Available online at www.elixirpublishers.com (Elixir International Journal)

Food Science

Elixir Food Science 132 (2019) 53322-53326

ISSN: 2229-712X

Consumer Perception about Quality and Uses of Flavoured Palm Oil Zomi in Sounthern Benin

Alexandrine H. Bokossa[1,2], Christian T. R. Konfo[1], Eulge S. Adjou[1], Boniface B. Yehouenou[1], Romaric Ouetcheou[1], Edwige Dahouenon-Ahoussi[1,*], Mohamed M. Soumanou[1] and Paulin Azokpota[2]

[1]University of Abomey-Calavi, Polytechnic School of Abomey-Calavi, Laboratory of Study and Research in Applied Chemistry,01 PO BOX: 2009 Cotonou, Benin.

[2]University of Abomey-Calavi, Faculty of Agricultural Sciences, Laboratory of Food Sciences, Cotonou, Benin.

ARTICLE INFO

Article history:
Received: 8 May 2019;
Received in revised form:
20 June 2019;
Accepted: 1 July 2019;

Keywords
Palm oil zomi,
Characteristics,
Consumer Perception.

ABSTRACT

The present work has been done to emphasize the place of palm oil zomi in people diet in southern Benin. It has consisted in evaluating consumers' perception and to record use of this oil in households in southern Benin. On the basis of an inquiry questionnaire, 200 consumers (consumer's producers (CP) and consumers non producers (CNP)) have been interviewed in six departments. Results have revealed flavored palm oil zomi was characterized by a deep red color (80%), a pronounced odor (10%), a good fluidity (67.14%) and an unsalted taste (93.55%). According to 99.14% of consumers, vegetable with tomatoes sauces were in their majority cooked with zomi oil. Beans according to 95.71% of consumers and boiled yam according to 89.15% of consumers represented foods largely consumed with zomi oil. Zomi oil supplying was frequently done in markets according to 50.7% of consumers. Totally, flavored palm oil zomi occupied an important place in Benin people gastronomy.

Introduction

The world resources in fats come from 74% of grains and oleaginous [1,2]. This justifies the importance of vegetable oils as alimentary resources used by population in order to satisfy their nutritional needs [3]. Urbanization phenomena gets consequences in many sectors of the economy. Among these, food supplying represents a very sensible sphere, in relation with not only of its important place in the satisfaction of needs of urban household's foods, but also of the importance of food budget in the consumption expenditures of these latters. In Benin, food expenditures, in urban areas constitute 55.4% of global expenditure for consumption [4]. Alimentary behaviors in urban zone are not stable. Many factors can determine the alimentary behavior of urban populations [5]. Alimentation is in fact, the result of a combination of biological, economic, social and cultural factors conducting to differentiated practices according to social groups. By elsewhere, according to [6], African urban consumers stay in general in transcultural situation of membership to a double referential ″modern″ and ″traditional″.

In the actual context of world wideness and markets over the world, opening Benin must offer through agricultural diversification products with competitive prices and must adapt itself to the changes, making prices accessible to exterior markets and maintaining a massive presence on interior markets of substitution products for local need. In spite of marginal conditions of Benin, palm oil tree stays the oleaginous plant the most important in economical social and political sides for the populations of South-Benin [7]. It's important for the amelioration of nutritional statut of households and also for the supplying of substantial income for many actors. It's have been mainly cultivated for edible vegetable oils which were extracted from the pulp of its fruit (palm oil) and from its almond (palmists oil). Among all the oleaginous, It's the one which produces the most of oil per hectare.

Palm oil path is one of the important sectors of economical tissue. Its gets advantage to integrate at the first the producers and at the bottom the transformers. In Africa, annual production of palm oil doesn't reach in satisfying the strong demand in ascension. Palm oil demand has grown from 8.7% annually between 1995 and 2004 [8]. Traditional component of African, South American or Asian cuisines, the vegetable oil is especially used in agro-food industry (80%), in cosmetics (19%) and for biodiesel (1%) [9]. Half of processed foods contain it because it contributes to their conservation. But palm oil is in particular preferred because of its low production cost [10]. Its detains a longest time of conservation related to the others edible oils because of its high antioxidants content which confer to it a particular resistance to rancidity [11]. Palm oil consumption takes a part for around 44% in total national intake of this food. Population evolution and nutritional consumption of palm oils pass from 53000 tons in 2000 to around 78000 tons in 2012 [12].

