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RESEARCH ARTICLE

SOCIO-ECONOMIC CONTRIBUTION OF TWO NON-TIMBER FOREST PRODUCTS, *SABA SENEGALENSIS* AND *LANDOLPHIA HEUDELOTII*: CASE OF THE MUNICIPALITIES OF OUSSOUYE AND OUKOUT, ZIGUINCHOR (SENEGAL)

Diallo Fatoumata and *Ba Awa

High Institute of Agricultural and Rural Training, Alioune Diop University, BP. 54, 21400 Bambey, Senegal

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ABSTRACT

Non-timber forest products (NTFPs) have great importance for rural households whose income they improve during the lean season and thus contribute to their food security. Despite forest degradation, the populations of some localities pay particular attention to the economic value generated by NTFPs. Thus, in lower Casamance, the collection of NTFPs is carried out by the villagers, in particular those living near forests. Among those which are widely collected there, we have *Saba senegalensis* and *Landolphia heudelotii* or, respectively, “*madd*” and “*toll*”, in Wolof, which bring significant income to households. To verify this situation, we conducted a study in the communes of Oussouye and Oukout. Its objective is to contribute to the assessment of income from the exploitation of these two NTFPs for poverty reduction. Following a documentary research, quantitative and qualitative surveys were carried out with 67 people. The results showed that more than 70% of the respondents who were active in collecting these two NTFPs were women. In addition to other income-generating activities, these two NTFPs contribute significantly to household income. However, *Saba senegalensis* yields relatively more than *Landolphia heudelotii*, whose production and revenue generated income., on the other hand, are, in absolute terms, higher.

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INTRODUCTION

West Africa is home to a large plant cover made up of tropical rainforests, dry forests and savannahs (Food and Agriculture Organization, FAO, 2000) from which the populations obtain a diversity of products, wood or non-wood, to meet their needs in terms of food, health, energy and construction (Ecological Monitoring Center, EMC, 2006). Regarding non-timber forest products (NTFPs), Senegal has several that play an essential role in the populations' food security strategies (Bonneville *et al.*, 2003, Nature Protection Department, NPD, 2010). In addition to human food, these NTFPs also contribute to animal feed and income creation and mainly concern the southern regions of the country (Tambacounda, Kédougou, Kolda, Sedhiou and Ziguinchor) where they are still relatively abundant (Kadri and Fall, 2005). These administrative regions constitute the natural region of Casamance drained by the river of the same name and renowned for its ecological wealth. Called Basse Casamance, the downstream side of this natural region is home to the Ziguinchor region comprising the

departments of Ziguinchor, Bignona and Oussouye (Bassene *et al.*, 2014). This region benefits from the most plant diversity in the country, with 1,150 plant species out of the 2,500 listed (Environment and Nature Protection Ministry, ENPM, 2006). The dense two-storey semi-dry forest encountered in the region is characteristic of the Guinean domain. This forest ecosystem sometimes presents undergrowth made up of sarmentous shrubs, grasses and lianas including the species *Saba senegalensis* (*ndipp*, in Diola or *madd*, in Wolof) and *Landolphia heudelotii* (*pimb*, in Diola or *toll*, in Wolof) which play an important role in the household economy (Charahabil *et al.*, 2018). The fruits collected from these wild species constitute an important part of the diet of the Diola, especially in the department of Oussouye, and strongly contribute to food security and the creation of income for different social strata (Djihounouck *et al.*, 2018). These NTFPs allow populations active in their sector not only to find an alternative to agricultural production which is becoming scarce but also to have an additional source of survival food and income (Bonkougou *et al.*, 1997). However, in recent decades, there has been a gradual degradation of forest resources (Cisse and Gning, 2013). Thus, the overall diagnosis of the forestry sub-sector carried out during the planning phase of the Senegal

*Corresponding Author: Ba Awa,

High Institute of Agricultural and Rural Training, Alioune Diop University, BP. 54, 21400 Bambey, Senegal.

