

## Processing and Marketing of Rice-Derived Products in the Township of Natitingou, Benin

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### Abstract

In view of the profound changes that have taken place in agriculture, rice has become a major consumer crop. Thus, in addition to its important role in food security, rice is increasingly being transformed into small-scale by-products that are still poorly understood and marketed. The objective of this research is to study the process of transformation and commercialization of rice products in the township of Natitingou.

The methodological approach adopted consists essentially of collecting data from 78 actors, mainly processors and traders of rice derivatives, processing the data and analyzing the results obtained using the SWOT model.

The analysis of the results revealed that the process of processing rice derivatives in Natitingou takes into account the parboiling of rice during its transformation, the transformation of parboiled rice into a derived food product, the hygiene rules observed in the processing room and the fermentation of rice flour for consumption. Nearly 80% of those surveyed said that rice derivatives are processed with archaic tools, and marketing is not very profitable. Despite this situation, rice processing has made it possible to obtain several by-products such as cookies, cakes, *akpan*, and even *tchoucoutou* or *tchapkalo*, etc. Finally, the marketing of these products is done through the marketing used by the groups, the strategies of sale and distribution price of the products derived from rice, the publicity and means of communication for the sale of these products.

**Keywords:** Natitingou, rice- derived, transformation, merchandising, products.

### Introduction

In the early 1990s, the annual global volume of production was around 35 million tons (milled rice equivalent), and reached almost 410 million tons at the end of the last millennium (WARDA, 2004, p.4). In 2014, world production of brown rice amounted to 740 million tons compared to only 585 in 2003 (FAO, 2015, p.3). Rice is the second cereal cultivated and the third production consumed and exported in the world after wheat and corn, whose sown areas reach 149 million hectares cultivated for a production of around 600 million tons per year in the region. world (R. Hirsh, 2001, p.2).

In Africa, rice cultivation is practiced in nearly 40 countries. It is a very valuable activity for the populations of certain areas of West and Central Africa ensuring the food security of nearly 20 million rice farmers and directly supports nearly 100 million people, if we allow an average of 05 people per peasant family (WARDA, 2004, p.6). Rice production in West Africa is expected to increase very slightly in 2017/18 to exceed 10 million tons (FAO, 2015, p.3).

Rice production in Benin remains marginal in the sub-region and represents only 0.31% of the total rice production in West Africa, which is of the order of 6,136,000 tons (FAO, 2004, p.9). Rice is the second most

widely imported cereal after wheat. National production increased fivefold between 1990 and 2000, rising from 10,940 tons Paddy in 1990 to 52,441 tons in 2000 (MAEP / INRAB, 2005, p.7).

In most countries of Africa, agriculture is the most important business and the lifeblood of economic development. Indeed, it is absolutely essential to the growth and development of sub-Saharan Africa (P. Odjo, 2010, p.15). It is aware of this situation that developing countries have based their development policies on agriculture with a view to meeting food needs (P. Adegbola, 2005, p.18).

The Beninese economy remains based on agriculture. It employs nearly a large part of the working population (over 60% of active men and 36% of working women) and contributes around 38% to the formation of GDP (UNDP, 2011, p.3)

Benin, with more than 8,000,000 inhabitants in 2008, is a country whose agricultural sector employs 70% of the working population and contributes nearly 32% to the Gross Domestic Product (INSAE, 2009). Agriculture remains a sector rich in opportunity in terms of production, exploitation and processing. The predominant speculations are among others cassava, maize, rice, and cashew nut. The least exploited are among others, shea, palm oil, fruits, vegetables (S. Bio Goura, 2006, p. 76). Rice is a cereal crop which is arguably one of the most recognized and cultivated food products around the world. It represents 27% of the energy intake of inhabitants of Third World countries and 24% of their dietary protein (FAO, 2004, p.16).

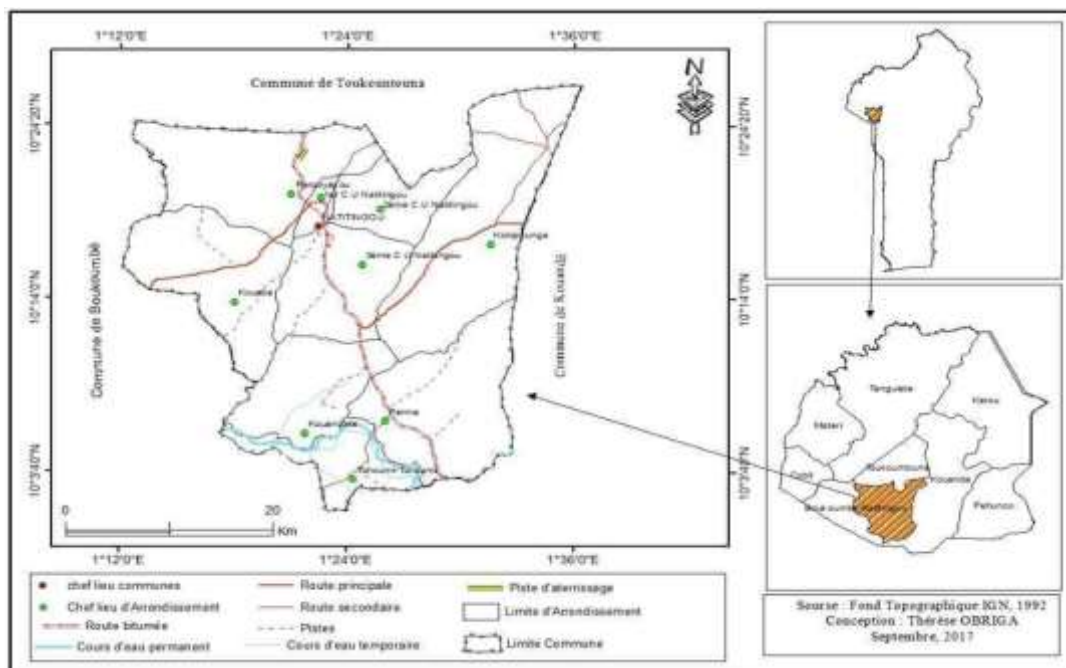
In Benin, the rural sector employs 70% of the working population. It contributes 39% to the constitution of the GDP and contributes 15% to State revenue (CUMA BENIN, 2008, 17).

