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SHORT COMMUNICATION

DRY SEASON WOODY FODDER PRODUCTIVITY IN SAVANNAS.

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ABSTRACT

The objective of this study was to assess the woody fodder production based on local herdsmen pruning practices. The method consisted firstly in using a questionnaire to evaluate species utilised followed by sampling and estimation of yield of trees utilised. Browsing on woody fodder in the protected forest of Wari-Maro in Benin concerns mainly three species: *Khaya senegalensis*, *Afzelia africana* and *Pterocarpus erinaceus* which are exploited by cattle keepers. Fodder tree production varied significantly according to the species but was less in the dry season. There was a relation between diameter and biomass produced by species. Pruning was the main method used to utilise trees.

Key Words: Tree fodder, browse, yield, cattle

INTRODUCTION

In tropical Africa, cattle rearing is based on extensive use of grazing lands (Sinsin 1993, Akpo et *al*. 2000). The importance of trees fodder is well recognised, especially in the arid and semi arid region, for their utility for human and animals (Le Houerou 1980). Trees and shrubs are hardy and can provide year-round fodder to be used to supplement grazing in lean periods. (Amir, 1991). In the dry season where herbaceous fodders are not yet available, woody fodders are the only source of proteins, vitamins and mineral salts (Le Houerou 1980). Dicko and Sikena (1991) reported that woody fodder supplied goats and camels with the bulk of their nutritive requirements and complemented the diet of cattle an sheep with proteins, vitamins and minerals in which bush straw is deficient during the dry season.

In Benin there is a vast natural grazing extents estimated to more than 7 million hectares, mainly located in the northern and central regions of the country (Tchiwanou 1994). The protected forest of Wari-Maro belongs to this natural grazing area and cattle depend greatly on this forest for nutriment, however, quantitative data on the function of this ecosystem is lacking (Agonyissa and Sinsin, 1998).

The objective of this survey is to assess the woody fodder production based on herdsmen pruning practices.

MATERIALS AND METHODS

Study area. The Wari-Maro forest reserve is located to the center of Benin. This protected forest has been invaded by the riparian populations in quest of agricultural and grazing land. It covers a surface of 107500 hectares and is located between 1°50' and 2°30' longitude E and between 8°30' and 9°35' of north latitude (Figure 1). The climate is tropical one with one rainy season (April to October) followed by one dry season. The monthly average temperature varies from 24,3°C in August to 29°C in March. The maximum value of the air humidity is observed from July to September during the rainy season. Two vegetation formations could be distinguished in this forest reserve: the natural formation: savannas, woodlands and gallery forest, and anthropogenic formation composed of fields and fallows.

