

## Production, processing and marketing of oil palm (*Elaeis Guineensis*) derivatives in the district of attogon (Municipality of Allada)

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### Abstract

*The processing and marketing of oil palm products are of paramount importance both socially and economically. This research contributes to a better understanding of the production, processing and marketing system of oil palm products in Attogon.*

*The methodology adopted is based on data collection, processing and analysis of results using the SWOT model. A sample of 95 households was the target of investigation.*

*The analysis of the results shows that the processing of oil palm derivatives is gainful. For instance, for an investment of 5,500 CFA francs for the production of 25 liter can of palm oil, women processors make an average profit of 6,500 CFA francs. Likewise, an average investment of 4,600FCFA gives an average profit of 9,300FCFA on the production of 10liter of palm kernel oil. As for the manufacture of baskets, brooms, racks and cake, the processors invest nothing to obtain the raw material. The average profit they make on the sale of a product varies between 50 and 200 FCFA.*

*But despite this economic advantage, the actors are confronted with difficulties to make the sector more vivid.*

**Key Words:** Attogon, oil palm, derivatives, processing, marketing

## Production, transformation et commercialisation des dérivés du palmier à huile (*Elaeis Guineensis*) dans le district d'attogon (Municipalité d'Allada)

### Résumé

*La transformation et la commercialisation des produits du palmier à huile sont d'une importance capitale tant sur le plan social qu'économique. Cette recherche contribue à une meilleure compréhension du système de production, de transformation et de commercialisation des produits du palmier à huile à Attogon.*

*La méthodologie adoptée repose sur la collecte de données, le traitement et l'analyse des résultats à l'aide du modèle SWOT. Un échantillon de 95 ménages a été la cible de l'enquête.*

*L'analyse des résultats montre que la transformation des dérivés du palmier à huile est rémunératrice. Par exemple, pour un investissement de 5 500 FCFA pour la production d'un bidon de 25 litres d'huile de palme, les femmes transformatrices réalisent un bénéfice moyen de 6 500 FCFA. De même, un investissement moyen de 4 600 FCFA donne un profit moyen de 9 300 FCFA sur la production de 10 litres d'huile de palmiste. Quant à la fabrication des paniers, des balais, des claies et des gâteaux, les transformateurs n'investissent rien pour obtenir la matière première. Le profit moyen qu'ils réalisent sur la vente d'un produit varie entre 50 et 200 FCFA.*

*Mais malgré cet avantage économique, les acteurs sont confrontés à des difficultés pour rendre le secteur plus vivant.*

**Mots Cles :** Attogon, palmier à huile, dérivés, transformation, commercialisation

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## INTRODUCTION

Benin's cash crops play an important role in external trade (Eniayehou, 1993, p. 24). One of the cash crops that has long contributed to the growth of the Beninese economy is the oil palm (*Elaeis guineensis* Jacq.). Exports from the former Dahomey were based on this crop, whose products represented about 70% of the tonnage and 65% of the value of total exports between 1959 and 1969 (Dissou, 1988 cited by Sissinto, 2000, p. 21).