Rice, a cereal with high potential cultivated in lowlands and river valleys, deserves more intensification actions in order to seize market opportunities linked to the soaring prices of staple foods and to consolidate stocks. food security especially as its production has evolved in recent years. The question of food crop production arises in terms of income or gain that this production provides after trade (DPP / MAEP Bénin, 2010, p.9). The observed production persistence is due to the low level of individual production income despite the efforts of the peasants who paradoxically do not derive substantial profits (income) from their efforts (S. Bio-Goura, 2006, p. 31). However, food products such as corn, rice, cowpeas, chili peppers and tomatoes, which are abundantly cultivated, should enable the populations to achieve exploits to meet their basic needs in the absence of an integration policy for Benin's external markets (DPP/MAEP Benin, 2010, p.18).

It is in the face of these observations which highlight the place occupied by rice in the production of food products in the township of Natitingou, a question arises: What are the mechanisms of transformation and marketing of rice derivatives in the township of Natitingou? The overall objective of this research is to analyze the processing and marketing mechanisms of rice derivatives in the township of Natitingou.

### **1. Geographical presentation of the township of Natitingou**

Geographically located in the North-West of the Republic of Benin, between 10 ° 3'40 "and 10 ° 24'20" North Latitude, and 1 ° 12 'to 1 ° 36' East Longitude, the township of Natitingou covers an area of 3,045 km<sup>2</sup> or nearly 12.8% of Atacora department. It is bounded to the North by the township of Toucountouna, to the East by the township of Kouandé, to the South East by the township of Copargo to the South-West, and to the West by that of Boukoumbé. The population is 103,843 inhabitants according to RGPH4 (INSAE 2013). The figure 1 illustrates the geographical location of the township.



**Figure 1: Geographical location of the township of Natitingou**

The township of Natitingou is located in a valley at the foot of the Atacora mountain range which rises to 641 meters above sea level. It has 65 villages and city districts spread over nine (09) districts including three (03) urban namely Natitingou I, Natitingou II, Natitingou III and six rural: Perma, Kouandata, Tchoumi – Tchoumi, Kotopounga, Péporiyakou and Kouaba. The geographical or administrative position is very favorable to the inhabitants of the region for the exercise of many activities such as: trade, crafts, agriculture, industry, tourism and also other processing activities of many products like soybeans, fonio, peanuts, rice, etc.

## 2. Data and methods

This is the process used to collect data, process it and analyze the results. One approach involves determining the sample and the study population.

### 2.1. Sampling

The sampling technic adopted for this work is based on a survey of processors and traders of rice products. For this reason, the study environment is subdivided into three research units which are: the Sourou Bayayé rice mill, the Tchirimina Oga alternative rice mill and the traders. The choice of interviewees is based on the following criteria: Age; gender; the duration of the activities of the actors in the township of Natitingou. The resource persons are chosen according to their responsibilities in the processing of products derived from rice and their marketing in Natitingou.

The sampling mode is random, which made it possible to objectively judge the value of the estimates. During these surveys, the resource persons, the agents of the Sourou Bayayé rice mill, and of the alternative rice mill (men or women) were interviewed. For the simple fact that, sampling is done on processors and traders in order to have reliable results. The choice of rice mills is based on the importance of processing activities. Thus, two (02) rice mills were chosen in the Municipality. Table I lists the choice of two rice mills in the township of Natitingou, including that of Sourou Bayayé and that of Alternative Oga.

**Table I: Number of actors surveyed in the various rice mills as well as resource persons and supervisors**

Rice mills Activities	Sourou Bayayé	Alternative Ogar	Total	Percentage (%)
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Transforming	6	6	12	15,38
Traders	30	30	60	76,92
People resources	2	2	4	5,13
Framers/ Supervisors	1	1	2	2,56
Total	39	39	78	100

**Source:** Field survey results, August 2019

Table II shows the different actors including processors, traders, resource persons and supervisors, met during the collection of field data in the rice mills and groups of Natitingou. Indeed, the proportions vary according to the number of actors surveyed. A total of seventy-eight (78) respondents were approached as part of this research.

## 2.2. Data collected and methods of analysis

Individual interview with populations using interview guides and questionnaires is the method used to collect the data. It enabled actors to identify the advantages favorable to the processing and marketing of products derived from rice in the township of Natitingou, to describe the socio-economic effects of the processing and marketing of products derived from rice in the region. The township of Natitingou and to propose solutions to strengthen the processing and marketing of products derived from rice in the township of Natitingou

The data collected mainly concerns the processing and marketing of rice derivatives in the township of Natitingou with a view to improving the observed situation. The use of this methodological approach has led to conclusive results.

