

# Knowledge of artisanal potash based on agricultural produce in Cote d'Ivoire

## ABSTRACT

Artisanal potash is a product derived from the co-products of foods consumed in households and agricultural crops. The main objective of this study is to identify the different co-products used for the production of potash and the different process of manufacturing artisanal potash and the different areas of use thereof. To carry out our work a survey has been completed in seven cities of Côte d'Ivoire from March 2020 to 20 March 2021. Sixty-five people have been interrogated from an already pre-established question in order to collect their knowledge of artisanal potash. The questionnaire and data processing were performed using the Sphinx software. The co-products used for the manufacture of potash are various, and the most used are cocoa (13.8%) and coffee pane (12.3%). As for the manufacturing processes, the different processes listed are identical irrespective of the co-product used. The steps of the artisanal manufacturing process are: the co-product collection chooses, the incineration, the anchorage of the ashes, the draining, the separation of the nerve and the supernatant, the preparation and solidification of the potash. Also, potash is used in various fields. It is more used in the food field with a proportion of 90.8%. Agricultural co-produces used for the manufacture of artisanal potash are various and the manufacturing processes are identical. Knowledge of co-producers and the optimization of the manufacturing process of artisanal potash is a necessity for rural populations and the valuation of co-producers is a means of protecting the environment and economics.

*Keywords: artisanal potash, co-products, process of Manufacturing, area of use.*

## 1. INTRODUCTION

The potash is an alkaline potassium substance generally used in fertilizers. In fact, the term refers to a variety of salts obtained during the extraction of minerals or through a chemical manufacturing process [1]. It was first discovered in New Brunswick in 1971 [23] and comes mainly from conventional underground mines or conventional solution mining [1]. Canada is the world's largest potash producer and exporter [1]. Potash is a strategically important resource because it is mined and processed in just 13 countries, with a global estimate of 250 billion tonnes [20]. However, in Africa, north of Bornou, throughout the 19th century and right up to the dawn of independence, other types of "salt", rich in sodium or potassium chloride, were extracted from saliferous soils or from the ashes of *salvadora persica* [18]. Potash was also originally produced by selectively dissolving wood ash in water and allowing the solution to evaporate in large iron pots [1]. The potassium-rich residue that remained in the pot was known as "potash", hence its name [23]. Moreover, this salt, extracted from ashes, is still an important part of the diet and pharmacopoeia of many people in sub-Saharan Africa [18]. However, potassium is essential to the health of plants and animals, and there are no known negative effects on human health or the environment, even at levels well above those commonly found in soils and rivers [2]. In fact, crops that are deficient in potassium are more sensitive to forms of stress, whereas those that are properly fertilized will be much less affected [2]. It is also potash regulates insulin levels [25]. In Ivory Coast, various by-products are used to produce potash, including cocoa pod,

banana stubble, palm branch and coffee parchment by-products [3]. In fact, agricultural by-products are important sources of mineral elements [24]. View that the Ivory Coast economy is essentially based on agriculture, composed of traditional export crops, including cocoa and coffee. Today it extends to other export crops such as oil palm, rubbish, pineapple, sugar cane, cotton, banana, etc., and food crops like plantain, yam, cassava, cassava [4]. Indeed, the exploitation of agricultural by-products for a valuation has benefited in recent years with a renewed interest for economic reasons as well as environmental [5]. However, the transformation of these agricultural by-products into artisanal potash could not only constitute a lucrative activity, but a solution to the improvement of the environment. So, optimization of the production process of potash from agricultural co-products becomes a necessity for the valuation of these. The overall objective of this study is to list the different co-producers and manufacturing processes used for the manufacture of artisanal potash made from agricultural co-products in Ivory Coast.

## 2 Material and methods

### 2-1. Material

- Survey sheets
- Pen
- Ruler
- Bottle for collecting potash
- Large bowl for carrying bottles
- Adhesive tape for labelling samples
- Notepad for jotting down key points
- Camera for taking pictures
- Laptop computer to capture data for processing
- Potash sample

#### 2-1-1. Study site

The different cities visited are returned to the territory of Ivory Coast. The Republic Ivory Coast is a country in Africa located at the latitude  $7^{\circ} 18'00.00''$  North and longitude  $5^{\circ} 12'00.00''$  West. The country's development is based on agriculture.



Figure 1: Map showing distribution of local populations surveyed according to the localities visited.