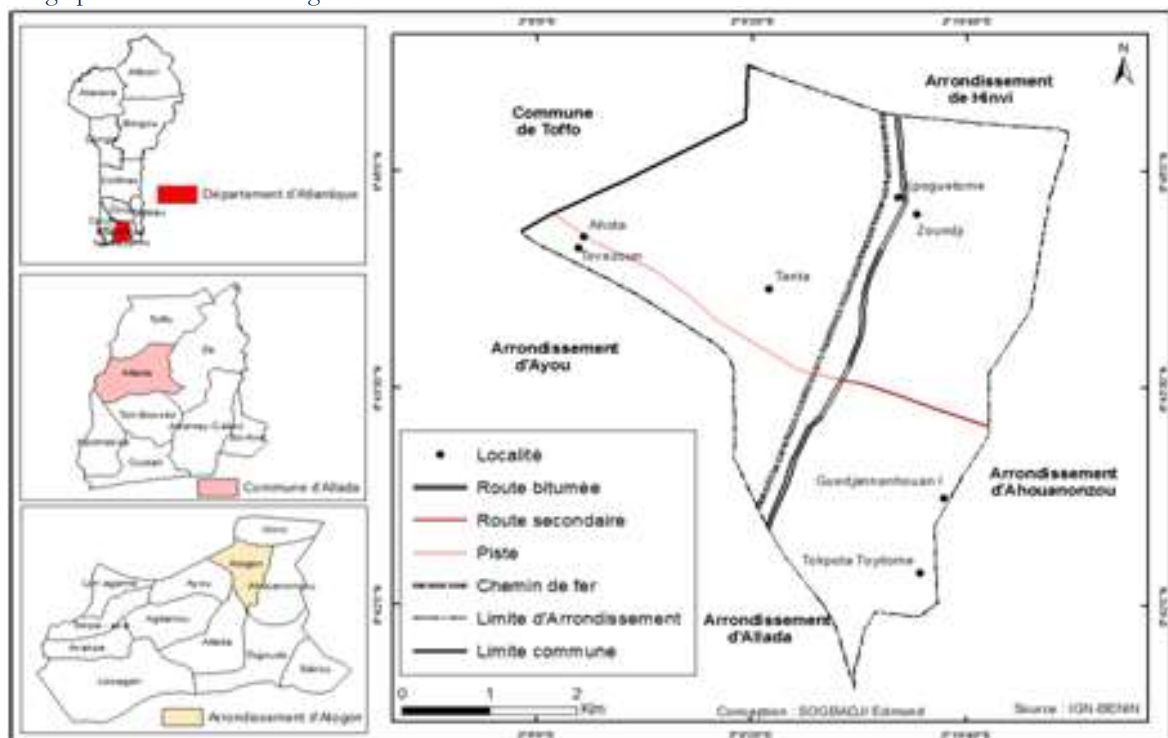
Palm products play an important role in the economic, social and religious activities of the population in southern Benin (Fatoumbi, 2006, p17). These oil palm products account for up to 40% of the value of exports and form a large part of the population's needs (Lokossou, 2012, p19). The products and by-products derived from oil palm that are commonly used by the population in Benin are numerous (Fournier et al., quoted by Odjo 2009, p38). These include palm oil, palm kernel oil, palm kernel cake (for livestock feed), palm nut shell (for fuel), palm pulp cake (for fuel), leaves (for roofing, fences, brooms), the palm trunk (poles and beams) and the sap which gives palm wine that is consumed directly or transformed into local alcohol, sodabi (Gbayi, K. P, 2002, p 39).

All these products derived from oil palm are produced much more in the south of Benin, more precisely in the departments of Mono-Couffo, Ouémé-Plateau, Atlantique-Littoral (Lokossou, 2012, p 31). The processing and marketing of oil palm products are important as they help stakeholders socially and economically. It should be noted that the palm tree has an important socio-economic value that needs to be assessed. Owing to this, it seemed interesting to analyze the socio-economic effect of oil palm and its derivatives. The biophysical and human factors are favourable to the production and marketing of oil palm products in Attogon. The marketing of oil palm by-products has a socio-economic impact on the actors in the district.

## MATERIALS AND METHODS

**General presentation of the district of Attogon:** Located in the municipality of Allada, the district of Attogon is situated between 6°41'14" and 6°46'01" north latitude and 2°7'45" and 2°10'40" east longitude. It is bordered to the north by Hinvi district, to the northwest by Toffo commune, to the south by Allada district, to the east by Ahouanonzoun district and to the west by Ayou district (figure 1).

Figure 1: Geographical location of Attogon district



**Methodological approach:** The methodology adopted in this work can be summarized as data collection, data processing and analysis of the results.

