowa, Buyala A and Namizi C were randomly selected. Four plots were systematically placed in each of these villages (only three were placed in Kabowa and Namizi C) to make a total of 22 plots. The first plot in each village was randomly located, then subsequent plots were placed every 500 m in a straight line in a north to south direction.

Each plot had dimensions of 10×1000 m. To ease sampling, each plot was subdivided into smaller plots. Trees ≥20 cm dbh were sampled over the entire transect. Smaller trees between 10 and 20 cm dbh were sampled in smaller plots of 10×100 m; poles and saplings (2–10 cm dbh) in plots of 10×50 m. While seedling (plants <1 m in height) were sampled in three 1×1 m plots randomly placed within the 10×50 m plots. Within each plot all individuals of *Albizia coriaria* were counted and their dbh was measured.

Data analysis

Data from the ethnobotanical part of the study were coded and summarized in frequency diagrams. From the quantitative inventory, the species density was calculated. A size class frequency distribution plot (SCD) was drawn by plotting the stem density, against size class. A least-squares linear regression slope was also calculated for the SCD using the software SPSS for windows. The SCD slope summarizes in a single number, the shape of the SCD (Condit *et al.*, 1998; Lykke, 1998). If a population has a steep negative slope, it is interpreted to be stable and naturally replacing itself. While weak-negative slopes or flat slopes portray poor recruitment and declining populations (Hall & Bawa, 1993; Lykke, 1998; Obiri *et al.*, 2002).

To calculate the regression slope, the size-class midpoint (d_i) was treated as the independent variable and the number of individuals per unit area (N_i) in each size class as the dependent variable. To get straight line plots, N_i was transformed by $\ln(N_i + 1)$ because some classes had zero individuals. The regression was calculated between d_i and $\ln(N_i + 1)$ (see Lykke, 1998; Obiri *et al.*, 2002).

Results

Uses of A. coriaria

Albizia coriaria was reportedly harvested to provide ten different products (Fig. 1). Of these, eight were mentioned by more than two people. The species was also useful in the provision of services such as shade. Harvesting of the species for timber or herbal medicines (human and livestock) was mentioned by the largest number of people. Respondents when asked, further, to identify the most important use for the species, reported human medicine to be the most important (n = 15). The bark or root of the tree was harvested for the treatment of syphilis, skin diseases, jaundice, eye diseases, cough, sore throat and as a general tonic. It was also used to concentrate breast milk in humans.

Products from the species were harvested by gathering dead wood for firewood, and sap or bark for use as human medicine. Mature trees were sometimes sawn into timber, while pole-sized trees were cut for use in the construction of houses. Roots were also collected for use in herbal medicine, while branches were pruned for use as fodder or for construction.

Ecological status

All respondents claimed that the species was rare in the area. They also believed that it was declining in abundance (n = 20). These community perceptions were collaborated

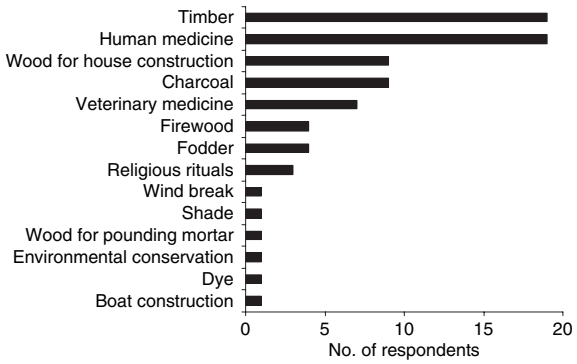

Fig 1 Products and services of *Albizia coriaria*

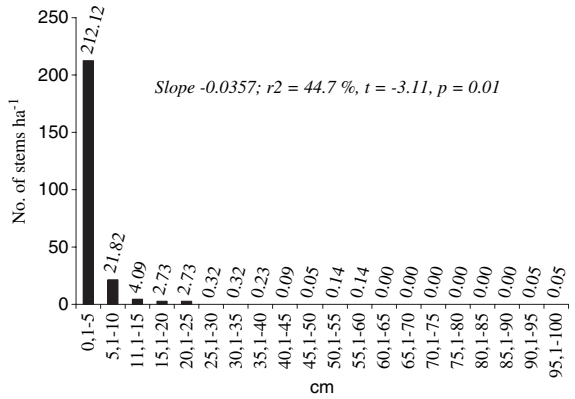

Fig 2 Size class frequency distribution (number of stems ha^{-1}) of *Albizia coriaria* in Buwagi and Namizi parishes

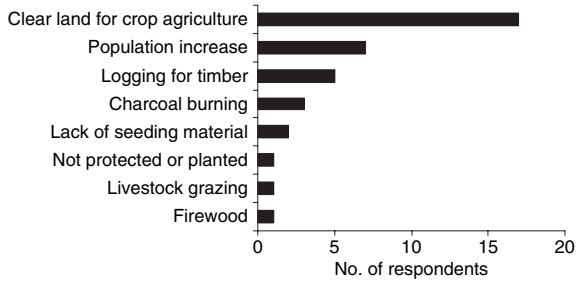

Fig 3 Factors believed to be causing loss of *Albizia coriaria* in Buwagi and Namizi parishes

by the analysis of the population structure. The population had a flat size class distribution (calculated regression slope −0.0357; r^2 = 44.7%, t = −3.11, P = 0.01). The plot of the size class distribution showed that the population was made up of juveniles and that there was an almost total absence of adult individuals. Mortality of seedlings was very high (*c.* 90%; Fig. 2). Results of the quantitative inventory indicated further that the species was widely distributed as it was encountered in 21 of the 22 plots. The species had a density of 245 stems per hectare. Most of these (212 stems per ha) were small sized individuals of <5 cm dbh.