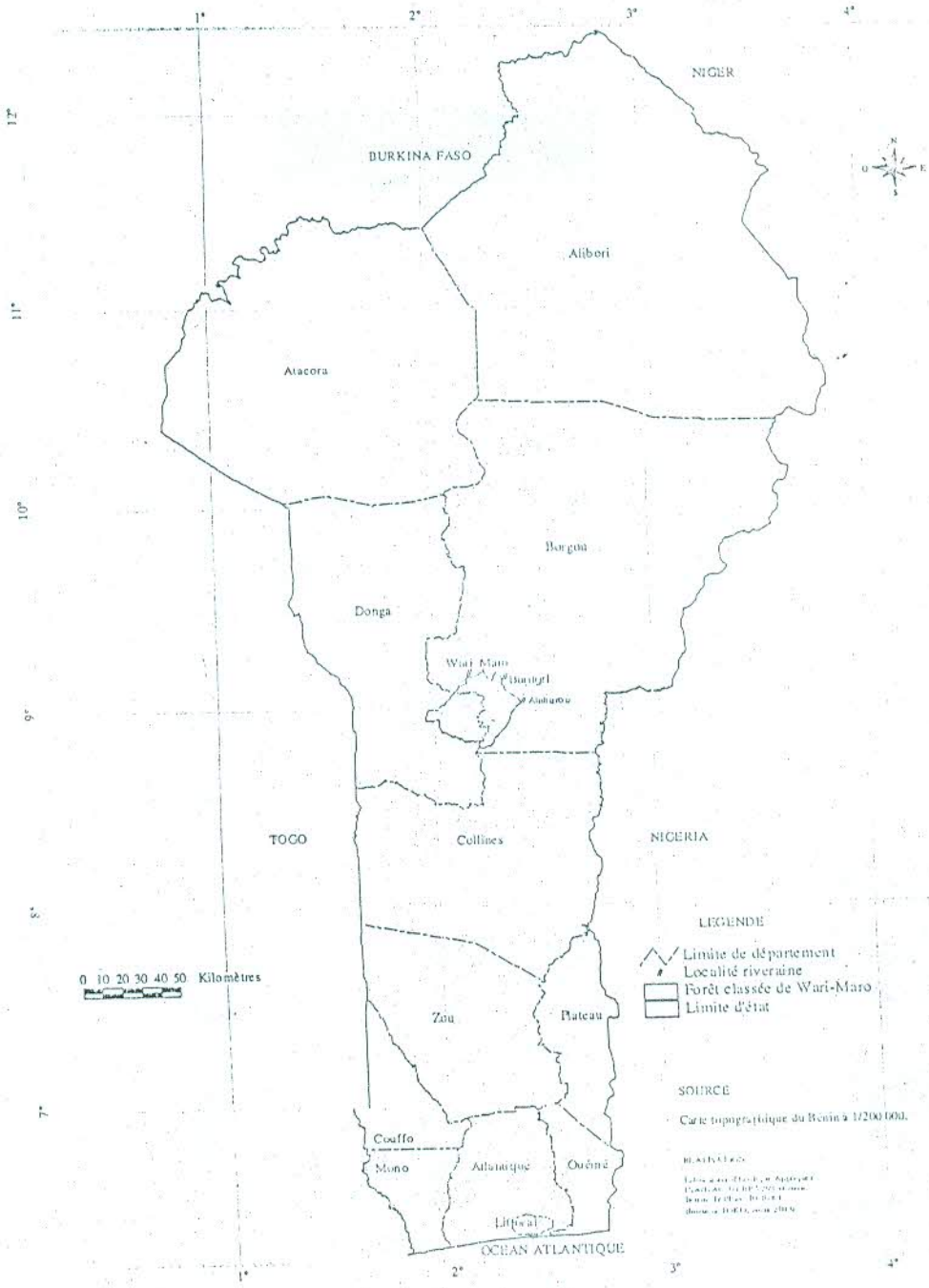

Figure 1: Location of the survey area

Data collection. A questionnaire was administered to cattle keepers to establish which species was utilised and how they were utilised. Grazing areas were also surveyed daily to identify the species and know the number of individual tree exploited per day. Grazing area survey was done from December to April. During grazing time woody forages harvested by cattle owners was

weighed. Trees fodder branch of 1-2 to 5 cm of length pruned by herdsmen were weighed during the dry season (Sinsin 1991). Data were collected each day from herds made up of 50-60 cattle for five months.

The biomass of each of the exploited fodder species was determined from the estimated dry matter after drying the samples in oven at 70°C for 72 hours. Biomass per hectare was estimated based on tree density determined in this forest reserve by Fonton (1996). Carrying capacity was calculated based on branches biomass per hectare.

Data analysis. Analysis of variance was done to compare the biomass of the principal fodder species at 5% significant level.

RESULTS AND DISCUSSION

Tree species inventory. An average of 30 individual trees were exploited per day by a herd of sixty cattle. Pruning consisted of cutting the small branches of the trees. The inventory of woody fodders show that although several species are exploited in the dry season only three species were regularly pruned throughout the dry period; namely, *Khaya senegalensis*, *Afzelia africana* and *Pterocarpus erinaceus* in order of preference. Pruning of the woody fodder begins with *K. senegalensis* that is entirely pruned along January and in the beginning of February, followed by *A. africana* which is exploited from February up to the early month of March and finally *P. erinaceus* which is exploited from the end of February to April. It was observed that in March, *P. erinaceus* and *A. africana* were more intensively pruned. Other tree species such as *Prosopis africana*, *Cussonia barteri*, *Bombax costatum* and *Daniellia oliveri* were exploited in a sporadic way because they are less appreciated by cattle.

Biomass and carrying capacity. The biomass of the main fodder tree species exploited are summarised in the Table 1. The mean amount of woody fodder produced was 48.27 kg DM ha^{-1}. The biomass ranged from 101.9 to 11.25 kg DM ha^{-1}. The highest biomass was observed with *Khaya senegalensis* whilst lowest biomass was from *Afzelia africana* ($p<0.05$)., (Table 1).

The amount of biomass decreased as the dry season progressed (Figure 2). This varied from 844.69 kg DM ha^{-1} in the beginning of the dry season to 60.898 kg DM at the end of the dry season. There was a linear and significant regression ($p< 0.05$) between biomass and dry month ($y = 252.94 + 1038.9$; $R^2 = 0.9648$).

For each species pruned, there was a significant relation ($p< 0.05$) between diameter and aerial biomass as shown by equations established for each of the fodder tree species (Table 2).