## 3. Results

The main results obtained are organized around the advantages favorable to the processing and marketing of products derived from rice in the township of Natitingou, the socio-economic effects of the processing and marketing of products derived from rice in the township of Natitingou. then solutions to strengthen the processing and marketing of products derived from rice in the township of Natitingou

### 3.1. Fundamentals of rice processing and marketing in Natitingou

#### 3.1.1. Human environment

The population of the township of Natitingou is estimated at 103,843 inhabitants, including 50,998 men and 52,875 women according to the last census (INSAE, 2013). The township of Natitingou is made up of 65 villages and city districts spread over 09 districts which are: the urban districts of Natitingou (1 to 3); and the rural districts (Péporiyakou, Perma, Koundata, Tchoumi-Tchoumi, Kotopounga and Kouba). The third (3rd) arrondissement of Natitingou is the most populous with 22,011 inhabitants and Kouandata the least populated with 4,915 inhabitants (INSAE, 2013). 68% of the population lives in rural areas, and 32% in the 03 urban districts.

The main movement of the population is the rural exodus and the displacement of young people towards Borgou, Alibori, Collines at the national level in search of fertile land then towards Nigeria and Togo. Through the mining of Perma gold and ornamental stones; cotton cultivation; and the support of certain development partners and the Beninese State through its program to fight poverty, this once important phenomenon is now on the decline (S. Adam and M. Boko, 1993, p.29).

The most important socio-cultural groups in the municipality are the Waama and the Bètammariè 60%. We also meet the Dendi, the Batombou, the Fulani, the Yorubas, the Fon, the Natimba. The exploiters of ornamental stones are mainly the Bètammariè and the Waama (K. S. Adam and M. Boko, 1993, p.21).

Like the rest of the country, three major religions coexist peacefully in the city of the "Nanto". These are: Animism or traditional religion practiced by the majority of the population; Christianity making up the group of Catholics, Protestants, heavenly Christianities and many evangelical churches; and Isla

However, the presence of these different religions has no effect on agricultural activities (K. S. Adam and M. Boko, 1993, p.25).

The habitat in the town is mixed. On the rural side, there is a traditional type of habitat (tata, round huts and rectangular huts) strongly threatened by fires due to the precariousness of construction materials; and on the urban side, a modern type of housing with modern and sustainable construction materials (Afrique Conseil, 2006, p. 13).

The population of Natitingou has a young and abundant workforce, favorable to the practice of several activities related to the processing of cereal products, particularly that of rice, a source of employment for young people. The practice of these rice processing activities generates income and contributes to reducing the unemployment rate (Mairie, 2018. p. 53).

### **3.1.2. Economical activities**

The main activities practiced by the population are agriculture, animal husbandry, handicrafts, tourism, trade, transport and mining.

As in most Beninese communes, agriculture is extensive and is done on a slash-and-burn basis in the township of Natitingou. The agricultural products are: yam, cassava, sweet potato, tarot, sorghum, millet, maize, fonio, peanuts, cowpeas, sesame, soybeans, chilli, tomatoes, nutsedge, cotton, okra, rice etc. A large part of the quartzite miners in Natitingou are engaged in agriculture. Likewise, animal husbandry is often also integrated with agriculture in most households. The species reared are cattle, goats, sheep, pigs, poultry (chicken, guinea fowl, duck). There is a strong development of craftsmanship in the area. In general, one meets the artisans of production and processing such as local beverage makers, stone and wood workers, and service artisans.

The town of Natitingou has significant physical potential including a mountainous landscape, caves and undeveloped ponds, a waterfall in Kota where a hiking trail is set up in the tourist area. In addition, the existence of a museum which houses several cultural elements and objects and the presence of several hotels in the town of Natitingou, attracts many tourists, especially Europeans. These tourists are often interested in products made from ornamental stones.

Apart from the chain trade of buying and selling agricultural products and providing services in Natitingou, the inhabitants are engaged in the trade of ornamental stones. According to the steering committee of the PDC of the township of Natitingou (2018), the commercial sector operates in an informal environment and participates in the economic dynamics of the municipality.

In terms of transport, the access roads to the town's capital have visibly improved. Two-wheeled vehicles, cars and trucks are the main means of transportation in Natitingou. The RINE 3 which crosses the town of Natitingou facilitates traffic and exchanges with external partners, then promotes the transport of ornamental stones to Tanguiéta and the south of the country. In addition, the tracks connecting the production sites to the points of sale are defective.

## **3.2 Process of transformation of products derived from rice in Natitingou**

### **3.2.1 Parboiling rice during processing**

From a technical point of view, parboiling is a process that consists of pre-cooking paddy rice previously hydrated to a water content of around 30%. This pre-cooking allows gelatinization of the starch which loses its crystalline structure to form complexes ensuring strong grain cohesion. Parboiling therefore improves the technological quality of the rice (husking yield) by resoldering the cleaved grains, thus reducing the rate of breakage. It increases the organoleptic (firmness and absence of stickiness) and nutritional qualities by enriching the almond with water-soluble vitamins (vitamin B) and minerals initially concentrated in the pericarp. Parboiled rice therefore has certain technological, organoleptic and nutritional qualities.