Forest Action Plan (Diouf *et al.*, 2001) confirmed a trend towards degradation and decline of forest resources (ENPM, 2006). This is due to climate change and bad anthropogenic practices. This phenomenon is also observed in exploitation of *madd* and *toll*. This study aims to contribute to the assessment of income derived from exploitation of NTFPs for poverty reduction in rural areas. To do this, several specific objectives are defined: i) estimating the quantities of *Saba senegalensis* (*madd*) and *Landolphia heudelotii* (*toll*) collected by the inhabitants of the Oukout and Oussouye towns; ii) identify the destination (self-consumption, processing or saling) of collected products and concerned volumes; and (iii) determine the part of households' income provided by *madd* and *toll* saling and expenses it supports.

MATERIALS AND METHODS

Site presentation: Located, respectively, 41 km and 40 km South West of Ziguinchor, the municipalities of Oukout and Oussouye are positioned between 12 ° 20 'and 12 ° 30' North latitude and 16 ° 30 'and 16 ° 40 'West longitude. On the one hand, the municipality of Oukout is located in the district of Loudia Oulof, the department of Oussouye and the region of Ziguinchor. It covers 180 km² or 35% of the total area of the district (LDP, 2008). It is home to a population of 14,347 inhabitants spread over 19 villages, according to the general population census of 2015 (LPD, 2015). It is bounded to the East by the communes of Nyassia and Enampore, to the North by the commune of Mlomp, to the South by the commune of Santhiaba Mandjack and to the West by the commune of Diembéring. On the other hand, the municipality of Oussouye is the smallest municipality in Senegal, with 1.55 km². Its population is 7,461 inhabitants (CDP, 2016). It is made up of six districts: Kalobone, Ethia, Essinkine, Souleuk, Sara Demba and Buwentene (Figure 1).

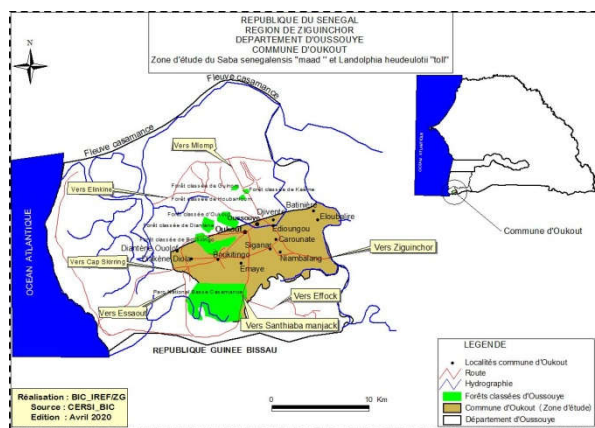


Figure 1. Administrative location of the Oussouye and Oukout municipalities

Our choice fell on the municipality of Oukout because the latter contains large forests, in particular, classified (the forest of Boukitingho, the forest of Oukout and the forest of Diantène) and almost all the gatherers of the municipality of Oussouye exploit in these classified forests. Thus, we have chosen to work on the villages where there are farmers and on the people who collect *madd* and / or *toll*. In the commune of Oussouye, all of its six (06) districts use these products and, in the commune of Oukout, only nine (09) villages, out of the 19 that it has, operate them.

Material: To carry out this study, questionnaire used to interview resource persons likely to provide general information on the socio-economic and cultural role of the two products (*madd* and *toll*), a laptop computer for data entry, the sphinx Plus² software version 6.3.9600 for data processing and analysis, an ITEL S32 camera, a Jakarta motorcycle for trips between villages and a notepad for taking notes.

Methods

To conduct this study, the methods used are: a documentary review to collect secondary data and a questionnaire to collect quantitative and qualitative data. For sampling, we used Fisher's formula.

The sample size was determined on the basis of the total households' number in the two municipalities, estimated at 1,597, according to the tax roll of their village heads.

$$nf = n / (1 + n / N) \text{ with } n = 1 / d^2$$

nf = sample size;
N = total number of households;
d = degree of error = 12%;
Application: $n = 1 / 0.122 = 70$
 $nf = 70 / (1 + 70/1597) = 67$

Since the sample size is 67 households, the number of households to be surveyed per village is determined in proportion to the number of households in the village, with the following formula.

$$X = \text{sample size per village}$$

$$Y = \text{Number of households per village}$$

$$X = (nf * y) / N.$$

Table 1. Size in the sample of each district or village of the two municipalities

