

Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove

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ABSTRACT: In the municipality of Ouidah, the production of ignigenic salt is dominant in all localities with salt-producing sites. The objective of this study is to show the challenges, the limits of the production of ignigenic salt in the municipality of Ouidah as well as its impacts on the mangrove. The methodological approach adopted is based on documentary research and field surveys. These are essentially made up of field observations, interviews with a representative sample of 90 people selected by reasoned choice provided socio-economic and environmental data from the study area. Thus, the results obtained show that the production of fire-producing salt plays an important role within salt-producing households. Indeed, 100% of the salt farmers surveyed confirm a diversity of types of use of the financial profitability of this activity. According to 50%, this profitability allows them to satisfy their vital needs, 5% for health, 20% for the education of children, 15% for various ceremonies, 10% for the purchase of work materials. However, this activity faces natural, anthropogenic and security constraints. However, this activity faces natural, anthropogenic and security constraints. The latter have significantly affected the practice of this activity through the theft of salt from salt-producing sites (30%), the obstacle to selling salt (30%), competition with solar (10%) and marine salt on the market (10%) and the intervention of mangrove protection projects (20%). In addition, this activity in this municipality has led to a reduction in the mangrove estimated between 2005 and 2022 at 7.2%. To overcome these problems, salt farmers have developed some adaptation strategies with a view to maintaining this activity sustainably.

KEYWORDS: Benin, municipality of Ouidah, salt production, challenges, impacts on mangrove

INTRODUCTION

Since the Neolithic, man has strived to invent processes that allow him to extract salts from their natural supports, water, salty soils and plants (P. Gouletquer, 1988, p.91). While it becomes a means of preserving food, improving the lactation of domestic animals, or a nutritional supplement with the emergence of cereal agriculture poor in mineral salts, salt is a phenomenon in the full sense of the term, as a process of transformation of liquid into ignigenic salt farming, which consists of cooking a brine obtained by scraping the surface layer of tannes with wood, is largely dominant. In South Benin, and more precisely in the town of Ouidah, the production of ignigenic salt is an activity which dates back more than three centuries and which allows the local population, in particular the salt farmers, to meet their vital needs. Around 4,000 tons of salt have been produced per year using traditional and rudimentary methods for centuries (UNDP, 2021, p.6). The production of igniter salt remains an innovation with profitable economic and tourist value for producers and traders. However, this activity consuming large quantities of wood energy has led to a degradation of the mangrove which is not without consequences on the income of salt farmers to which are added natural and security

constraints. solid, and dissolution of crystals (S.Cassen et al.;2013, p.7). According to grdr (2016, p.3), it is a seasonal activity practiced by women between February and April. Ignigenic salt farming, which consists of cooking a brine obtained by scraping the surface layer of tannes with wood, is largely dominant. In South Benin, and more precisely in the municipality of Ouidah, the production of ignigenic salt is an activity which dates back more than three centuries and which allows the local population, in particular the salt farmers, to meet their vital needs. Around 4,000 tons of salt have been produced per year using traditional and rudimentary methods for centuries (UNDP, 2021, p.6). The production of igniter salt remains an innovation with profitable economic and tourist value for producers and traders. However, this activity consuming large quantities of wood energy has led to a degradation of the mangrove which is not without consequences on the income of salt farmers to which are added natural and security constraints.

I-Presentation of the study region

The municipality of Ouidah is located in South Benin between 6°22'04" and 6°35'08" of North Latitude and 1°52'43" and 2°18'45" of East Longitude. It is a town highly coveted by national, regional and international tourists due to

“Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove”

the existence of mangrove formations and salt-making activities. Figure 1 presents the situation of the study region.

