

Ethnobotanical survey of the cassava (*Manihot esculenta* Crantz) culture in the rural communities of Ebo, Cuanza Sul, Angola

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Abstract

*Ethnobotanical studies record plant resources of a given community as well as ways of use and manage these resources by the same communities. Despite their importance, there are few published ethnobotanical studies about Angolan rural communities and their plant resources, thus there is the need to undertake such studies. The aim of the present study was to undertake an ethnobotanical survey of the cassava cultivate in the rural communities of Ebo, Cuanza Sul province. A sample size of 50 smallholder farmers was selected to answered to a questionnaire about the cassava species they cultivate, their farming practices and the end-use of the edible plant parts in addition to socioeconomic aspects. Farmers were visited in their houses and semi-structured interviews were used to collect information. The results indicated that cassava (*Manihot esculenta* Crantz) is one of the most cultivated plant species, whereby up to 7 different local varieties are usually cultivated in less than 5 hectares per household, among which the bitter cassava was the most cited. These local varieties have been kept for decades because they are well adapted to the soils and produce satisfactory yields. Besides organic fertilizers, no mineral fertilizers nor pesticides are used for cultivation of cassava. Leaves and tuber (fruit) are the most consumed plant parts, and the highest income is obtained by transforming the fruit into flour. There is the potential for a certified organic production system with premium prices and development of a local supply chain with a wider consumer market because consumption of cassava in Angola is irrespective of gender and age.*

Keywords: *ethnobotany, Manihot esculenta, interview.*

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I. Introduction

Ethnobotanical studies assist in investigating questions about medicinal and food plant species to design conservation strategies through ethnobotanical surveys [13]; [16]; [15]; [3]. Hence, ethnobotanical studies assist in understanding the relationship between human beings and plants, via detailed observation of the use of the plant resources by the human beings and the importance of these plant resources for the local communities. On the other hand, ethnobotanical studies assist in validating the vast traditional knowledge as well as valuing local cultures because sometimes this knowledge and local culture may be neglected by the research communities [1].

The ethnobotanical knowledge also assists in identifying various ways of managing plant resources by local communities in addition to cataloguing the use of the plant resources by these communities [15]. Therefore, an ethnobotanical survey should contribute to the conversion of the information gathered into tangible benefits for the same community and also contribute to the scientific knowledge of the plant species [13].

Cassava (*Manihot esculenta* Crantz) is a tuberous dicot plant species member of the *Euphorbiaaceae* family, which is very popular and widely cultivated in countries with tropical and subtropical environments. Many edible cassava species have been cultivated in the world which can be characterized by their sweet or bitter taste. Technically, the sweet cassava is that which the glycoside content of the fruit is lower than 100 mg/kg whereas the bitter cassava has higher than 100 mg/kg [8]. From a nutritional perspective, cassava is rich in carbohydrates and can supply recommended calories especially for those people with limited access to nutritious and diversified foods. From a utilitarian perspective, cassava is a valuable resource due to its multiple uses particularly its leaves and fruit both for animal and human feed as well as industrial use.

Angola, with 10 million tons obtained in 2016, is one of the top-10 producers of cassava in the world just behind Nigeria, Thailand, Indonesia and Brazil [7]. In Angola, cassava is cultivated on more than 60% of the arable lands; in the province of Cuanza Sul, the community of Ebo is one of the largest producers of cassava, competing with Sumbe, Kibala, Libolo, Amboim and Cela. However, the production system has a low technical level, using outdated farming techniques with intense manual labor. The farmers' income results mainly from

refining the fruit into flour. Considering the importance of cassava to the farmers in the municipality of Ebo, the aim of the present study was to carry out an ethnobotanical survey of the cassava (*Manihot esculenta* Crantz) culture in the municipality of Ebo, Cuanza Sul, Angola to characterize their knowledge and management of this plant species.

II. Materials And Methods

A preliminary visit was carried out in April 2019 for reconnaissance and scoping the area, whereby the traditional communities of Uteca-Ebo, Londa-Choua, Balaya and Ebo-Centre were chosen. The ethnobotanical survey was carried out over two months i.e., November and December. Ebo is a municipality located in the central region of the Cuanza Sul province (**Fig.1**).