The purpose of parboiling is to produce physical (color, clarity and texture of the grains), chemical and organoleptic (taste) changes in the grain. These modifications are beneficial to the processor and the consumer from a practical, economic, and nutritional standpoint.

Consumers generally agree that parboiled rice has good culinary, taste and nutritional qualities. Even if it requires a longer cooking time than white rice, parboiled rice swells better and therefore appears more economical to the housewife.

### 3.1.2 Rice parboiling process

Successful parboiling depends on compliance with the various necessary operations. Operations as much as they are fundamental. They take place in the following chronological order:

- **Choice of raw material (paddy rice)**

This step is essential, because the quality of the paddy rice depends on the quality of the husked rice to be obtained. It is about stocking up on paddy rice that is as free as possible of impurities. This facilitates the other operations and promotes a good dehulling yield. Mixing varieties should be avoided as much as possible. It is therefore necessary to avoid buying paddy that is not uniform in terms of varieties and also to refrain from mixing paddy of several varieties yourself to conduct the processing. At the GERME NGO center, two varieties are processed: IR 841 and NERICA 20.

- **Cleaning of the chosen rice**

It is an operation which allows the rice (paddy) to be rid of all its impurities (empty, immature, blackened or rotten paddy, twigs, dust and others). This involves winnowing, sorting, washing the rice (paddy) that you want to steam. Thus plate 1 shows the washing and sorting of paddy rice.

The board below shows the different ways of cleaning the paddy.



**Plate 1: cleaning the paddy to be steamed**

**Shooting:** Obriga, August 2019

The paddy is sorted and washed before going to draining, that is, put in a colander to filter the washing water.

Plate 1 shows that the available paddy is washed properly in a basin of water in the proportions of two (2) volumes of paddy for at least three (3) volumes of water. When washing, remove any immature or empty paddy grains that float on the surface of the water by collecting them with a small colander. The grains of sand which settle at the bottom of the basin should also be discarded after having carefully collected the paddy. This first wash can be done in three times.

- **Draining the rice**

Washed paddy should be drained for a few minutes to get rid of all the washing water. All you have to do is transfer the washed paddy into a clean basket on a stand that allows the water to drain. The photo below confirms the draining of the rice.



**Photo 1: Draining the Paddy**  
**Shooting:** Obriga, August 2019

After sorting the paddy, it goes into draining for a few minutes as shown in photo 1 and then goes into hot water soaking.

- **Soaking paddy in hot water**

This operation is necessary to provide the starch (carbohydrate compound) with a quantity of water which is sufficient to gelate it completely. During this operation, the paddy grains absorb a large amount of water. Thus, the moisture content of the grains drops from 13% to 30-35% at the end of the soaking, which lasts 10 to 12 hours (soaking between 8 p.m. the day before and 8 a.m. the next day).

It is an operation which consists of pouring the washed and drained paddy into a pot containing clean water placed on the hearth for heating. This water should submerge the paddy. From time to time, you need to stir with a wooden spatula in order to have an evenly heated product.

When the water temperature reaches around 80 ° C, that is, when the first bubbles appear on the surface of the water, the heating must be stopped. The pot should therefore be removed from the preheating hearth to allow the paddy to cool completely in the preheating water. This heating operation generally lasts between 20 and 30 minutes for 24 kg of paddy. Care is also taken not to cover the pot when heating. The heated paddy is removed from the heat and left to cool for a time of between 10 and 12 hours. The preheating and cooling operations must be done late at night so that the cooling takes place during the night.

This makes it possible to carry out the actual steaming the next morning and to benefit from the sun for drying from noon.

For a good soaking, make sure that:

- grain size is uniform. This grain size determines the depth (thickness) of water penetration;
- the grains are completely covered by the lumps. If not, the shape and color of the grains are affected.

The photo below announces the hot water soaking of the Paddy



**Photo 2: Soaking the Paddy in hot water**  
**Shooting:** Obriga, August 2019

This is the hot water soaking that precedes steaming the paddy. It is done the day before cooking.

- **Second washing and draining**

Early in the morning, the cooled paddy was taken out of the preheating water and then washed in clean water. Once again, care is taken not to soil the paddy with grains of sand or other impurities. The paddy washed in this way to obtain a colorless washing water is drained in a clean basket placed on a container which collects the water.

- **Steam cooking: Steaming**

After washing the Paddy, it switches to steaming as shown in photo3.



**Photo 3: Steaming the Paddy**  
**Shooting:** Obriga, August 2019

This operation makes it possible to reach a “gelatinization” temperature of the paddy of 70 ° C. After draining, the paddy is poured into the parboiling tray inserted in the pot placed on the hearth. This pot should contain about 15 to 20 liters of water (for a large pot size No. 25). The water level will not exceed the first mark at the bottom of the pot.

Particular care must be taken to ensure that the bottom of the container containing the paddy does not touch the surface of the water. You must first cover the paddy put in the bin with a clean cloth or a jute bag and then close the device with its cover ensuring that the cover adheres to the wall of the bin by tightening the loops.