In nutritional side, this palm oil especially called *zomi* is rich in carotenoids (α, β and γ carotene) [13]. Produced also in Nigeria and Togo, the particularity of its organoleptic quality (flavor, color) is in relation with its treatment and the specificity of its composition in fat acids. Then this quality allows to it a conservation without particular conditions [14].

Tele:
E-mail address: edawenon@gmail.com

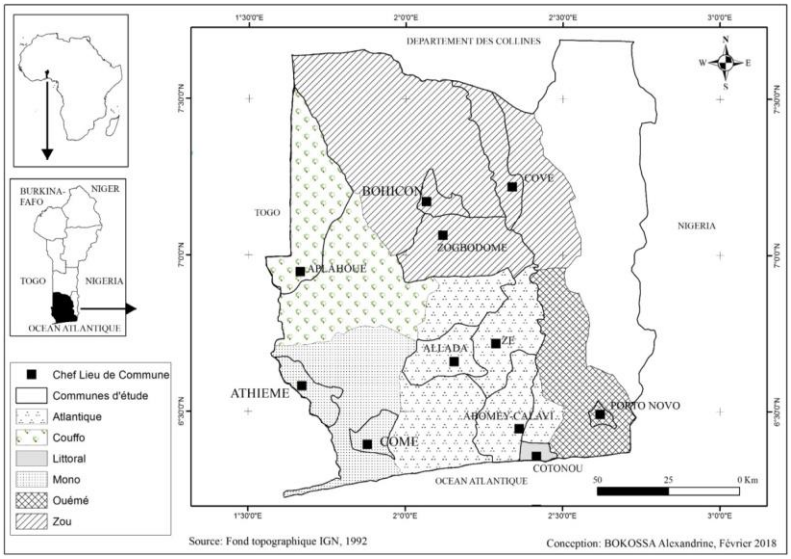

Figure 1. Investigated districts cartography.

This study aims to promote the flavored palm oil *zomi* produced in Benin through the knowledge of endogenous practices in relation with its consumption.

Methodology

Preliminary investigation

Prospective study has been done after a documentary work which permitted to obtain preliminary informations about markets of distribution and zones of high consumptions of palm oil *zomi*. It consisted organizing some conversations with persons implicated and some leaders in the prospected zones in the aim to get an idea about the place occupied by *zomi* in the gastronomy of populations.

At the end of preliminary investigation, six departements and 11 districts have been selected with four ethnical groups (mina, fon, goun, yaruba) to monitor *zomi* consumption investigation. The choice of districts has been achieved according to some considerations like the accessibility to the zone (village). The reputation of the zone in relation with *zomi* consumption and opened mind from population to collaborate.

Investigated zone

The survey of *zomi* consumption has been conducted in the districts of Abomey- Calavi, Allada, Athiémé, Aplahoué, Bohicon, Cotonou, Covè, Porto-Novo, Zè and Zogbodomè of Atlantique – Littoral, Mono-Couffo, Ouémé and Zou respectively (figure 1).

Methodology of survey

The surveys based on the semi - structured interview method have been conducted on two types of *zomi* consumers categorized as followed:

Consumers producers (CP) which took in account informed consumers that means those who not only got an idea about how the oil was produced and who also produced it sometimes.

Consumers non producers (CNP) or typical consumers which concerned those who got an idea or not about the oil production but didn't produce it.

Sampling

Sampling size has been obtained using a normal approximation of binomial distribution proposed by **[15]**:

$N = [(U1-\alpha/2)2 \times p(1-p)]/d2$

with:

U1-α/2 value of uncertain normal variable for the probability value of 1-α/2, α is mistake risk. For α = 6 % (1%≤d≤15%), the probability 1-α/2 = 0.5 and we have U1-α/2= 1,96. P is the proportion of persons who consume *zomi* palm oil and d the margin of estimation mistake , fixed at 7 % in this study.

From these values of P descended from the exploratory stage of the study, in total 200 consumers of *zomi* oil have been selected in the studied zone with a rati of 100 consumer's producers (CP) and 100 consumers non producers (CNP). In each locality, the investigated persons have been identified according to a simple random sampling.

Statistical analysis

The data collected have been codified, and statistically analyzed with SPSS/2.0 Software (Statistical Package for Social Sciences)**[16]** for the determination of descriptive statistics.