**Data collection:** In order to analyze the production and marketing system of oil palm derivatives in Attogon district, several data are used.

**Data used:** Both quantitative and qualitative data are used in this research. They include demographic data, income from the production and marketing of oil palm products at the level of the stakeholders. The qualitative data include the quality of the products marketed and the quality of the market and transport infrastructure.

**Data collection techniques:** The techniques used for data collection are essentially documentary research, field surveys, direct observations and interviews.

- **Documentary research:** This consisted in consulting the existing documents on oil palm products, on certain aspects related to the processing and marketing of derivatives. This allows to have an idea of the work already done on the subject.

- **Field surveys:** These surveys were carried out in the field through direct observations, interviews and questionnaire surveys of the sampled households.

- **Direct observations:** Direct observations were made during the entire field survey period. They allowed us to learn about the different processing and marketing techniques for oil palm products in Attogon and to take pictures so as to illustrate the work.

- **Interviews:** The interviews were conducted with people identified and selected from the sample according to their degree of involvement in the processing and marketing of oil palm products. These were local elected officials and leaders of farmers' organizations. These interviews were conducted using interview guides.

- **Surveys by questionnaire:** These were carried out with processors, traders in oil palm by-products and heads of households using questionnaires on various aspects of processing, trade in oil palm by-products and income from these products, and on the various constraints encountered by the various actors in carrying out their activities. These investigations are carried out by determining a sample and selecting the villages visited.

- **Sampling:** To conduct this research, target groups were identified and a sample defined. The three (03) villages of Attogon District were taken into account. The technique of reasoned choice was applied. The choice of respondents was made according to the following criteria:

- ✓ Living in Attogon district
- ✓ be the head of a household
- ✓ be oil palm producers
- ✓ be a processor of oil palm products or a trader in oil palm derivatives.

The sample is determined by the Schwartz (1995) formula, which is as follows:

$$N = Z\alpha^2 (PQ/d^2)$$

N = Sample size per village

$Z\alpha$  = deviation set at 1.96 which corresponds to a confidence level of 95%.

P = number of village households / number of households in the district according to INSAE 2013

Q = 1- P

d = margin of error which is equal to 5%.

Thus, the following numerical application was observed in the village of Attogon centre:

$Z\alpha^2 = (1,96)^2 = 3,841$

$P = 1087/1843 = 0,59$

$Q = 1-p = 0,41$

$d^2 = (5\%)^2 = 0,0025$

$N = 371,65$

This result is scaled down to 15% due to the resources available for the surveys. This makes:  $371.65 \times 0.15 = 55.74$ ; that is 56 respondents. The same formula is applied to the villages of Niaouli I and Niaouli II. Thus, for Niaouli I, there are 17 households and for Niaouli II, there are 22 households respectfully surveyed. This gives a total of 95 households interviewed (Table I).

Table I: Sample size of villages and respondents (Source: Survey results, December 2019)

District	Villages surveyed	Number of households	Number of households surveyed
Attogon	Attogon centre	1087	56
	Niaouli I	334	17
	Niaouli II	422	22
	<b>Total</b>	<b>1843</b>	<b>95</b>

It results from Table I that three (03) villages were visited to survey a total of 95 households. Thus, various tools and materials were used so as to facilitate the collection of information in the field and to achieve the objectives.

- **Data processing:** The processing of data and information mainly involved the numbering and tabulation of the survey forms, interview guides and observation grids. The questionnaires were opened and processed manually. Some data were presented in the form of tables or graphs using Excel 2010 software. Text input was done using Word 2010. The cartographic processing was done with Arc view software. All this made it easier to explain the information in a consistent way.