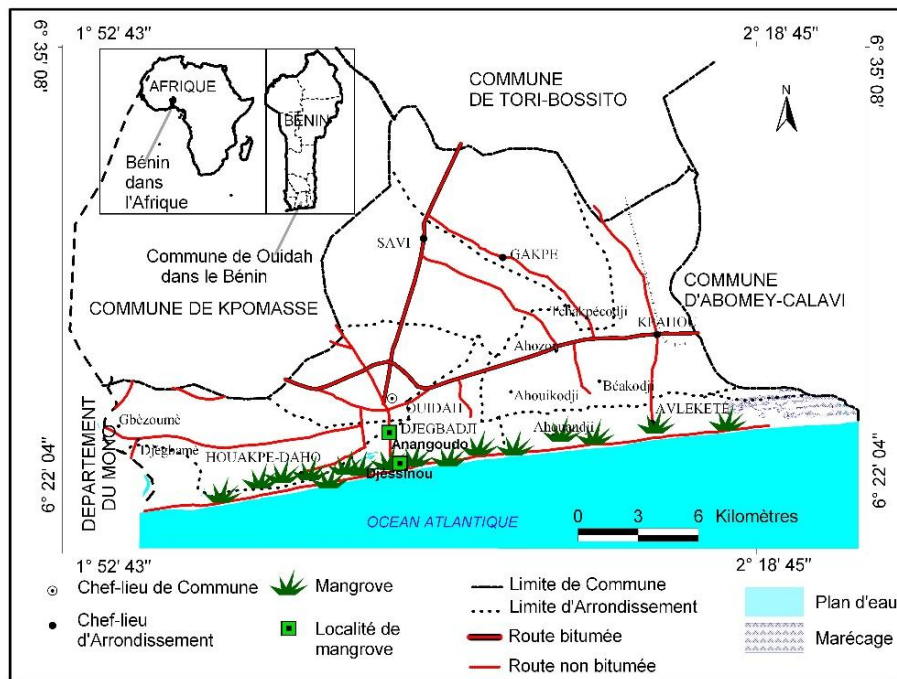


Figure 1: Geographical location of the municipality of Ouidah
Source: Topographic background, IGN 1992

This town concentrates the largest salt production sites in South Benin including: Djègbadji, Houakpè-Daho, Djègbamè, Gbèzoumè, Djondji.

II – Data, Materials And Method

Planimetric data from the National Geographic Institute (IGN) and CENATEL (topographic maps, satellite images and aerial photographs) to analyze the dynamics of land use and the spatio-temporal evolution (2005 to 2022) of the mangrove in the town of Ouidah. Thus, the variation of landscape units and in particular of mangrove formations is given by the mathematical relationship: $\Delta U = U_{2022} - U_{2005}$. From this formula, three situations arise:

- If $\Delta U = 0$, stability
- If $\Delta U > 0$, progression
- If $\Delta U < 0$, regressed

As for the socio-economic data, they were collected from 90 salt farmers and relate to the quantity of salt produced daily and monthly, the profits made, their destination as well as the limits which hinder their activity. With regard to data tools and materials, it is necessary to remember: GPS for the georeferencing of igneous salt production sites in the municipality of Ouidah; the photographic camera for taking instantaneous images of the different salt production processes as well as the phenomena relating to the limits of this activity; direct observation made it possible to see the organization of the production of igneous salt; the interview guides made it possible to interview the salt farmers on the

current state of the mangrove on the one hand; on the other hand, they made it possible to know the places of sale or even the profits made by season, the types of uses of income and the strategies implemented to overcome the limits of the production of ignigenous salt as well as those developed for the protection of the mangrove in this town.

III - RESULTS:

Several factors contributed to the production of ignigenic salt in the town of Ouidah.

III-1. The climate

The municipality of Ouidah enjoys a subequatorial climate with two dry seasons and two alternating rainy seasons of unequal duration. Rainfall is observed during the months of April to July and October to September. On the other hand, they are less than 40 mm and almost zero in the months of December, January, February and March or even April. This last season corresponds to a period of intense salt production activity on all the salt production sites in the municipality of Ouidah. With the effects of climate change, salt production activities in this municipality are experiencing a change in the timetable for the production of ignigenous salt. Indeed, the temperature plays an essential role in salt-making activities if it remains high with an average of 27.7°C.