### 2-2. Methods

#### 2-2-1. Investigation

The survey was conducted in eight cities of Ivory Coast. These are: Man, Béoumi, Aboisso, Korhogo, Séguéla, Gonaté and Daloa. In these cities, the specific places visited were the markets and the targeted villages as areas of production of potash. A structured questionnaire made it possible to carry out the investigation. In order to identify the different co-products and manufacturing processes and the different areas of use of artisanal potash. For this purpose, a pre-examination was carried out with the population in the cities markets to identify producers, artisanal potash. The questions posed were of the closed type (unique or multiple choice) and open (giving the latitude to the person interested in expressing their opinion) within each locality, each producer or tradesman has been subjected to the different questions with multiple choice and the answers obtained have been reported directly on the questionnaire. The questions were asked in French. But whenever it was necessary to translate, a translator guide was associated to communicate with the interlocutors not speaking French language. In these localities, the surveys were carried out both in the city in the markets and in the field (targeted villages producers). Regarding the markets, three Daloa markets (Lobia, Balouzon, Oli), two of the cities of Korhogo (victorious market and the big market) and the major markets of Béoumi, gonaté, Séguéla, Aboisso and ISSIA have been visited. The villages selected were those listed as a village of production by traders and consumers interviewed in the markets. These are Kassiapleu and Pkangouin (Man); Diacohou, Kononbo and Belakro (Béoumi); Woe, Lèguè and Bakro (Aboisso); Guipri and Ouattarakro (Gonaté). The interviewees were chosen without distinction from ethnicity and but sex (women's preferences) and different socio-professional layers. They are manufacturers and traders of artisanal potash. Questionnaire forms and a pen were used to record the data. The potash samples were collected in glass bottles and labelled using adhesive tape and a marker pen. They were then placed in a large hermetically sealed plastic bowl for transport. Shots on the elements of the survey (co-products and potashes) were performed using a camera. Finally, the data was entered into the computer and the additional information into a notepad.

### **2-2-2. Statistical analysis**

The questionnaires were codified and data processing were done using the Sphinx software. These analyzes allowed us to make histograms highlighting the socio-demographic characteristics, the areas of use and the uses as well as the actions of the artisanal potash. Also, the different co-products met. The modes of sourcing and marketing, conservation equipment and manufacturing technology were highlighted.

## **3. RESULTS AND DISCUSSION**

### **3.1 RESULTS**

#### **3.1.1 Socio demographic characteristics of respondents**

The socio-demographic characteristics of the surveyed persons are presented in Table I. On all seven cities surveyed (Béoumi, Man, Aboisso, Séguéla, Daloa, Gonaté, Korhogo) the respondents were 65, the largest of which came from Béoumi with 16 respondents, or 24.6%. These people were mostly women 62 or 95.4% and their ages ranged from 20 to more than 40 years. The age group 40 years and over, presents the highest frequency percentage or 50.8%. The majority of respondents had a primary level of study or 47.7%. The most surveyed are producers / traders with a frequency 44.6%. The people interviewed were married (47.7%).

**Table 1 : Socio Demographic characteristics of investigated parameters medium Study Area**

Parameters	Area							Moyenne
	Béoumi	Man	Daloa	Gonaté	Aboisso	Séguéla	Korhogo	7
Workforce	16	7	8	11	10	4	9	65
<b>Education level</b>								
Illéstrate	10	1	8	0	5	3	3	30 or 46,2%
Primary	5	6	0	8	5	1	6	<b>31 or 47,7%</b>
Secondary	1	0	0	3	0	0	0	4 or 6,2%
Superior	0	0	0	0	0	0	0	0 or 0,00%
<b>Age class</b>								
Less from 20	0	0	0	0	0	0	0	0 or 0.00%
From 20 to 30	0	0	0	2	0	0	0	2 or 3.1%
From 31 to 40	10	1	1	5	7	0	6	30 or 46.2%
More than 40	6	6	7	4	3	4	3	<b>33 or 50.8%</b>
<b>Sex</b>								
Male	2	1	0	0	0	0	0	3 or 4.6%
Female	14	6	8	11	10	4	9	<b>62 or 95.4%</b>
<b>Social Status</b>								
Merchant	5	1	0	2	0	0	1	9 or 13.8%
Producers	4	1	3	6	9	0	4	27 or 41.5%
Producer / Trade Merchant	7	5	5	3	1	4	4	<b>29 or 44.6%</b>
<b>Matrimonial Location</b>								
Single	0	1	0	4	1	0	1	7 or 10.8%
Coupled	7	5	4	5	5	2	3	<b>31 or 47.7%</b>
Married	7	1	3	2	4	2	5	24 or 36.9%
Divorced	0	0	0	0	0	0	0	0 or 0.00%
Widow (er)	2	0	1	0	0	0	0	3 or 4.6%

### 3.1.2. Potash supply mode and organoleptic characteristics

Out of 65 people 40 get potash by manufacturing 61.5%. Indeed, they themselves produce their potash to resell them then. The artisanal potash colors encountered are various such

as gray, white and brown. But the most encountered is the white color with a frequency of 46.2%. Also, the powder aspect of it is dominant to other aspects or 70.8%. Tables with color numbers show a very significant difference in the values, with  $1-p = 99.99\%$ .