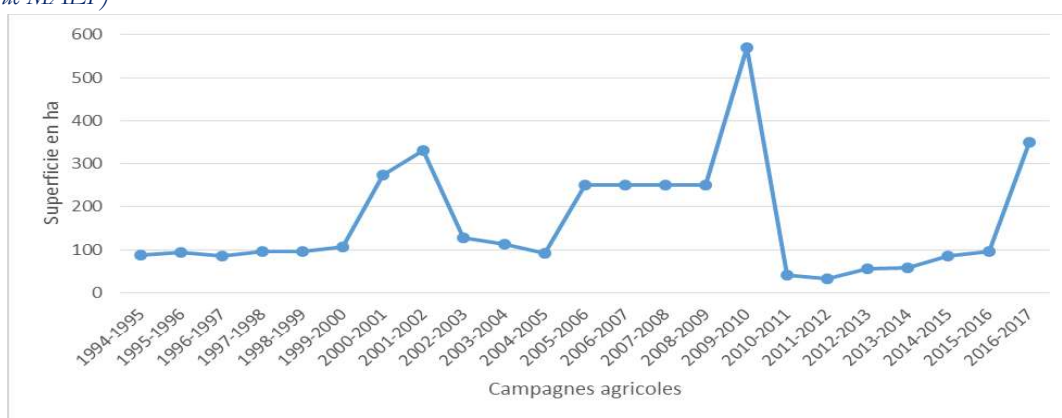
## RESULTS

The results are analyzed using the SWOT model (Strengths - Weaknesses - Opportunities - Threats). This model is used to analyze, on the one hand, the strengths and opportunities of the study environment and, on the other hand, the weaknesses and threats related to the development of oil palm processing and marketing activities. This method integrates internal and external factors that interact with each other to enable an integrated analysis of the strengths and weaknesses of the environment.

**Production of oil palm in Attogon:** The practice of oil palm cultivation offers the population of Attogon district many paid jobs. The specific nature of these jobs leads us to distinguish between direct and indirect jobs. Direct jobs are those that are directly related to the product from the production of the raw material to the finished product. These jobs are perceived through different activities. According to their specificities, they are practiced by men for cultivation and by women for processing. This confirms the distribution of activities by gender in rural areas. Indirect jobs are only the consequences of direct jobs, especially in the case of processing. They are related to the manufacture of certain objects (baskets, sickles). The manufacture of all these materials is the work of blacksmiths, welders and carpenters. This analysis shows that oil palm cultivation indirectly creates opportunities for the craft industry.

**Evolution of oil palm production:** Oil palm is the main cash crop in the municipality of Allada in general and the district of Attogon in particular. Figure 2 shows the evolution of the area planted to palm from 1994 to 2017.

Figure 2: Evolution of new areas under palm cultivation in the municipality of Allada from 1994 to 2017 (*Source : CeRPA Atlantique, service statistique MAEP*)



A reading of the palm area curve shows that the area under this crop tripled in 2002 (332 ha) compared to 1995 (88 ha). From 2004 to 2010, this area increased six (06) times more, from 91 ha in 2004 to 571 ha in 2010, as the curve shows. The fall in the curve in 2012 shows that new land is hardly available for new plans, due to the occupation of previously vacant spaces. For the respondents, it is land conflicts that hinder the production of this perennial crop.

Oil palm is a monoecious crop, meaning that the same tree bears both male and female flowers. Each tree produces compact clusters of fruit weighing between 10 and 25 kilograms and each containing between 1000 and 3000 young fruits. The fruits are spherical or elongated in shape. The young fruit is usually dark purple, almost black, and becomes orange-red when ripe. It consists of a hard core (seed) enclosed in a shell (endocarp) which is surrounded by a fleshy mesocarp. Palms can grow to over 20 meters in height. The trunks of young and mature trees are wrapped in leaves that give them a rough appearance. Older trees have smoother trunks, but bear the scars left by withered and fallen leaves. The oil palm begins to bear fruit 30 months after planting and remains productive for 20 to 30 years, ensuring a steady supply of oil. Plate 1 shows a palm grove and a palm diet in Niaouli I.