III-2. The tannes

These are geomorphological units of southern Benin called djèzandji, and constitute hyper-salty environments with almost no vegetation. There are three categories: bare tannes

“Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove”

with efflorescence, grassy tannes with the presence of herbaceous plants and floodable tannes (Plate 1).



Plate 1: Bare tannes (1), grassy tannes (2) made up of *Sesuvium portulacastrum* and flooded tannes (3) in the municipality of Ouidah

Shooting: Bamisso, March 2023

Plate 1 shows the types of tannes identified in the commune. The most used by 100% of the salt farmers surveyed are the bare tannes.

III- 3. Supply of wood energy for the preparation of ignigenic salt

Several woods are used by salt producers for the preparation of ignigenic salt. These woods are obtained by free cutting and by purchase, it is wood from red mangrove trees (*Rhizophoracemosa*) and white (*Avicennia germinans*). Added to this are the woods of certain species. Added to this are the woods of certain species plants such as: caïlcédrat (*Khaya senegalensis*), neem (*Azadirachta indica*) Eucalyptus (*Eucalyptus camadulensis*), coconut husks as well as

branches and all other species that can be used as fuel. All this is sold according to different measurements (boot and stere). As for mangrove trees, they are sold either by bunch or by canoe and the prices vary depending on the size of the wood from 500 FCFA to 10,000 FCFA. For terrestrial species they are sold to salt farmers according to the stere per bunch (400 or even up to 2000 FCFA), by tricycle (5000, 75000 or even 8500 FCFA) or bacchet (30000 or even 40000 FCFA). Plate 2 shows the types of wood used by salt farmers.



Plate 2: Coconut tree trunks (1), combination of Eucalyptus wood, neem and caïlcédrat (2), red mangrove wood (3) and bunch of eucalyptus (3) on the salt production sites of the Commune of Ouidah

Shooting: Bamisso, January and April 2024

All these different types of wood are used by 100% of the salt farmers surveyed for the preparation of ignigenic salt in the municipality of Ouidah.

species. Indeed, the salt farming activity in this town is more practiced during the long dry season and extends over four or even five months (mid-November to March and sometimes April).

III-4. Methods of Exploiting Salt Flats in the municipality of Ouidah

The exploitation of salt production sites in the municipality of Ouidah is very old. It is an activity carried out mainly by 95% of women aged between 35, 45, 60 or even 70 years and over. The role of men for the majority of the time on the sites is to help the salt farmers in the construction of the huts inside which are located a large giant hearth, the utensils for preparing the fire salt, the brine, the wood serving as fuels, etc. Also, men are responsible for making baskets for leaching the salt crust, selling firewood to salt farmers, particularly those from mangrove trees and some plant

The method of salt production remains archaic, to the extent that salt farmers always start by scraping and gathering the saline sand, then piling it in large baskets made with the rhizophores of the red mangrove tree (*Rhizophora racemosa*) and including the interior is covered with clay. The scraped sand is leached to dissolve the salt and collect the brine through a pipe into a canary half buried in the ground. The salt content of the brine is checked by old palm seed nuts. When the nuts float this indicates that the brine has a salinity close to 200 g/l and can be used for the preparation of ignigenic salt.

“Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove”

III- 5. Income from salt production activities by season in the municipality of Ouidah and their use

In the municipality of Ouidah, income from salt production activities varies according to 100% of the salt farmers surveyed from one season to another during the year and also from the site. The sale of ignigenic salt on salt-producing sites varies according to certain units of measurement such as the

bowl (Tohungolo) which represents the kilogram and which is sold at 350 FCFA in high salt-producing activity compared to 600 FCFA in low salt-producing activity, the baskets being able to contain five ten measures of salt are worth 1750 to 3500 fcfa. These benefits are used in various ways by salt farmers to satisfy their vital needs. Figure (2).