Municipality	District or village	Number of households	Sample size
Oussouye	Calobone district	209	9
"	Oussouye "	652	27
Oukout	Boukitingho Village	123	5
"	Diackene diola "	92	4
"	Diackene oulof "	84	4
"	Diantene "	62	3
"	Emaye "	104	4
"	Kahinda "	60	3
"	Oukout Eteilo "	81	3
"	Oukout Madiop "	58	2
"	Singhalene "	72	3
TOTAL		1597	67

For data processing, we used Sphinx plus² software, according to the variables entered, using univariate or bivariate analysis. Results were transferred on the Excel spreadsheet of the Microsoft Office 2010 suite to be presented as tables and figures and, the drafting of the report was done on the Word software of the Microsoft Office 2010 suite.

RESULTS AND DISCUSSION

Results

Sociodemographic characteristics of the respondents
Breakdown of respondents by sex

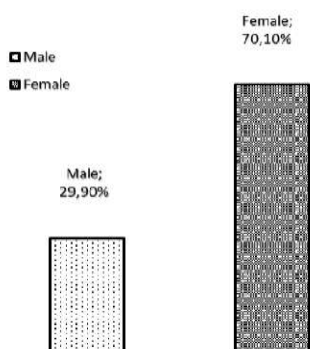


Figure 2. Breakdown of respondents by sex

Figure 2 shows that 47 (or 70.1%) of the respondents are women and 20 (or 29.9%) are men.

Distribution of respondents according to their age

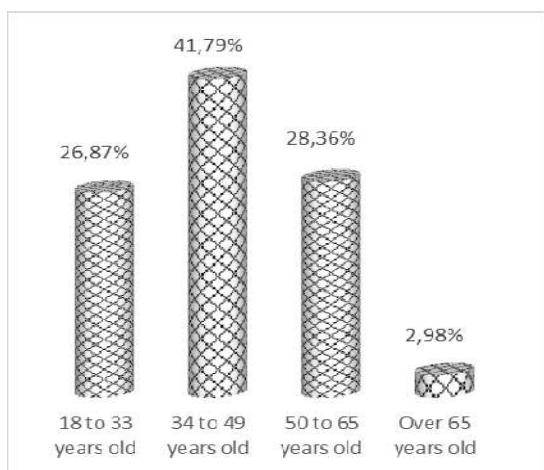


Figure 3. Breakdown of respondents by age

Figure 3 shows that the age of operators is between 18 and over 65 years; 18 (i.e. 26.86%) are 18 to 33 years old; 28 (i.e. 41.79%) are 34 to 49, 19 (i.e. 28.35%) are 50 to 65 and 2 (or 3%) are over 65 years old.

Distribution of respondents according to ethnicity

Table 2. Distribution of respondents according to ethnicity

Ethnic group	Number	Pourcentage
Diola	59	88,1%
Peulh	7	10,4%
Serere	1	1,5%
Total	67	100%

Table 2 shows that the Diola are more represented, with 59 individuals, or 88.1%, followed by the Poular, with 7 individuals, or 10.4% and, finally, the Serer who represent a minority, with 1 individual, i.e. 1.5%.

Socio-economic and professional characteristics of respondents

Breakdown of operators according to the madd and toll collecting sites

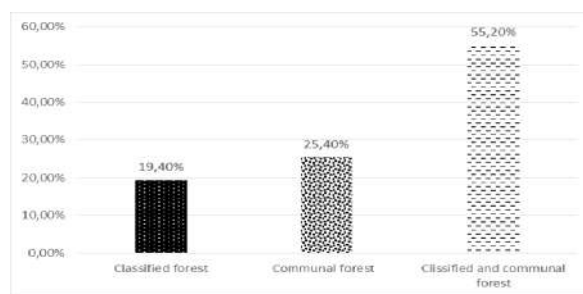


Figure 4. Breakdown of operators according to the madd and toll collecting sites

Figure 4 shows that in both communes, 37 (i.e. 55.20%) log in the classified forest and in the communal forest, while 17 (or 25.40%) log in the communal forest and 13 (19.40%) operate in the classified forest.