Plate 1: Palm grove of an oil palm producer in Niaouli I and palm nut diet (*Shot: Sogbadji, December 2019*)



On Plate 1, Photo1-1 shows a palm grove in Niaouli I. It is the set of palm groves that provide the different raw materials used for the production of the different derivatives from the palm tree. The most widely produced product from the palm tree in Attogon is palm oil, which is produced from the palm nut diet (photo 2-2). This picture shows a palm nut diet. Through this diet, producers obtain palm oil, palm kernel oil and other derivatives that enable them to enlist financial resources.

**Production system for oil palm derivatives in Attogon:** Several products are derived from the processing of oil palm in Attogon. The oil palm by-products identified during the fieldwork are: palm oil, palm kernel oil, the local alcohol 'Sodabi' produced from palm wine, baskets, brooms, racks and palm cakes. The processing of palm nuts into palm oil in Attogon is done in the traditional way. This technique adopted by the processors takes about four to five days. A barrel of prepared palm nuts yields about 1.5 cans of 25-litre, or about 38 liters of red oil. Thus, 73% of respondents are involved in the processing of palm nuts into palm oil in Attogon.

**Production of red palm oil:** In Attogon district, the palm tree is grown largely for its seeds, which are used to produce palm oil. The oil does not only come from the sauce; it can also be produced traditionally by cooking the seeds in a pot or large barrel (Plate 2). This traditional process produces red oil for cooking and other purposes.



Plate 2: Traditional cooking of palm oil in Attogon (Shot: Sogbadji, December 2019)

**Production of palm kernel oil:** The traditional processing of palm nuts into palm kernel oil is an activity reserved exclusively for women. Indeed, 100% of our respondents are women producing this oil. There is only one traditional processing procedure. The processors here have only rudimentary means at their disposal. In this case, the extraction is done by cooking the almond paste at a temperature of around 100°C and the women processors do not even have a traditional press. They crush the prepared nuts in mortars or tubs and knead them to obtain the almond paste. With these rudimentary means, the processing time varies from three days to a week and even longer when uncrushed palm nuts are used.

**2-3-3-Production of local alcohol "Sodabi":** Trees are first uprooted for the production of local alcohol or Sodabi. It is generally the old palm trees (more than 10 years old on average) that are stumped by the sodabi manufacturers. Once the palm tree has been stumped, the branches are removed, a hole is made in the heart of the palm tree, and a receptacle (calabash/can, etc.) is drilled into the hole at the bottom. Through this hole the tree releases a succulent beverage called "Attan" (palm wine) collected at the bottom through the hole in the perforated part. Photo 1 shows the production of palm wine.



Photo 1: Extraction of palm wine (Shot: Sogbadji, December 2019)

Photo 1 shows the extraction of palm wine. This technique consists first in digging up the palm tree, removing the branches and then placing a canister just at the top where the hole is created to collect the wine directly.

**Marketing of oil palm derivatives in Attogon:** As palm is a cash crop, 99% of all oil palm by-products are intended for the market. The sale of these products follows an internal distribution chain within the district and an external one in the various local, regional and national markets.

**Oil palm by-products distribution chain in Attogon:** In Attogon, oil palm by-products follow two chains: the internal and the external ones. The internal chain is developed because Attogon market is functional and comes alive every five days. Producers and processors deliver their products to local traders and those who arrive from elsewhere. As for the external chain, it is also developed and serves as a relay for the sale of oil palm by-products to national markets such as Sékou, Bohicon and Dantokpa markets in Cotonou, through the wholesale and semi-wholesale traders.

**Actors involved in the marketing of oil palm derivatives in Attogon:** The marketing of oil palm by-products calls up several economic actors. These are producers, processors, wholesalers, retailers, transporters and consumers. The consumer market is composed of two types of consumers: direct consumers and indirect consumers.