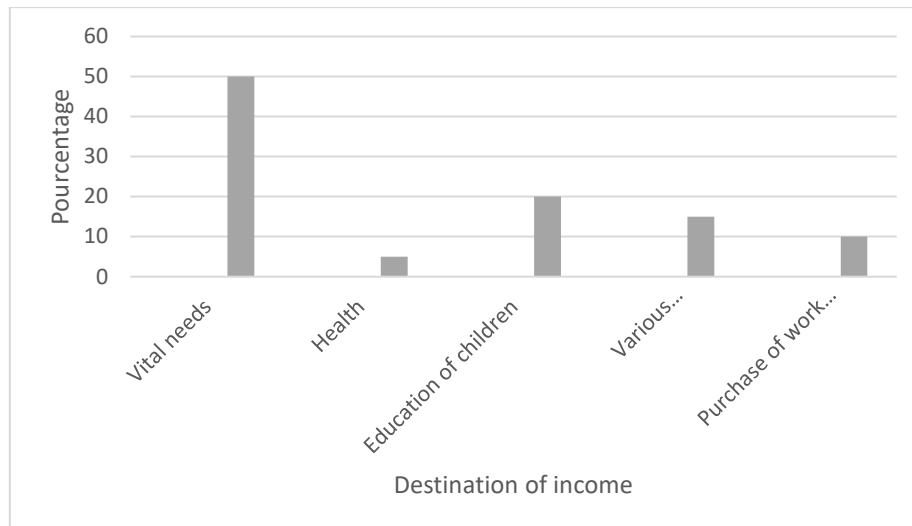


Figure 2: Types of use of income from the production of ignigenic salt by salt farmers in the municipality of Ouidah

Source: Field surveys, December 2023 and March 2024

The analysis of Figure 2 shows five (5) types of uses of the financial profitability of ignigenic salt production activities by salt producers. Indeed, 50% of this profitability makes it possible to satisfy their vital needs, 5% for health, 20% for the education of children, 15% for various ceremonies and tontine, 10% for the purchase of work materials and wood energy from different plant species, etc.

III- 6. Marketing of ignigenic salt in the municipality of Ouidah

In the municipality of Ouidah, the marketing of ignigous salt is done by salt farmers on salt production sites to wholesale and retail resellers. According to 100% of the salt farmers surveyed, cash sales are the most reassuring and allow producers to benefit from the fruits of their efforts. To sell the salt, the sellers crisscross the town on foot with their load on their heads placed in a basin with the measure (Tohungolo in

the local Fon language). The salt is sold to the local population and sometimes even to national, regional or international tourists visiting the town. Also, customers come from all over, starting with those from the Dantokpa International Market in Cotonou by taxi or even tricycle to purchase bags of salt. Next come buyers from the markets of Kpassè, Pahou, Atrokpodji cocotomey, Calavi, Godomey, etc.,

However, the production of igniter salt faces several constraints in the municipality.

III-7. Limits of ignigenic salt production in the municipality of Ouidah

Several limits hamper salt production in the municipality of Ouidah (figure 3).

“Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove”