Results

Socio-demographical characteristics of *zomi* oil consumers

The table 1 presented results of descriptive analysis of socio-economic variables of consumer's producers (CP) and consumers non producers (CNP) of *zomi* oil according to departments of studied zone.

Women represented the majority (86%) of *zomi* oil consumer's producers (CP) against 14% of men. Among these women 55% were most aged from 18 to 45 years old and were elsewhere unalphabetized (73%). Their main occupation was the production and selling *zomi* oil. For the consumers non producers (CNP) of *zomi* oil, women represented also the majority (82%) against 18% for men. 78% of these women were aged between 20 and 45 years and 55% among them were alphabetized in Atlantic-Littoral. Their main occupations were trader's householders, dress makers, teachers, hairdressers, agronomy etc.

Perception of consumers about *zomi* oil quality

Table 2 presented results of descriptive analysis of variables on criteria appreciation of *zomi* oil quality by consumers according to the 6 departments of study zone. These criteria of quality appreciation varied according to investigated persons and organoleptic variables.

Table 1. Socio-demographical characteristics of *zomi* consumers.

Variables	Modalities	Answerings percentage								
		Atlantique-Littoral		Mono-couffo		Ouémé	Zou		Total	
		CNP	CP	CNP	CP	CNP	CNP	CP	CNP	CP
Sex	-man	3.1	-	28.9	13.6	13.3	23.1	8.9	18.1	14
	- woman	96.9	100	71.1	86.4	86.7	76.9	91.1	81.9	86
Age	20≤age≤45	75	63.6	77.8	56.8	93.3	69.2	51.1	78.1	55
	45≤age≤80	25	36.4	22.2	43.2	6.7	30.8	48.9	21.9	45
Level of instruction	- No scolarised	6.3	63.6	44.4	68.2	40	38.5	80	31.4	73
	- alphabetized	3.1	27.3	2.2	20.5	6.7	23.1	2.2	5.7	1
	- primary	3.1	-	26.7	6.8	20	7,7	11.1	16.2	17
	- secondary 1	9.4	9.1	6.7	4.5	6.7	7.7	6.7	7.6	7
	- secondary 2	56.3	-	6.7	-	20	7.7	-	23.8	2
	- universitary	21.9	-	13.3	-	6.7	15.4	-	15.2	-
Profession	-producer of oil / seller	3.1	63.6	4.4	77.3	-	-	77.8	2.9	76
	-other activities	96.9	36.4	95.6	22.7	100	100	22.2	97.1	2

Table 2. Appreciation criteria with good quality *zomi* oil

Variables	Modalities	Answerings percentage								
		Atlantique-Littoral		Mono-couffo		Ouémé	Zou		Total	
		CNP	CP	CNP	CP	CNP	CNP	CP	CNP	CP
Knowledge of *zomi*	- Yes	99	100	100	100	93.3	100	100	99	100
	- No	1	-	-	-	6.7	-	-	1	-
Technology knowledge	- Yes	-	100	44.4	100	-	27.8	100	18	100
	- No	100	-	55.6	-	100	72.2	-	82	-
Technology used	-Technology 5	-	36.4	-	75	-	-	73.3	-	70
	-Others	-	63.6	-	25	-	-	26.7	-	30
Color	-orange red	25.7	27.3	6.7	38.6	-	15.4	20	15.7	29
	-deep red	74.3	72.7	93.3	61.4	100	84.6	80	88.05	71
Viscosité	- Fluid	69.5	63.6	73.3	61.4	100	38.5	68.9	69.5	62
	-few leavy	30.5	36.4	26.1	38.6	-	61.5	31.1	30.5	38
odor	- strong	-	-	-	-	-	-	-	-	-
	- pronouneed	100	100	100	100	100	100	100	100	100
Taste	-few salted	-	-	8.9	34.1	-	-	-	2	8
	-unsalted	100	100	91.1	61.9	100	100	100	98	91

For the consumer's producers (CP) the technology 5 was the most used in the department of Mono-Couffo (75%) and Zou (73.3%) whereas it's minors used in the departments of Atlantic- Littoral (36.4%). Some organoleptic characteristics like a deep red color (71%) a fluid viscosity (62%) a pronounced odor (100%) and an unsalted taste (70%) might be the characteristics of a good quality oil.

The consumers non producers (CNP) of the study zone got also a good knowledge of the *zomi* oil (99%). In contrary, 82% of those consumers didn't expertise the technologies used for its production excepted in Mono-Couffo and Zou where some of these consumers (44.4% and 27.8% respectively) declared get some information about how the oil was obtained but didn't produce it. The organoleptic characteristics defining the oil according to those consumers were the same as the consumers' producers of the oil.