Direct consumers are people who use the by-products such as palm oil in the kitchen for their daily diet, Sodabi, etc. Indirect consumers are those who use them for things other than their own food. They are the processors of soap (which is sometimes made from palm kernel oil), the sellers of fried fish and fritters, and the traditional healers. The group of indirect consumers is the most important consumer group, especially for palm oil and palm kernel oil because of the refined oils used by the majority of households. These are also the households that use dry branches as fuel, wood for cooking and fresh branches as brooms.

**Producers:** They are the key players in the marketing of oil palm products. They are all the owners of oil palm plantations in the district. They represent around 6% of the actors. The producer with the smallest area of oil palm plantation has half a hectare (1/2 ha) of plantation. The largest producer in the district has ten hectares (10 ha). According to the producers, the average monthly income from 1 ha of oil palm is one hundred thousand (100.000F) CFA francs. This shows that palm is a very profitable perennial crop.

**Processors:** They ensure the largest part of the marketing of products. They represent 11% of the actors. In fact, they are often in partnership with semi-wholesalers and wholesalers. Some of them produce on orders made by wholesalers. This exempts them from transport costs to the markets. For palm oil, for example (the most widely produced by-product), wholesalers often go to the production sites with vehicles (tarpaulins) to transport the oil, which is already in 25 liter cans. During the investigations, it was learned that the prices offered by the wholesalers most of the time take into account the transport costs. Nevertheless, the processors find this method profitable, because if they had to transport the oils to the markets themselves, it would be less profitable for them. This is in contrast to the processors of palm kernel oil, grid oil, cake oil and basket oil, who prefer to go to the market because it is more profitable for them to do so than to sell it at home.

**Semi-wholesale traders and wholesalers:** These are a group of women who carry out commercial activities in urban areas. They themselves go to the processors in the villages to buy large quantities of the palm oil produced by the latter. They represent 2% of the actors. They have tacit partnership agreements with the processors. In fact, in order to secure the source of supply, they prepay processors for the purchase of raw materials necessary for their processing activities, notably palm nuts from the producers. These are usually prepayments for the oil cans to be produced by the processors. In return, the latter deliver the products of their processing to the customers who have become the wholesale resellers. Their outlets are essentially soap processors, fried fish resellers, retail traders and rarely direct consumers. The latter lead them to sell the oil in small quantities.

**Retailers:** This is a category of actors whose role is quite decisive. They constitute the medium between wholesalers, producers and consumers. They represent about 20% of the actors and obtain their supplies from wholesalers and then proceed with retail sales. They can be found in all markets and their daily turnover varies between 3,500 f and 7,500 CFAF; they are the main organizers of the distribution markets. They often make the products available to consumers by splitting them up according to the demand.

**Transporters:** This category of actors can be described as associated or related actors in the marketing of palm derivatives. They represent 1% of the actors and play the role of facilitator in marketing by ensuring the transport of products from the production sites to the various marketing markets. They fall into two categories: transporters by motorbike and by car.

Motorbike transporters (taxi-moto), commonly known as 'zémidjian', are quite numerous and are employed by 90% of local wholesalers and retailers to transport their products from the places of purchase to the places of distribution. The vehicles used are Bajaj, Jencheng and other motorbikes. Their daily turnover depends on the number of kilometers travelled with the goods. Car transport consists of 404 tarpaulin vehicles and 504 cars (9 seats) and is used by about 10% of local wholesalers or those from surrounding areas.

**Consumers:** Consumers are one of the most important links in the marketing chain of oil palm derivatives. They represent more than 60% of the actors. Without them, the sector would be almost non-existent. They represent the entire population of Attogon district and the populations of other areas where the products processed in the district are marketed. They belong to all ages and all social strata.

#### **Socio-economic effects of the processing and marketing of oil palm products in Attogon**

The rural economy of Attogon district is dominated by agriculture. However, it seems appropriate here to appreciate the choice made by rural populations for the cultivation of oil palm, which has a socio-economic impact on the management of the population's daily life. The profitability of the production and marketing of oil palm by-products in Attogon district is divided into two categories: profitability of processing and profitability of marketing.