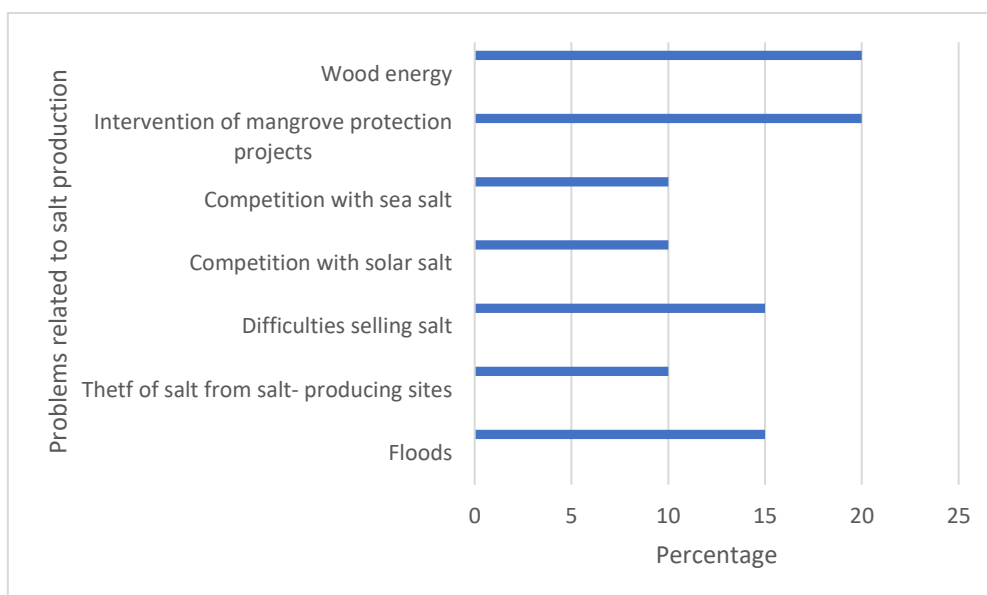


Figure 3: Limits linked to salt production in the municipality of Ouidah

Source: Field work, October 2023 and April 2024

The analysis of Figure 3 shows the limits linked to salt production in the commune of Ouidah. These include wood energy (20%) and the intervention of mangrove protection projects (20%). Then comes competition with solar salt produced on salt production sites (10%) and sea salt (10%) sold in different markets throughout the territory; difficulties in selling igniter salt (15%); theft of salt from salt production sites (10%) and flooding (15%).

In the municipality of Ouidah, the supply of wood energy constitutes a real problem for salt producers, linked to the ban on cutting mangrove wood throughout the Beninese coast. For this purpose, firewood has been obtained for a decade by purchasing firewood other than that from mangrove trees. Furthermore, solar salt, which has the same characteristics as ignigenic salt in the Municipality, does not allow salt farmers to benefit from the fruits of their efforts, especially since this salt produced on the tarpaulins by solar crystallization is less expensive than ignigenic salt. With regard to sea salt imported from Europe and the sub-region and whose price varies from 250 FCFA to 300 or even 350 FCFA in any season, it is favored by the entire population in favor of ignigenous salt whose prices vary according to the seasons (dry and rainy). Also, salt farmers encounter enormous difficulties in selling their product given the distance that separates the salt production sites from the markets. Faced with this circumstance, salt farmers, particularly the older ones, sell their salt at a very reduced price compared to other less old salt farmers to be able to meet their needs. Thus, not being able to transport the salt produced from the salt production

sites to the house, the salt produced is left on the sites and is subject to theft at night.

Flooding constitutes a major constraint in salt production activities throughout the coast. In particular, the periods of high water which occur from September to November lead to the cessation of salt farming activities and the development of secondary activities, in particular market gardening and the sale of market garden products in the markets by salt farmers in order to flourish financially.

Other limitations include:

- the difficulty of accessing markets in order to sell the salt produced, linked to the impassability of rural roads during rainy periods;
- high cost of transporting the salt produced due to lack of adequate means of transport;
- problem of access to tools and work equipment adapted to the production of igniter salt;
- the non-exercise of salt-producing activities on the day of the Adjaha market according to traditional legislation relating to salt;
- the flight of young workers to the cities for domestic work, the zemidjan, etc.;
- non-existence of storage stores for produced igniter salt.

III- 8. Impacts of ignigenic salt production on the mangrove in the Municipality of Ouidah

The production of ignigenic salt uses enormous quantities of mangrove wood (branches, trunks, etc.) in the municipality of Ouidah. (Plate 1)

“Production of Ignigenic Salt in the Municipality of Ouidah in South Benin: Challenges, Limits and Impacts on Mangrove”



Photo 1: Cutting mangrove wood in Gnigbohoué (1) for the preparation of fire salt in the municipality of Ouidah Shooting: Bamisso, July 2023

Photo 1 shows the different cuts of mangrove trees (*Rhizophora racemosa* and *Avicennia germinans*) for salt production activities. Mangrove wood sold by fishermen to salt farmers on salt production sites. Indeed, this technique of cutting the mangrove in the municipality leads to its disappearance, the sedimentation of the lagoon, as well as that

of biodiversity and a loss of income for the local population with regard to sightseeing or tourism. ornithology due to its Ramsar zone character.