But the oil got a fair salted taste according to 34.1% of consumer's producers and 8.7% of consumers non producers in Mono.

We slightly conclude *zomi* oil with good quality was appreciated by the two types of consumers and at with deep red color, a fluid viscosity, a pronounced odor and an unsalted taste.

Use and technics for oil conservation

Use done with *zomi* oil by populations of studied zone were diverse and mainly related to cooking aims (table3) In fact, the ethnical and cultural diversities and cooking behaviours showed *zomi* oil belonged to many preparations compositions whose the most frequent constituted the sauces (67.3%), gombo, crincrin (74%) and assrokouin (21%). Excepted these direct preparations, *zomi* palm oil constituted in alimentary pratices of populations an accompanier of other foodstuffs (table3) In fact, beans (100%) boiled yam (100%) and an important part of Beninese gastronomy were accompanied with *zomi* oil (80%). The *zomi* oil was then well know by the two categories of interviewed consumers. Its place in Beninese gastronomy was no more discussed.

Table 3. Different use of *zomi*

Variables	Modalities	Answerings percentage								
		Atlantique-Littoral		Mono-couffo		Ouémé	Zou		Total	
		CNP	CP	CNP	CP	CNP	CNP	CP	CNP	CP
Do you use *zomi* for sauce?	-yes	93.3	100	100	100	100	100	100	99	100
	-no	6.7	-	-	-	-	-	-	1	
Precision of sauces	Vegetable sauce	100	100	100	100	93.3	100	100	99	100
	tomatoe sauce	3.1	100	2.2	97.7	33.3	-	4.4	1.9	67.3
	Gombo	75	63.6	44.4	70.5	73.3	69.2	80	61	74
	Crincrin	68.8	45.5	88.9	75	33.3	69.2	80	72.4	74
	Assrokouin	56.3	23.7	26.7	386	80	23.1	15.6	42.9	27
	frying	-	9.1	-	22.7	26.7	-	4.4	3.8	13
Food accompagnied with *zomi*	Beans	93.8	100	100	100	73.3	100	100	94.3	100
	Boiled yam	93.8	100	55.6	100	80	100	100	76.2	100
	Sweet potatoe	87.5	90.9	55.6	90.9	-	100	97.8	62.9	94
	Gari	12.5	9.1	46.7	18.2	26.7	15.4	8.9	29.5	13
	Boiled cassava	43.3	54.5	66.7	50	53.3	84.6	44.4	60	48

Photo 1. Beans plate with *zomi.*

Photo 2. Crincrin sauce with *zomi.*

Photo 3. Vegetable sauce cooked with *zomi*.

Supplying and stocking of the oil

Palm oil *zomi* representing an important foodstuff in alimentary behaviors of populations of the studied zone, many technics were used for its stockage and its conservation (table4). In fact, the majority of consumers (CP) of that oil didn't buy it because they produce it themselves. 78.3% of these letters always reserved a quantity for their own consumption. The oil was generally stocked in same cans for the most of consumers for about eight weeks when it was utilized. But this time of conservation could be extended till 48 weeks when the oil was stocked essentially inside cans with the two categories of consumers, respectively 79% for the consumer's producers (CP) and 58% for the consumers non producers. The whole of consumer's producers did it. These oils were bought in the markets (72%) or with the ambulatory sellers who marketable in consumer's areas. The oil could be conserved for one year time in the majority of regions (64%), excepted in Atlantic and Zou where it was conserved for about eight weeks (66%).

Discussion

Socio-demographic plan: The results of the consumer survey showed that the respondents are predominantly female and are under 50 years of age. 55% are mostly 18 to 45 years old for producer consumers (CP) and 78% of these women are aged 20 to 45 years for non-producer consumers (NPCs). This is due to the fact that in Benin, it is the woman who par excellence take care of the kitchen so it is she who decides above all that goes into the preparation of meals while taking into account of course preferences of her husband. *Zomi* oil, therefore, is a consumer oil that is loved not only by women, but also by men of all ages since it goes into the preparation of family meals. These results corroborate with those of [16] CHEYNS 2001 according to "Contrary to what is most often admitted, artisanal red oil is still widely consumed in urban areas, even in the capital, Abidjan. Among the 28 urban households surveyed, only one does not consume red oil. Of the 27 households interviewed who consume red oil, the average consumption is 1.4 liters / month, or 17 liters / year (it ranges from 0.3 liters / month to 5 liters / month, but the majority households consume between 1 and 2 liters / month).