**Profitability of processing oil palm by-products:** For some women, processing is the only source of liquid income. Table II shows the average investment cost and profit margin in processing oil palm products.



**Table 2: Presentation of a transformer operating account** (Source: Survey results, December 2019)

Oil palm derivatives	Average investment	Average selling price	Average realised profit
1 x 25 L can of palm oil	5500 F	12.000 F	6.500 F
10 L of palm kernel oil	4.600 F	13.900 F	9.300 F
20 L of Sodabi	5000 F	12.000F	7000 F
1 medium basket	0 F	50 ou 200 F	150 ou 200 F
1 broom	0 F	50 F	50 F
1 rack	0 F	200 F	200 F
1 crab	0 F	50 F	50 F

The analysis of Table II shows that the processing of oil palm derivatives is gainful. Thus, for an investment of 5,500 CFAF for the production of 25 liter cans of palm oil, processors make an average profit of 6,500 CFAF. Likewise, an average investment of 4,600 CFAF yields an average profit of 9,300 CFAF on the production of 10 liters of palm kernel oil. As for the manufacture of baskets, brooms, racks and cakes, the processors invest nothing to obtain the raw material. The average profit made by them on the sale of a product varies between 50 and 200 FCFA. Thus, per market day, they claim to make profits varying between 2500 and 5000 FCFA. This makes the processors want to be part of this sector of activity.

**Profitability of marketing:** Ninety-eight percent (98%) of the oil palm by-product traders we met in the study area are women. According to them, this activity is very gainful. Table IV shows the average purchase price and profit margin achieved by the palm oil resellers in Attogon.

**Table 3: Average purchase price and profit margin realized by the resellers of palm derivatives in Attogon during the production season** (Source: Survey results, December 2019)

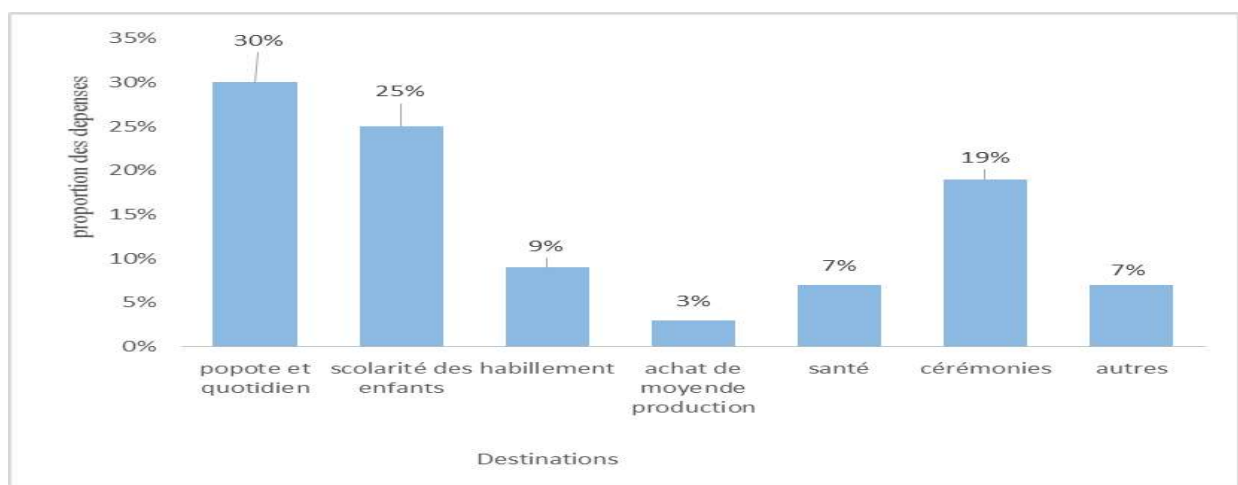
Oil palm derivatives	Average investment	Average selling price	Average realised profit
1 x 25 L can of palm oil	12.000 F	17.000 F	5000 F
10 L of palm kernel oil	13.900 F	20.000 F	6.100 F
20 L of Sodabi	12.000F	18.000 F	6000 F
1 medium basket	150 ou 200 F	250 -300 F	100 F
1 broom	50 F	100 F	50 F
1 rack	200 F	500 F	300 F
1 crab	50 F	100 F	50 F