Quantity of madd and toll collected during the 2019 picking campaign (in kg) in the two municipalities

Table 3. Quantity of madd and toll collected during the 2019 picking campaign (in kg) in the two municipalities

	Total quantity picked in madd (Kg)	Total quantity picked in toll (Kg)
Oussouye commune	25 120	129 280
Oukout commune	69 400	68 960
Total picked quantity (Kg)	94 520	198 240

Table 3 indicates that, in the municipality of Oussouye, the total quantity of collected madd is 25,120 kg and that of toll is 129,280 kg; and that in the commune of Oukout, that collected in madd is 69,400 kg and that of toll is 68,960 kg.

Price of the two harvest products, madd and toll

Table 4. Price of the madd and the toll

Product	Price by the conditioning (in CFA franc)		
	1 heap	1 bucket	1 basin
<i>Saba senegalensis</i> (madd)	200 to 500	1,000 to 2,000	2,500 to 6,000
<i>Landolphia heudelotii</i> (toll)	50 to 300	750 to 2,000	1,500 to 4,000

Table 4 shows the variation in the prices at which the two products are sold during the picking period. The products are either sold by heaps, by bucket or by basin.

Generated income in 2019 by madd and toll at households' level

Table 5. Income generated in 2019 by madd and toll at households' level

Product	Quantity / year (Kg)	Number of basins of 25 Kg, for the madd, and 20 Kg, for the toll	Amount / year (CFAF) (for 3000 F /Kg for madd and 2000 F / Kg for toll)
<i>Saba senegalensis</i> (madd)	94,520	3,781	11,343,000
<i>Landolphia heudelotii</i> (toll)	198,240	9,912	19,824,000
Total	292,760	13,693	31,167,000

Table 5 shows that the generated income by the *madd* for an amount of 94,520 kg, due to 3,781 basins, is 11,343,000 FCFA. While for the *toll* with a quantity of 198,240 Kg, the generated income due to 9,912 basins are 19,824,000 FCFA. Thus, the total income from the sale of both NTFPs is 31,167,000 FCFA.

Estimated part of the madd and toll's income, in 2019, in total income of the producers

Tableau 6. Estimated part of the *madd* and *toll*'s income, in 2019, in total income of the producers

Percentage of producers	Proportion of the total income earned by <i>madd</i> and <i>toll</i> 's income
20,90%	Less than 25%
40,30%	Between 25 and 50%
31,34%	Between 50 and 75%
7,46%	More than 75%

Table 6 shows that among the people surveyed, 14 or 20.90%, have a *madd* and *toll*'s income less than 25% of their total income; 27 or 40.30%; have between 25 and 50%; 21 or 31.34% have between 50 and 75% and 5 or 7.46% have more than 75%.

Breakdown of respondents according to expenses incurred in 2019 and covered by all sources of household income, including madd and toll



Figure 5. Breakdown of farmers according to expenses incurred in 2019 and covered by all sources of household income, including *madd* and *toll*

Figure 5 shows that, among the respondents, 100% spend for food, 41 (i.e. 61.2%) spend for the feasts, 60 (i.e. 89.6%) spend for education, 56 (i.e. 83.6%) for medical care and, 52 (or 77.6%), for paying labor and buying work tools).

DISCUSSION

About composition of operators according to sociodemographic variables: The analysis made of the socio-demographic characteristics showed that, on the one hand, both men and women exploit the *madd* and the *toll*. This is confirmed by Djihounouck *et al.* (2018) who says that "the gatherers who are men and women of all ages, harvest the products of wild plants in well-defined areas and resell them to traders". The results showed that there are more women in the sample because they are generally the main actors in the exploitation of NTFPs. On the other hand, the age groups most represented in the sample of operators is the 34 to 49 age group, followed by the 50 to 65 age group. This is linked to the fact that, not only do the heads of household take more care of the income brought to the household level but also they see in the exploitation of wild products a revival of economic interest.

This can be supported by the results of Mbaye (2016) which show that, in recent years, NTFP have experienced a resurgence of interest. According to ethnicity belonging, the Diola ethnic group is the one that is most represented in the exploitation of the two NTFPs studied. This is explained by the fact that this ethnic group is mainly represented in the study area. This is confirmed by the CDP of Oussouye (2016) and the (LDP) of Oukout (2008) which, respectively, indicate that the Diolas are more than 95% and 98% of the total population of these localities.