Carrying capacity was estimated to be 0.063 $TLU.ha^{-1}$. Carrying capacitiy determined by Agonyissa and Sinsin (1998) in the protected forest of Wari-Maro varied from 1.16 $TLU.ha^{-1}$ to 1.66 $TLU.ha^{-1}$ per annum. The results of this study are lower. This difference of carrying capacity derived from biomass could be explained by the low density of fodder tree. The yield may be unable to support the high pressure browsing in the dry season.

Socio-economic impact of tree fodder exploitation. The woody fodder utilisation by the various users in the study area has social and economic impacts. The herdsmen claim to be giving value to K. *senegalensis* and argue that this tree fodder is the one resource necessary for the survival of cattle during the dry season. Milk is the main source of income for the cattle owners. Effectively, the pruning of these fodder trees allows the livestock to produce some milk for the herdsmen even though it is in a small quantity, compared to the rainy season milk production. Thus herdsmen severely prune these woody fodder species without any regard for the negative impact on the survival of such species.

The trees commonly used as fodder are also logged for commercial purposes. The cattle owners blame logging for the disappearance of these tree fodders but on the other hand the loggers claim to be owners of these trees as they

Table 1 : Biomass and carrying capacity of three main species

Species	Tree number	Biomass (kg DM)	Tree density/ha	Biomass(DM/ha)
Khaya senegalensis	35	25,49 ±19,68	4	101,96	0,14
Afzelia africana	46	11,25	1	11,25	0,01 ±8,37
Pterocarpus erinaceus	41	7,90 ±5,27	4	31,6	0,04
Mean				48,27	0,063

Table 2 : Relationships for each species

Species	Equation	R^2
Khaya senegalensis	1/biomasse = 0.0853 – 0.00111 dbh	78.4
Afzelia africana	$1/(\text{biomasse})^2 = 0.0214 - 0.000259$ dbh	53.7
Pterocarpus erinaceus	ln (biomasse) = 2.97 – 24.4 (1/dbh	90.8

The best relationship is observed with *K. senegalensis*.

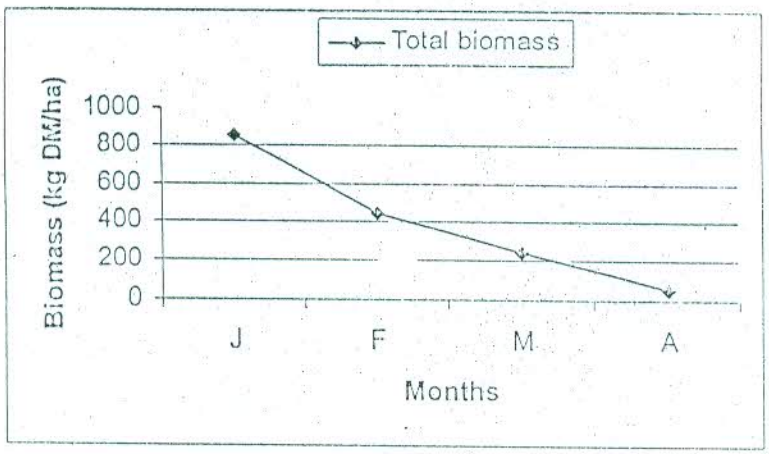

Figure 2: Biomass evolution during the dry season (January to April

pay logging taxes for that. Such a conflict between different users of these multipurpose trees is common. It is a problem related to exploitation of any natural resource under common ownership by local communities.

Other causes of fodder tree disappearance are charcoal production, lard cleaning for crop farming, and debarking of certain medicinal tree like *Khaya senegalensis* so that these fodder species undergo a strong pressure due to their importance as vital resources. This situation reflects the dilemma of the conservation of the natural resources and the satisfaction of the vital needs of population.

Ecological impact of the exploitation of the woody fodder. The exploitation of tree fodder species does not completely destroy trees in a short time but has harmful consequences in the long term. Pruning practices modify the production of seeds gradually and modify productivity in terms of quantity and quality (Hiernaux (1980).

Pruning can cause erosion by rainfall since foliage is reduced and thus rain impact on ground

is higher. This has been observed around *P. erinaceus* stands which were pruned severely during the dry season before the first rains.

Houinato (2001) noted that some species such as *K. senegalensis*, *A. africana* and *P. erinaceus* which have their foliage pruned frequently are unable to bear fruits and thus this could limit their natural regeneration cycles. Sinsin (1997) mentioned that birds of prey and vultures also lost possibilities to build nests if big trees are pruned by herdsmen.

CONCLUSION

The most exploited woody fodder species in dry season are *K. senegalensis*, *A. africana* and *P. erinaceus*. The biomass varies with the species and decreases as the dry season ends. Relation between diameter and aerial biomass show an evolution of the biomass according to the diameter classes. Pressure on these species is the result of pruning done by herdsmen to feed their animals as well as the logging of the same tree species.

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