The analysis of this table shows that the trade in oil palm derivatives is gainful. For example, a retailer of the local drink 'Sodabi' makes an average profit of 6,000 CFAF on the sale of 20 liters. As for palm oil and palm kernel oil traders, they make a profit of 5,000 CFAF and 6,100 CFAF respectively after the sale of a 25 liter can of palm oil for one and 10 liters of palm kernel oil for the other. The sale of other products such as baskets, racks, brooms and cakes is also profitable.

The profits made by the various actors involved in the production and marketing of oil palm products in Attogon District are used for various purposes.

**Destination of incomes:** The processing of oil palm products is an important source of income for the actors involved. The profits made by the latter enable them to meet several needs (Figure 3).

**Figure 3: Destinations of profits from oil palm derivatives** (Source: Survey results, December 2019)



The analysis of Figure 3 shows the importance of family maintenance, with 30% of income going to food and daily expenses. Children's schooling also plays a significant role in these expenses. It consumes 25% of the income, especially as parents are nowadays more interested in the future of their offspring. The organization of ceremonies consumes 19% of income, while

clothing, the purchase of means of production and the family's health take up 9%, 3% and 7% of income respectively. The remaining 7% of income is intended for other purposes such as various protective sacking or savings made by the actors. The production and marketing of oil palm derivatives remain profitable activities in Attogon district in terms of the profits they generate for the stakeholders. However, despite this advantage, stakeholders face difficulties in carrying out their activities.

### Suggestions

Based on the above observations, the following suggestions are made to public authorities and private agricultural institutions. Thus, for a harmonious development of the national economy, the agro-industrial sector has a significant role to play. Indeed, an effort to revitalize and support the traditional processing sectors is necessary.

In view of the constraints to production and marketing mentioned above, it is important that measures be taken to ensure the smooth running of production and marketing of oil palm derivatives in the district of Attogon in the commune of Allada. Thus, it is necessary, among other things, to create an active cell within agricultural institutions whose main objective will be to provide support and direct advice to traditional processing units; to facilitate the granting of credit to production units by financial institutions; to create a palm nut and palm kernel collection body with a substantial storage facility; to create a quality control system for the oils produced; and to organize the actors into cooperatives.

### CONCLUSION

At the end of this research on the production and marketing of oil palm by-products in the Attogon district in the commune of Allada, it should be noted that the oil palm by-products identified in the Attogon district are: palm oil, palm kernel oil, the local drink "Sodabi" made from palm wine, baskets, broomsticks, racks and palm cake.

The analysis of the results shows that the processing of oil palm derivatives is gainful. For example, for an investment of 5,500 francs for the production of 25 liter cans of palm oil, women processors make an average profit of 6,500f. Likewise, an average investment of 4,600 francs yields an average profit of 9,300 francs for the production of 10 liters of palm kernel oil. As for the manufacture of baskets, brooms, racks and cakes, the processors invest nothing to obtain the raw material. The average profit made by them on the sale of a product varies between 50 F and 200 F. Thus, per market day, they claim to make profits varying between 2,500 and 5,000 F. Consequently, the processing of oil palm derivatives in Attogon district is gainful. This makes the processors be part of this sector of activity. But despite this economic advantage, the actors are confronted with difficulties in the line of their activities, to which solutions have been proposed in order to further boost the sector.

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