Fig. 1: Geographical location of the municipality of Ebo where the interviews took place. Image source: www.fas.co.ao

Two techniques were used to collect information. A raffle was used to determine the participants sample size, whereby 50 farmers residing in the rural areas who produce cassava besides other crops were sampled; a questionnaire with 32 questions was used to interview the participants one per household. The questionnaire was divided into three groups: 1) local varieties (characterization according to the use, crop cycle, resistance in the field, and main trait), 2) socioeconomic (gender, age, origin, marital status, number of children, education, and time of residence), and 3) farming practices and economics (fallow, cassava cultivated area, years of cultivation, use of pesticides, fertilization, commercialization of the product, workforce, seed supply, and varieties used). Various visits were carried out to interview each farmer, which agreed to participate in this study. The interviews were semi-structured. The information collected was tabulated according to group of questions and then a frequency percentile was calculated based on the answers of the farmers, using SAS – Statistical Analysis System program [14].

III. Results And Discussion

Table 1 shows the results about food crops cultivated in the region as well as about their use, crop cycle, resistance in the field and main traits. All participants said they cultivate various plant species including cassava (*Manihot esculenta* Crantz), maize (*Zea mays* L.), beans (*Phaseolus vulgaris*), potato (*Solanum tuberosum* L.), sweet potato (*Ipomoea batatas* L. Poir), onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) which are the most used for consumption. With regard to cassava (*Manihot esculenta* Crantz), all farmers said they use cassava leaves.

Table 1. Characterization of the plant species cultivated in the rural communities of Ebo,

Cuanza Sul, Angola.

Plant species	Edible plant part	Crop cycle (months)	Field resistance (months)	Main traits	Local variety
Pumpkin (<i>Curcubitasp</i>)	Leaves, fruit	6	18	Satisfactory yield	yes
Avocado (<i>Perseaamericana Mill.</i>)	fruit	12 or more	36 or more	Satisfactory yield, adaptability	yes
Peanut (<i>ArachishypogaeaL.</i>)	fruit	3 - 4	2	Satisfactory yield, taste	yes
Garlic (<i>Allium sativumL.</i>)	fruit	6	2	Satisfactory yield, taste	yes
Sweet potato (<i>Ipomoea batatas L. Poir</i>)	leaves, fruit	3 - 4	3	Satisfactory yield, adaptability	yes
Potato (<i>Solanum tuberosum L.</i>)	fruit	3	2	Satisfactory yield, adaptability	yes
Onion (<i>Allium capa L.</i>)	fruit	4	3	Satisfactory yield	yes
Beans (<i>Phaseolus vulgaris</i>)	leaves, fruit	3 - 4	2	Satisfactory yield, adaptability	yes
Maize (<i>Zea mays L.</i>)	fruit	6	3	Satisfactory yield, adaptability	yes
Cassava (<i>Manihot esculenta Crantz</i>)	leaves, fruit	6 - 12	24	Satisfactory yield, taste	yes

The majority of farmers said that cassava has a relatively long crop cycle and field resistance compared to other field crops (**Table 1**). They said that the crop cycle and field resistance are about 6 – 12 and 24 months, respectively, which are shorter than those of avocado only. Such variability is key to screening and breeding programs because these accessions could be used as parent lines. A similar study in Brazil, Tiago [17] found that the cassava species cultivated in the rural communities of Vila Rural I and II had approximately the same crop cycle; however, field resistance (12 – 24 months) was different from that (12 – 36 months) found in another community of Rio dos Couros.

All farmers said that the cassava species they cultivate produce satisfactory yields for their subsistence. They stated that they cultivate local varieties of cassava. Nevertheless, they also cultivate other plant species because of satisfactory yields and soil adaptability as well as taste.

With respect to farming practices (**Table 2**), the present study observed that 66% of farmers practice fallow when planting cassava or other plant species, while 70% of the farmers said that the cultivated area for cassava is usually less than 5 hectares. All farmers acknowledged that crop yields of cassava can be influenced by occurrence of diseases; however, though none of the farmers use any disease control measure, only 60% of them said they have had issues with diseases. In general, most farmers (63,7%) use only two local varieties, nevertheless, some of them (36,3%) have used up to seven local varieties in the same field. Almost all farmers (98%) have cultivated cassava for over 10 years, using their own seeds and always applying organic fertilizers. This shows that the cassava produced under these conditions might have a relatively high quality than that produced with application of mineral fertilizer inputs and use of agrochemicals for pest and disease control. It shows also the potential for a certified organic farming system. Nonetheless, the farmers also indicated that they still use outdated farming techniques that require intense manual labor. To address this issue, 67,5% of the farmers said that up to three people from their household work with them in the field while 64,5% said that in addition to the people from their household, they also hire extra labors to work in the field especially during planting and harvesting. Moreover, one of the main constraints for 34% of the farmers is to develop a cassava supply chain to obtain or improve their income whereas for the other 66% the main channel is the informal local market.