Factors affecting species survival

When respondents were asked what they considered to be the factors impacting negatively on the species survival, they mentioned eight different factors. The most frequently cited was clearing of land for crop agriculture. Another two commonly cited factors were human population growth and logging (Fig. 3).

Attitudes to conservation

People were poorly motivated to conserve *A. coriaria*. Only eight out of the 21 respondents had ever bothered to establish or manage the species for its continuous availability. Management was by transplanting wildings when encountered or by protecting existing individuals on their land. They attributed their lack of interest to a poor appreciation of the species true value (n = 16), and lack of land propagation material and skills. They were also unhappy that the species was slow growing and also that its timber was not resistant to insect damage.

Discussion

Population structure

The local population of *A. coriaria* appears threatened. According to the respondent's, the species was scarce and declining in abundance. The quantitative inventory supported the respondents view. The analysis of the SCD indicated that the species had a weak population structure. It exhibited a weak reverse J-shaped slope (−0.0357). Species with weak slopes generally have a poor regeneration potential and may be declining (Hall & Bawa, 1993; Lykke, 1998).

The SCD plot (Fig. 2) depicted a high density of seedlings, but these were lost to the population before they had recruited into saplings or mature stems. This loss of juveniles weakened the population. For a population to maintain itself, it needs to have abundant juveniles which will recruit into adult size classes (Lykke, 1998). Similarly, the absence of adults in a population affects recruitment into the population by seed (Hall & Bawa, 1993).

The extensive mortality of seedlings may be associated with the constant disturbance of clearing land for crop agriculture. Most respondents related the precarious status of *Albizia coriaria* to land clearance. Grazing was perhaps less important in the destruction of young individuals because it was mentioned by only one individual; however, it should not be disregarded; arguably even a single animal can destroy a substantial amount of the species when grazing. The absence of adults in this population may be assumed to be a result of poor recruitment from seedlings;

however, the most important reason could be attributed to the destructive practices of logging for timber and charcoal burning. Logging and charcoal burning were implicated by many respondents of this study, to be critical factors in the destruction of the species. Firewood collection is not considered an important factor because community members collected dead wood.

Species use and attitudes to its conservation

Albizia coriaria is a multipurpose species. Despite this characteristic, it does not seem to be highly appreciated among the local community of Budondo. This assumption is based on the fact that although each respondent, individually, knew of at least one end-use put to the species, most of the respondents claimed that the species was not important to them.

The low importance attached to the species discouraged the community from conserving it. Other factors worth noting were lack of propagation materials and lack of skills. These factors strongly suggest that the conservation of *A. coriaria* and other indigenous wood species need to be addressed in extension work. The communities living amidst these plants need to be sensitized about the true value of these 'wild' plants. At the same time, they should be given skills of propagating these plants and also be availed planting material in the form of seedlings.

Acknowledgements

The Department of Botany provided logistic support for this project. Dr J.M. Kasenene is acknowledged for his advice during the writing of this manuscript.

References

Condit, R., Sukumar, R., Hubbell, S.P. & Foster, R.B. (1998) Predicting population trends from size distributions: a direct test in a tropical tree community. *Am. Nat.* **152**, 495–509.

Forest Department (1997) *The National Biomass Study. Land Cover Stratification Map, Bulamogi County*. Forest Department, Uganda.

Hall, P. & Bawa, K. (1993) Methods to assess the impact of extraction of Non-Timber Tropical Forest Products on plant populations. *Econ. Bot.* **47**, 234–247.

Katende, A.B., Birnie, A. & Tengnäs, B. (1995) *Useful Trees and Shrubs for Uganda: Identification, Propagation and Management for Agricultural and Pastoral Communities*. Technical Handbook No. 10. Regional Soil Conservation Unit, Nairobi, Kenya.

Langdale-Brown, I., Osmaston, H.A. & Wilson, J.G. (1964) *The Vegetation of Uganda and Its Bearing on Land-Use*. Uganda Government.

Lykke, A.M. (1998) Assessment of species composition change in savanna vegetation by means of woody plants' size class distributions and local information. *Biodeversity and Conservation* **7**, 1261–1275.

Obiri, J., Lawes, M. & Mukolwe (2002) The dynamics and sustainable use of high-value tree species of the coastal Pondoland forests of the Eastern Cape Province, South Africa. *Forest Ecology and Management* **166**, 131–148.

Tabuti, J.R.S., Dhillion, S.S. & Lye, K.A. (2003) Fuelwood use in Bulamogi County, Uganda: species harvested and consumption patterns. *Biomass Bioenergy* **25**, 581–596.

Tabuti, J.R.S., Lye, K.A. & Dhillion, S.S. (2003) Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. *J. Ethnopharmacol.* **88**, 19–44.

(Manuscript accepted 20 August 2007)