When the adhesion of the steamer to the pot is not perfect and there is a risk of steam leakage, the operator must cover the walls of the pot with a cloth. The loaded device is heated until the operator notices the steam coming out through the junction of the tank and the cover. From this point on, the bin should be opened to check the condition of the balls. The steaming is stopped when the steam appears on the surface and the balls surrounding the grains begin to open. This operation can last from 30 to 40 minutes. The control is



done by exerting between two fingers (middle-thumb) a pressure on the paddy which releases the cargo rice. So, there is no need to wait for all the balls to open. When on the surface, a few grains of paddy rice burst; this is enough to stop the steaming.

- **Drying of parboiled rice**

Drying takes place in two forms: drying in the shade and then in the sun as shown in photo4



**Photo 4: Drying the steamed paddy**

**Shooting:** Obriga, August 2019

After pre-cooking, the parboiled paddy must be dried. This drying is done on a clean unperforated tarpaulin or a concrete drying area or even the veranda of the houses. Well-parboiled, well-dried and well-husked paddy has rice grains of uniform color, shiny, free from foreign bodies and with a low breaking rate (less than 15%). The drying is done in two phases:

- **Phase 1** is that of drying in the sun. This first phase consists in spreading the paddy steamed in the sun in a very thin layer. Exposure to the sun is for 1 hour 30 minutes to 2 hours. Almost 100% of the respondents do the drying in the sun.
- **Phase 2** is that of drying in the shade. After drying in the sun, collect the paddy and then spread it out in the shade under a shed or inside the hut / room to continue drying until the paddy is "completely dry" (approximately 10% humidity. Drying in the shade lasts at least 16 hours of time. Conveniently, the end of drying in the shade is marked by the easy removal of the bales by simply rubbing the paddy in the palms of both hands This makes the paddy ready for husking or storage Almost 70% of respondents after sun drying switch to shade drying.

During the two drying phases, it is necessary:

- ensure that the paddy is not contaminated by foreign bodies;
- run your hand from time to time in the paddy in order to present all faces to the sun;
- accelerate and allow uniform drying of all grains.

### **3.2.3. Processing of parboiled rice into a derived food product**

Food processing is an operation which consists in obtaining from a raw material a finished product ready for consumption. There are therefore several rice processing techniques. One of them is the making of sweet biscuits made from rice, *akpan* from rice, *tchoucoutou* from rice, biscuit from rice, etc. For the rice cracker, the raw materials used are among others: eggs, butter, baking powder, sugar, nutmeg, flavor (coconut and / or pineapple).

The processing section is a unit in which the rules of hygiene are respected at each level of production.

### **3.2.4. Hygiene rules observed in the processing room**

- Thoroughly clean and disinfect the room
- Clean the materials
- Regularly empty the bins

- Separate workplaces
- The rules observed to avoid product contamination
- Wear the correct outfits: a blouse, a cap and a bib
- Remove all jewelry from the arm and forearm
- Wash your hand with soap and thoroughly
- Treat all injuries to the arm and forearm with a bandage
- Avoid speaking while handling raw materials

- **Shelling of parboiled rice**

In the dehulling process, the following table shows the quantities of raw materials used.

**Table III: Quantities of raw materials used**

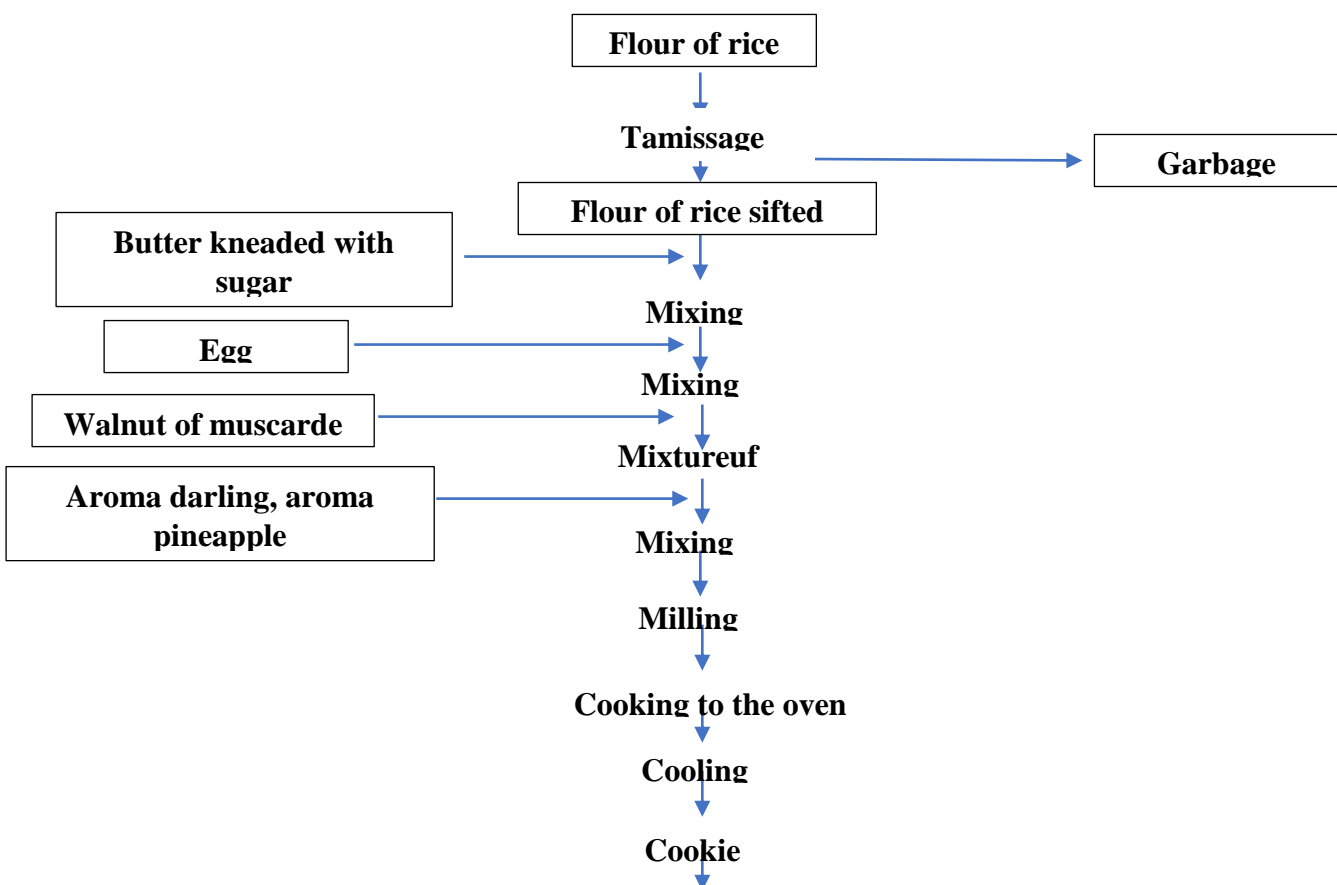
Product	Flour of rice	Sugar	Butter	Yeast chemical	Eggs	Walnut of nutmeg	Aroma of darling	Aroma pineapple
Quantities	1kg	300 g	400 g	One spoon of coffee	10	One spoon	Half - bottle	Half - bottle