Table 2. Questionnaire to the farmers about farming practices associated with cassava (*Manihot esculenta Crantz*) cultivation in Ebo, Cuanza Sul, Angola.

Question	Answer	Frequency (%)
Fallow practice?	Yes	66
	No	34
Cultivated área?	Less than 5 hectares	70
	More than 5 hectares	30
How long been cultivated?	Under 10 years	2
	Over 10 years	98
Pest and disease control?	Yes	0
	No	100
Fertilizer application?	Organic	100
	Mineral	0

Supply chain?	Yes	34
	No	66
Land ownership?	Own	98
	Rented	2
Household labor?	1 – 3 people	67,5
	4 – 6 people	32,5
Hiring labor?	1 – 3 people	35,5
	4 – 6 people	64,5
Origin of seeds?	Own (local)	100
	Other	0
Occurrence of pest and disease?	Yes	40
	No	60
How many varieties?	1 – 2	63,8
	More than 5	36,3

The results show that 64% of the interviewed were male (**Table 3**) which could be explained by the traditional social division of labor whereby men work in the fields and women stay at home for domestic activities. Several studies [2] have ascertained that tasks done by women are usually considered as “help”. Weisheimer (2007) cited by Carlos [5] stated that female labor is indispensable in the agricultural activities such planting, harvesting and processing as well as domestic activities. In general, whether agricultural or domestic activities done by women are still undervalued and often underpaid in some countries. Contrary to the present study, several ethnobotanical studies carried out in other rural areas such as Conda (Angola), Serra da Mantiqueira and Santa Catarina (Brasil) showed high number of women participants.

Table 3. Socioeconomic characterization of the farmers in the rural communities of Ebo, Cuanza Sul, Angola.

Aspect	Answer	Frequency (%)
Gender	Male	64
	Female	36
Age (years old)	20 - 40	36
	41 - 60	52
	61 - 90	12
Origin	Uteca-Ebo	12
	Balaya	22
	Londa-Choua	28
	Ebo-Cede	38
Marital status	Married	37, 8
	Single	62,3
Children	1 - 4	39,7
	5 - 8	60,3
Education	Uneducated	8
	Primary education	41,1
	Enrolled in primary education	20,4
	Secondary education (high school)	10,7
	Enrolled in secondary education (high school)	18
	Enrolled in tertiary education (university)	2
Residence (years)	0 – 5	20
	10 – 20	15
	21 – 40	10
	41 – 50	15
	Over 50	40

For example, Meyer [11], Miranda [12], and Capuambua [3], found 85, 67 and 56%, respectively, of the interviewed were women, which Meyer [11], attributed to the fact that the interviews took place during the day when most men were out working in the fields.

Only 8% of the interviewed have not had any formal education whereas 38,4% are enrolled at least in primary and secondary schools (**Table 3**). Although they regard agriculture as the primary occupation, these results suggest that the number of uneducated people in Ebo, Cuanza Sul is low considering that lack of formal education is still an issue in many rural communities particularly among smallholder farmers compared to 31 and 20% of uneducated people reported by Carniello [4] and Carlos [5]. The results of the present study are consistent with that of 9,5% of uneducated people found by Meyer [11].

IV. Conclusions

In conclusion, cassava (*Manihot esculenta* Crantz) is one of the most cultivated food crops in the rural communities of Ebo, Cuanza Sul, which farmers cultivate up to seven local varieties for multiple purposes. Their farming practices are also ways of ensuring on-farm conservation of cassava genetic diversity. Despite the outdated farming techniques and intense manual labor, crop yields cultivated in Ebo, Cuanza Sul are satisfactory with a relatively high quality and the farming system has the potential for a certified organic production system. Leaves and especially fruit (raw and as flour) are the most consumed plant parts. Cassava is a staple food crop whose consumption in these communities is irrespective of gender and age, thus highlighting a wide consumer market and the potential for developing a local cassava supply chain.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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