Consumer perception: The dark red color that characterizes the oil is certainly due to the presence of carotenoids, its viscosity is due to the high degree of cooking and the relatively long cooking time. These results are in line with those of [17] who showed that the color of palm oil, ranging from light orange to dark orange red, is due to the presence of carotene in the unsaponifiable fraction. Also, [18] found that *zomi* oil is characterized by a dark red color and a characteristic scent. These results also corroborate those of [19] who showed that the main quality criteria for oil are: taste, aroma, color and fluidity. Some regions are reputed to produce good quality oil. This is the case of the regions of Mono (Comé, Lokossa ...) that produce the best quality *zomi* oil. The use of palm oil for the preparations mainly concerns local dishes.

Different uses: The different uses of *zomi* show that the oil is very popular and accompanies many dishes. She enters the preparation of several sauces and thus occupies a very important place in the diet of Beninese. These results corroborate with those of several authors. Thus, [4], [14] and [20] claim that these oils are the basis of many diets, particularly in Africa. Also, according to [13], *zomi* oil is immediately helpful at the table for meals such as beans, yams and various other food uses. These results also corroborate those of [16] of Côte d'Ivoire, for whom red oil is used in "African" sauces ("leaf sauces" and okra sauces - dry and fresh, ie "djumblé sauce "and" Kopé sauce ") and African dishes made from plantain, cassava or yam - foufou (banana or cooked and ground yams), special attiéké

Table 4. Conservation and stockage technics of *zomi* oil

Variables	modalities	Answering percentage								
		Atlantique-Littoral		Mono-couffo		Ouémé	Zou		Total	
		CNP	CP	CNP	CP	CNP	CNP	CP	CNP	CP
Suppling	-Market	87.5	65	60	-	73.3	76.9	-	72.4	21.7
	-seller ambulant	12.5	-	40	-	26.7	23.1	-	27.6	-
	-proper production	-	35	-	100	-	-	100	-	78.3
packaging	-Can	56.3	100	55.6	70.5	53.3	61.5	68.9	56.7	79.8
	-Bottle	37.5	-	2.2	-	13.3	38.5	-	22.9	-
	-Bowl	6.2	-	42.2	29.5	33.4	-	31.1	20.4	20.2
Conservation period	[2 – 8 weeks]	65.6	-	64.4	25	64.4	53.8	55.6	62.1	26.8
	[8– 48 weeks]	34.4	100	35.6	75	35.6	46.2	44.4	37.9	73.2

(cassava) sauce," red "attiékè, boiled yam and allocos. In Senegal, [6] to show that apart from palm wine, palm oil is the second most consumed product among the populations among the different products of the oil palm. These results are also consistent with those of [19] for whom, on the culinary level, "red" oil is used in vegetable sauces, sticky sauces, tomato sauces and fried foods (fried roots and tubers, donuts, patties, tomato frying, etc.). Palm oil comes in two forms: *zomi* oil and ordinary oil. These two forms are used for all the aforementioned dishes. However, *zomi* (flavored palm oil) is preferably used to accompany boiled dishes (yam, cassava, boiled cowpeas, etc.) but also sauces, while ordinary oil sometimes undergoes a pretreatment change odor or bleaching before use. Depending on its aroma, the oil is used for different preparations. The most commonly prepared dish with palm oil is the vegetable sauce.

Procurement: The supply of *zomi* palm oil follows a well-defined marketing channel consisting of wholesaler (who sells in the markets) and retailers who are often street vendors. These results are in line with those of [3] according to which the palm oil marketing circuit is defined as a succession of stages through which flows of products pass through a defined period of time (the oil itself). These results also corroborate with those of [21] and [22] according to which the peculiarities of the oil supply underline the territorial anchoring of this product. But these particular procedures are also a way to guarantee quality. Village parent procurement, proximity to a vendor, or identification of a relationship supply network, are product qualification procedures. according to [23] These procedures are based on trust between people who know each other or who establish a loyalty link

References

[1] Aïssi, V. M., Soumanou, M. M., Tchobo, F. P., & Kiki, D. (2009). Etude comparative de la qualité des huiles végétales alimentaires raffinées en usage au Bénin. Bulletin d'Informations de la Société Ouest Africaine de Chimie, (06), 25-37.