Source: Field data, 2019

Table showing the different ingredients as well as their measurement for the manufacture of the rice-based biscuit.

### 3.2.5. Process of transforming rice into biscuit

This process indicates the different stages of the transformation of the biscuit made from rice flour. It looks like this:



### Packing

### Diagram showing the stages of processing rice into a biscuit

The photo 5 is of a biscuit made from rice processing.



**Photo 5: Conditioned biscuit made from rice**  
Shooting: Obrica, August, 2019

Today, almost any transformation of cereal food products is possible with rice, therefore no longer necessarily needs wheat to make biscuits as shown in photo 5.

#### 3.2.6. Fermentation of rice flour for consumption (*Akpan* of rice)

You can also transform rice by fermenting it for consumption (*akpan* of rice). It is an aperitif of the body. This is another form of processing made from rice but obtained by fermentation of the rice flour as shown by the process of transforming rice into *akpan*.

#### 3.2.7. *Tchoucoutou* rice

Regarding the rice *tchoucoutou*, it is the same process with the local *tchoucoutou* made from sorghum or other cereals. The difference is that the rice paddy is germinated here.

A brief process of obtaining a local drink from rice is as follows:

- after having ground the paddy of the germinated rice, we move on to diluting the flour and then to the first preparation;
- on the second day, the bran and the juice are separated by filtration. The juice obtained passes the second preparation;
- after cooling, the drink is obtained. Fermentation takes place at will or not fermented.

There are also other transformations made from rice such as: appetizers; rice dough

### 3.3. Marketing of rice products

Once transformed, the various groups organize themselves for the flow (sale) of their products. They build relationships with consumers and create appropriate strategies for the marketing of these products. They use thoughtful and structured ways, but also profitable ways. Each association mobilizes all the means at its disposal to sell its products. The 85% of the population adopts two forms of marketing: full-time commodity trading, and part-time trading.

The commercialization process goes through marketing where 80% of merchants have been able to gain the trust of individual consumers, while 10% are processors and observe the enthusiasm of the populations around each product and plan which ones to prioritize.

In addition, traders also use specific information to research the profile of each of the players; because for them, the more information you get, the easier it is to develop an effective marketing plan. Information among other things related to the size of the target market and trends in the target market, national and international market, individual consumers, shops, universities.

This analysis brings out the characteristics and advantages that make the customer want to buy the rice. A good sales and after-sales service is an essential element to ensure a positive image of an association and then makes it possible to define effective strategies for the sale and price distribution of products derived from rice.

Parboiled rice is packaged in sachets and then in sacks, the prices of which are set according to the quantity of sacks and sachets. This is shown in Table IV.

**Table IV: Summary of the quality, quantity and price of parboiled rice**

Quality of rice	Quantity	Price (FCFA)
Rice steamed	1 kg	500
Rice steamed	5 kg	2500
Rice steamed	25 kg	12000
Rice steamed	50 kg	24000

Source: Rice mill: Sourou Bayayé, field data, 2019

The price of packaged derivatives is set according to the quality of each product such as the biscuit, the cake. Plate 2 shows how the rice is processed before it is packaged.



**Plate 2: Processing and conditioning of rice.**

Shooting: Obriga, August 2019

The plate 2 shows how the rice is processed before it is packaged. To this end, after parboiling, the husked rice is sorted and then packed in the bags: this is the packaging. Then comes the storage of products and the marketing of these products.



**Plate 3: storage and marketing of rice**

Shooting: Obriga, August 2019

The plate 3 presents a form of preservation of the rice packaged in the containers for a short period, then its marketing.