Furthermore, Table I shows the dynamics of land use of the different landscape units in the Municipality of Ouidah from 2005 to 2022

Table I: Summary of surface areas (in %) of land use types from 2005 and 2022 around the Ouidah lagoon.

Units	Gap in 2005 (in %)	Gap in 2022 (in %)	Gaps between 2005-2022 (in %)
Agglomeration	1,733	2,612	0,879
Mangroves	9,719	2,506	-7,213
Swamp formations	0,003	25,105	25,102
Mosaic of crops and fallows	24,256	6,921	-17,335
Mosaic of crops and fallows under palm groves	2,340	10,814	8,474
Sandy beach	0,925	1,972	1,048
Bodies of water	49,515	49,897	0,382
Plantation	11,510	0,174	-11,336
Total	100	100	100

Source: Field surveys, 2022

It appears from the observation of this table that over the period from 2005 to 2022, the mangrove areas experienced a decline in their surface area of 7.213% despite the various awareness-raising and reforestation actions in this municipality. Indeed, the factors responsible for this dynamic are, among others, the cutting of wood for salt-making activities, poverty and various uses: construction of houses, constitution of ‘‘acadja’’, etc. The regression of cultivated and fallow mosaics and plantations is also remarkable (17.335% and 11.336%) in this commune in favor of an increase in urban areas, crops and fallows under palm groves and marshy formations.

IV- DISCUSSION

The production of fire salt in the municipality of Ouidah dates back more than three centuries and mainly concerns women

of various ages. This activity depends on a certain number of factors including: climate, geomorphological units, the existence of a workforce and energy wood. Indeed, in this town the salt preparation techniques remain traditional and consist of cooking a brine in wood obtained by scraping the surface layer of the tanns. This result is consistent with those found by grdr (2016, p.3). Indeed, the income from the production of ignigous salt by salt farmers allows them to satisfy their vital needs as also underlined by CFSI (2014, p.1) for whom artisanal salt farming constitutes an important additional income for hundreds of thousands of people. However, several limits hinder this activity, including: the difficulties of obtaining wood energy, the competition of salt on the markets with sea salt, the impassability of rural roads especially during rainy periods, the ban on logging of the mangrove by NGOs as well as the sacralization of mangrove

islets on the one hand, etc. these results are consistent with those found by CHEKOU KORE E.M. (2022, pp 69-70). Furthermore, this salt-producing activity has led to a significant disappearance of the mangrove despite the various awareness-raising campaigns and bans on cutting by the various structures, in particular international institutions (IUCN, UNDP, FAO, etc.), NGOs and the State (ABE , MCVD). The results found in this research are similar to those found by Joseph C. et al., (2019, p.70) for whom the degradation of coastal and marine ecosystems, particularly mangroves, has a close link with anthropogenic activities and more precisely the production of igneous salt.

CONCLUSION

The production of ignigenic salt in the municipality of Ouidah plays a crucial role in the lives of salt farmers through the satisfaction of their vital needs. However, there are several limits to the exercise of this activity such as: the search for wood energy, the ban on mangrove cutting, competition with imported salt, etc. hinder the production of ignigenic salt in the municipality of Ouidah. Furthermore, this activity has led to a decline in mangrove areas, the impact of which is significant on biodiversity in general, on the lagoon ecosystem and on socio-economic activities, particularly fishing and salt production. Perspectives are proposed with a view to improving and perpetuating this salt-producing activity and with the positive impact of preserving and protecting the mangrove.

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