[2] Agro Busness Center, (2016). Etude sur la commercialisation de fruit de palme et ses derives (huile de palme, huile palmiste, amandes de palmiste, fibres de palmiste) au Benin. 11-45p.

[3] Ahouansou,R.H., Monhouannou, J., Savi, M. C., Apkogan, F., & Djossou,P.(2008). Evaluation des performances technique et économique d'un dépulpeur de fruits de palme au Bénin. Bulletin de la recherche Agrnomique du Bénin, (60), 43-49.

[4] Angerand S. (2007) - FIPCAM Hold up dans les forêts Camerounaise : Les Amis de la terre 13 pages.

[5] Bricas, N. (1993). Les caractéristiques de l'évolution de la consommation alimentaire dans les villes africaines,. In J. Muchnik (ed.), Alimentation, Techniques et Innovations dans les régions tropicales. Paris, France, L'Harmattan, p. 127-160.

[6] Camara, B., Sagna, B., Ngom, D., Niokane, M., & Gomis, Z.D. (2017). Importance socioéconomique de Elaeis guineensis Jacq.(Palmier à huile) en Basse-Casamance (SENEGAL). European Scientific Journal, ESJ, 13(12).

[7] Coussy, J., Hugon, P., & Sudrie, O. (1991). Urbanisation et dépendance alimentaire en Afrique Sub-saharienne. Paris, France, Sedes.

[8] Dagnelie P. 1998. Interférence statistique à une et à deux dimensions. Statistique théorique et appliquée Volume, 2.

[9] Dagnelie P. 1986. Théorie et méthodes statistiques. Applications agronomiques. Vol 2. Les presses agronomiques de Gembloux. A.S.B.L. (Belgique). 463 p.

[10] Norusis MJ. 2002. SPSS 11.0 guide to data analysis. Prentice and Hall. P. 27.

[11] FAO. (2003). Le palmier à huile hybride prospère au Kenya. (Notes de recherche sur Internet : Google Scholar).

[12] Florence Carpentier, Quentin Hacquard,Pierre Jaouen, Julie Lebeau et Celia Pasquetti.(2004) «La déforestation et l'industrie : Le cas de l'Indonésie», La déforestation et l'utilisation des bois tropicaux, Agro polis Museum (Consulté le26 Octobre 2008)

[13] Fournier, S., Ay, P., Jannot, C., Okounlola Biaou, A., & Pédé, E. (2001). La transformation artisanale de l'huile de palme au Bénin et au Nigeria. Cirad. 45-51p.

[14] Gomis Z. D. (2015) - Les parcs agroforestiers à Elaeis guineensis Jacq. (Palmier à huile): Caractéristiques biophysiques et importance socio-économique à Ouonck (Basse-Casamance). Mémoire de Master 2. Université Assane de Ziguinchor. 79 pages.

[15] Gunstone, F. (2001). Yields of oilseeds and of oils and fats. Inform, 12, 1093-1096.

[16] Cheyns, E. (2001). La qualification des produits artisanaux: du marché de proximité à l'échange à distance. Études et Recherches sur les Systèmes Agraires et le Développement, 65-78.

[17] Jacquemard, J. C. (1995). Le palmier à huile. Collection le technicien d'agriculture tropicale. Maisonneuve & Larose, Paris.

[18] Segalla, P., & Bridier, B. (2010). Projet de Développement Rural: valorisation du ZOMI du MONO Bénin.

[19] Mitchikpè, E.C.,Ategbo, E.A., Fanou, J.A., &Nago, M.C. (2001). Consommation alimentaire des ménages urbains au Bénin.

[20] Sagna B., (2016). Paramètres structuraux, modes de gestion et importance socio-économique des parcs agroforestiers à Elaeis guineensis Jacq. (Palmier à huile) en Basse-Casamance. Mémoire de master Université Assane SECK de Ziguinchor 55 pages.

[21] Rouziere, A. (1995). Étude mini-et micro-huilerie de palme en Afrique de l'Ouest et du Centre.

[22] Bricas, N., & Cheyns, E. (1995). L'évolution de la qualification des produits agro-alimentaires en Afrique Sub-saharienne. Conséquences pour la valorisation des produits locaux sur les marchés urbains (version provisoire). INRA.

[23] Servet, J. M. (1994). Paroles données: le lien de confiance. Revue du MAUSS semestrielle, (4), 37-56