### **3.4. Difficulties and approaches to solutions related to the processing and marketing of products derived from rice in the township of Natitingou**

#### **3.4.1. Difficulties related to the processing and marketing of rice products**

The processing and marketing of products derived from rice encounter enormous difficulties in terms of both supply and parboiling.

Regarding the obstacles related to supply, it is necessary to note the quality of paddy rice, the climatic vagaries which lead to a bad harvest of the producers and prevent them from having a good yield available for the supply of the processors, the difficult conditions producers to put paddy on the market, the lack of financial means for producers to have large rice fields, insufficient means of transport for processors to transport paddy during supply.

As for the difficulties linked to the processing of products derived from rice, these include, among other things, the problems of the intensive deployment of the physical strength of the processors which is slowly destroying them; insufficient parboiling equipment which hinders processing activities and timely delivery of products; lack of protection and direct contact of transformers with fire; insufficient drying air portions.

The marketing of rice is also experiencing some difficulties. This is mainly the competition of local rice with those imported from China, Japan in particular; and the lack of a policy to promote local rice. To this must be added the sluggish sale of products derived from rice processing during the rainy season, the long storage period of the products leading to the loss of their quality and taste, the insufficient credits allocated to traders to encourage the Beninese commercial sector.

#### **3.4.2. Approaches to resolve the difficulties observed around the processing and marketing of rice-derived products**

The solution approaches concern: sorting the paddy, which is an important step in eliminating wild paddy and some solid waste; washing the paddy with clean water each time to obtain a clean paddy (the last washing water must be clear and limpid, without color), drying the parboiled paddy in thin layers.

### **3.3. Suggestions from the investigations**

The suggestions are made at the place of several actors.

Regarding the members of the association, special attention must be paid to the quality of the paddy purchased to carry out the processing and rigorously conduct all stages of parboiling and rice processing.

With regard to the association and its managers, each of the constituent groups must be energized; specialize the group in the choice of rice varieties; build up quality paddy stocks to ensure the functionality of the groups throughout the year; look for outlets for the easy flow of processed rice.

For the affiliated NGOs, it is advisable to facilitate the obtaining of credit by the association for the constitution of a working capital to allow the purchase and the storage of a sufficient quantity of paddy to ensure a permanent functionality. ; promote the contractualization of paddy rice purchases between the association and individual rice growers or in groups or their regional umbrella organization (URPR) to ensure regularity of supply and also the quality of the paddy purchased; support the association in the construction of a store for the storage of paddy and processed rice; support the association in the search for outlets for the sale of husked rice; support the group in identifying a label to ensure the traceability and visibility of processed rice.

### **3.5. Discussion**

The main results obtained are organized around the advantages favorable to the processing and marketing of products derived from rice in the township of Natitingou and the socio-economic effects of the processing and marketing of products derived from rice in the township of Natitingou.

Regarding the foundations of the processing and marketing of rice-derived products in the township of Natitingou, it should be said that they are a function of the human assets and the mainly agricultural economic activities of the municipality. As a result, rice is produced in large quantities and remains a commodity widely consumed by the populations of the township of Natitingou. This result is identical to that of R. Hirsch (2001, p. 7) who asserts that rice is the second cereal cultivated and the third production consumed and exported in the world after wheat and corn. Likewise, according to FAO (2004, p. 3) and UNCTAD (2004, p.8), rice is a cereal crop which is arguably one of the most recognized and cultivated products around the world. This globally cultivated culture is not marginalized in Benin. The issue of development in Africa, agriculture remains and remains the heart of economic development. G. Trebil and M. Hossain (2004, p.108) and P. Odjo (2010, p. 39) follow the same logic and affirm that this culture is absolutely essential to the economic growth of sub-Saharan Africa. This is the reason why developing countries have based their development policies on agriculture in order to meet the satisfaction of food needs.

Regarding the transformation of rice and its socio-economic effects, it should be remembered that many products are derived from the processing of rice. We can note bread, tchoukoutchou, cookies, etc. These products allow the actors of rice production and processing to meet their needs from the marketing of different products. Due to the consumption of products and the growing expression of demand, J-L. Maurer (1987, p.227) and P. Adegbola (2005, p.19) assert and maintain that population growth and increasing needs demand agricultural production because of the increased demand for food. Likewise, speaking of the overlap between city and countryside ACEB (2018, p.17) points out that “in tropical Africa, cities are perceived not only as places of social success but a large consumer of food products; which attracts rural populations”. Following this, C. Danvi and P. Assibge (2003, p.6) then ONASA (2003, p.13) show that the cost of transporting goods represents 60% of total marketing expenses. In addition, there are communication difficulties between traders in the various food markets such as rice derivatives.

## **Conclusion**

This research analyzes strategies for processing and marketing products derived from rice in the township of Natitingou. The groups are hampered in finding new strategies, methods, and techniques more efficient in the processing of rice, so that it is not only considered as a product of raw consumption but also, a product that can be transformed into other by-products. in the township of Natitingou. This subject directly dismays certain development objectives of the processing and marketing sector in the township of Natitingou, the food self-sufficiency of new methods of processing agricultural products, especially rice.

In general, rice processing is a fairly profitable activity for farmers in the said commune. The only handicap is the still negligible burden of financial resources. With all the associations or groups of women in the different processing activities, parboiled and husked rice is packaged or passes through different processing levels. But apart from the benefits of rice, processors who strive in these activities face a great deal of difficulty. Such a sacrifice would contribute to the satisfaction of the needs of the population and at the same time to the needs of the processors.