About socioeconomic variables: About the *madd* and *toll* collecting sites, the majority of operators said that they exploit NTFPs in classified and communal forests. Some work in so-called communal forests, which are more or less far from their homes. Indeed, the forest has always provided important benefits to the rural population. This is confirmed by the 4P Project (2014) which underlines that "the forest has always occupied an important place among populations, in particular, those in rural areas. However, we find a good number of NTFPs in the lower Casamance National Park (PNBC), but they remain unusable and end up being eaten by animals or rotting. This is due to the fact that the park has been inaccessible for years due to the Casamance crisis". The quantities of *madd* and *toll* collected during the 2019 picking campaign in the two municipalities showed that the respondents from the commune of Oussouye exploited a more significant quantity in *toll* compared to the commune of Oukout. But, for the *madd*, it's the opposite. Thus, the population of the two communes finds an interest in forest resources, in particular NTFPs. This result is in agreement with that of Project 4P (2014) which reports that indeed, the lifestyles of rural populations traditionally give a large place to the use of various categories of forest resources. According to the operators, the price of the sale is not fixed. Most of the produce is sold raw by basket or by pile; some take the fresh or broken *toll* to turn into sour juice for cooking or for sale; the liter can be sold up to 500 F. Similar results were obtained by Goudiaby (2013) who explains that the fruits of *Saba senegalensis* and *Landolphia heudelotii* are sold in heaps or in baskets of variable volume for unstable prices set according to the law of supply and demand. Surplus picked fruits are transformed into acid juice to season the sauces of local dishes. In terms of income creation, the one generated in 2019 by the *toll* is greater than that of the *madd*; due to the accessibility, abundance and massive exploitation of the *toll*. About evolution of the quantity of *madd* and *toll* circulated from 2010 to 2019, almost all of the surveyed producers have confirmed the decrease of *Madd* and *toll* in the past two years. This is explained by the fact that when the rain is heavy, so are the *madd* and the *toll*. Finally, for the large part of the expenses financed by the income from the *madd* and the *toll*, in 2019, and the various expenses covered (paying the labor to cultivate the fields and rice paddies, buy food, take care of the sick family members, pay children registration and supplies), Loubelo (2012) confirmed this because, according to him, the commercialization of NTFPs brings in income which is used to purchase food products and medicines.

CONCLUSION

It emerges from this study that the contribution of NTFPs is of paramount importance to household income. We must therefore admit that they must be more valued, especially than

in Senegal, the collection of *Saba senegalensis* and *Landolphia heudelotii* remains an activity very widely practiced in many localities where these products are found. However, it was found that, in our study area, the villages that own or are close to forests (community and / or classified) all collect these products. In addition, these two products, highly prized for home consumption and consumption in urban areas, deserve to be quantified to see their share in the country's GDP. At the end of our study, we see that the picking can bring at the level of the households surveyed an annual revenue of 11,343,000 FCFA for *madd* fruits (*Saba senegalensis*), with a quantity of 94,520 kg harvested, while for the *toll* (*Landolphia heudelotii*) the annual revenue amounts to 19,824,000 FCFA, with a quantity of 198,240 kg harvested. These contributions result from the maximum concentration of women in the gathering activities. The income from this activity is very high for the vast majority of households and shows the growing interest in these products. From this point of view, some organizations are increasingly interested in NTFPs, notably the FAO, for achieving food security. This confirms that they can be considered as a food source and even an economical one.

The part of the contribution of these wild products to the support of daily expenses which cannot be ensured by the receipts from agriculture is important. Thus, the collection of NTFPs contributes very strongly to the economy of rural households and very largely to the national or even global economy. This indicates that the population and the ecosystem must maintain a strong link for the sustainability of the forest.

Therefore, it will be necessary to promote the collection and marketing of NTFPs in the same way as for woody forest products (LFP) which are more valued. It will therefore be necessary to combine rational and sustainable management of forest resources and improvement of living standards in rural areas.

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