This profit for processors is increasing and this is explained by the continuous evolution of the transformation which is justified by new working methods and techniques. The increase in the number of processors and traders of rice products in the commune, which has risen from 45 to 85%, confirms the verification of the hypotheses. This also means that most people are no longer unaware of the potentialities arising from rice in the commune. It would therefore be desirable to think about the organization of the transformation system. Likewise, it is important to broaden communication between processors, traders, actors promoting the rice sector and make available to them a microfinance policy for better rice processing for the benefit of the satisfaction of the population of Natitingou and its surroundings.

## **Bibliographical references**

1. **ACED, 2018**, Le marché des produits maraichers dans le Sud-Bénin : dynamiques et perspectives, Centre d'Actions pour l'Environnement et le Développement Durable (ACED)-Bénin, 33 p. [www.aced-benin.org](http://www.aced-benin.org).
2. **ADAM Kolawolé Sikirou et BOKO Michel, 1993**, Le Benin. Les éditions du flamboyant, EDICEF, 93 p.
3. **ADEGBOLA Patrice, 2005**. Facteurs socio-économiques déterminant l'adoption et la diffusion des nouvelles variétés NERICA du riz au Bénin. Rapport technique. PAPA/INRAB/MAEP et ADRAO. Février 2005.
4. **ADRAO, 2004**, Improving Rice Grain Quality and Competitiveness through Better Harvest and Post-Harvest Technologies. Bamako, Mali.
5. **Afrique Conseil, 2006**, Monographie de la Commune de Natitingou, Mission de Décentralisation, MDGL, Bénin, 56 p.
6. **BIO GOURA Soulé, 2006**, Production et commercialisation du gari au Bénin : Etude sur la sécurité alimentaire au Bénin, ONCI - GTZ n°5,124 p.
7. **CNUCED, 2004**, Le riz (2004), [www.unctad.org](http://www.unctad.org)
8. CUMA BENIN, 2008, Programme de Mécanisation partagée au Bénin, Cotonou, 47 p.
9. **DANVI C. Célestin et ASSIGBE Paulin, 2003**, Développement de la riziculture au Bénin contraintes, atouts et perspectives. Publication présente de la 24ème session du conseil des ministres de l'ADRAO. MAEP. Cotonou, 2003 pp. 3-11
10. **DPP/MAEP Bénin, 2010**, Stratégie nationale pour le développement de la riziculture au Bénin, 26 p.
11. **FAO, 2004**, Annuaire statistique de la FAO (FAOSTAT). Vol 1, [www.org](http://www.org), 32p
12. **FAO, 2004**, Production care BOOK, Vol. 58. Rome. Elaboration d'un plan national de relance du riz [w.w.w.org](http://w.w.w.org), 48 p.
13. FAO, 2015. Annuaire statistique de la FAO (FAOSTAT). [www.fao.org](http://www.fao.org)
14. **HIRSCH Robert, 2001**, Le riz en Guinée ou la difficulté de concilier l'auto-suffisance et la lutte contre la pauvreté. Note rédigée à l'issue d'une mission de deux semaines effectuées en avril-Mai 2001. 11 p.
15. **INSAE, 2013**, Recensement général de la population et de l'habitation IV (RGPH4) : Que retenir des effectifs définitifs de la population de 2013 ? Direction des Etudes Démographiques, 33 p.
16. **Mairie de Natitingou, 2018**, Plan de Développement Communal, Mairie de Natitingou, Mission de la Décentralisation, MDGL, Bénin, 129 p.
17. **MAURER Jean-Luc, 1987**, *Modernisation agricole, développement économique et changement social : le riz, la terre et l'homme à Java*, *Archipel*, 34 pp. 227-229. [www.persee.fr](http://www.persee.fr) › [arch\\_0044-8613\\_1987\\_num\\_34\\_1\\_2397](http://www.persee.fr/doc/arch_0044-8613_1987_num_34_1_2397).
18. **Ministère de l'Agriculture, de l'Elevage et de la Pêche (MAEP)/Institut National des Recherches Agricoles du Bénin (INRAB), 2005**, Impact de l'importation du riz sur la compétitivité et la rentabilité de la production nationale au Bénin, (Dir : Adegbola et Singbo) Communication à l'atelier régional de l'ADRAO sur le thème : Politique et stratégies pour la promotion de la production rizicole et la sécurité alimentaire en Afrique subsaharienne, Centre de Recherche Agricole à vocation nationale basé à Agonkanmey Programme Analyse de la Politique Agricole (PAPA), République du Bénin, 13 p.
19. **ODJO Paulin, 2010**, Potentialités agricoles et sécurité alimentaire dans la Commune de Tchaourou. FLASH/ UAC, 78 p.
20. **ONASA, 2003**, Rapport annuel. Atlas de sécurité alimentaire et nutritionnelle du Bénin, LARES / PILSA, Cotonou pp.12-16.
21. **PNUD, 2011**, Rapport sur le développement humain, Durabilité et Équité : Un Meilleur Avenir pour Tous, ISBN-13 : 978-92-1-226037-2
22. **TREBUIL Guy et HOSSAIN Mahabub, 2004**, **Le riz : enjeux écologiques et économiques**, Paris : Belin, Mappemonde.265 p.