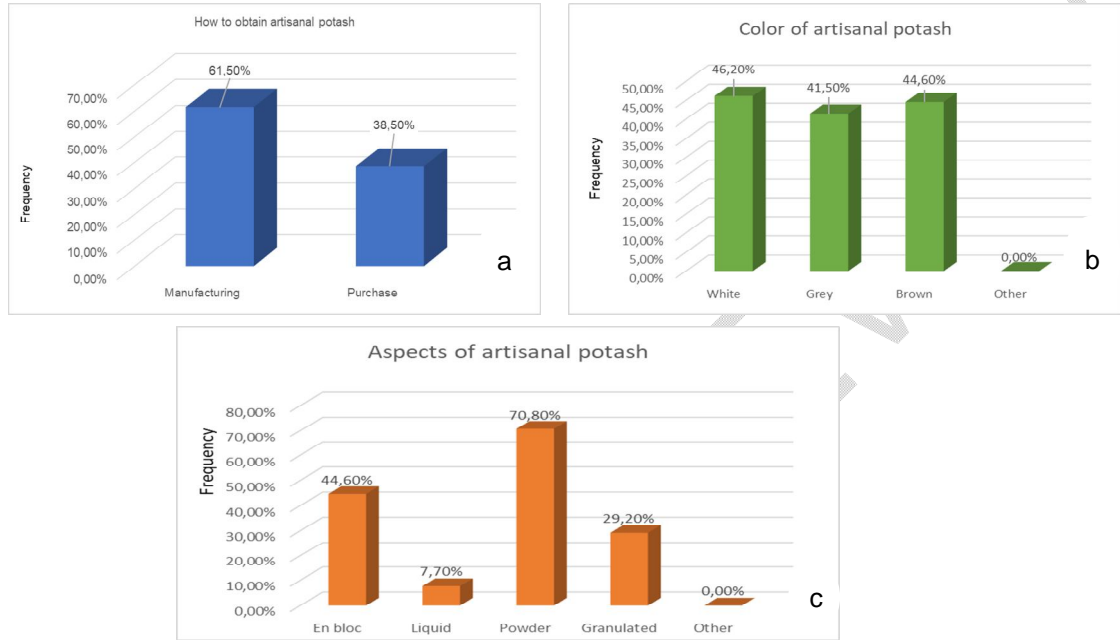


Figure 2: Histograms showing production methods and organoleptic characteristics of artisanal potash.

*a – How to obtains artisanal potash; b – Color of artisanal potash; c – Aspects of artisanal potash.*

### 3.1.3. Storage condition of the potash

The results of the survey show that there are several materials for the conservation of artisanal potash. These are : packets and hermetically closed rubber buckets (15.4%), but the most used are the glass bottles with a frequency of 70.8%. Also, another person says she first put potash in front packets of preserved in cocoa or rice bags (1.5%). And the shelf life differs from one person to another. The most recurring preservation time is 6 to 1 year.

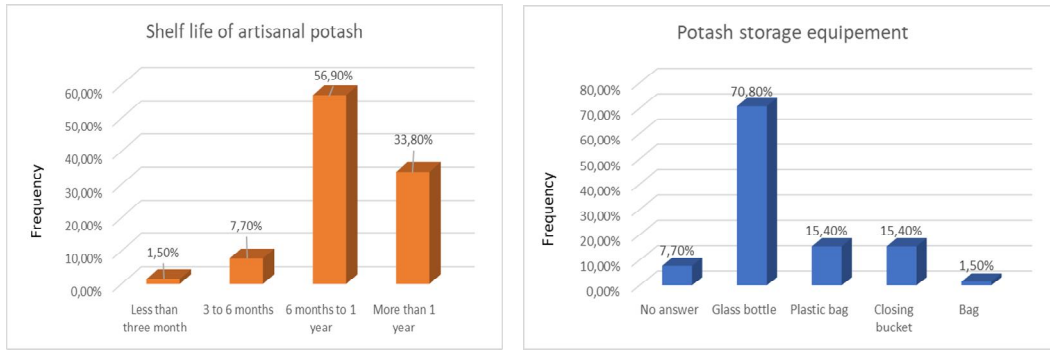


Figure 3 : Histograms showing storage conditions for artisanal potash

*a – Shelf life of artisanal potash; b – Equipment for conserving artisanal potash*

### 3.1.4. Marketing of the artisanal potash

The artisanal potash is sold in detail on the market at different prices and the most common price with a frequency of 61.5% is less than 400 francs CFA and the measuring utensil is the bag of 10 francs CFA with a frequency of 63.1%. Trade traders buy wholesale potash to sell it or to make soap, the most popular dropping price on the market is from [10000 to 20000 CFA francs] with a frequency of 38.1% and the measuring utensil. Wholesale most used is the 20-liter basin with 64.6%. The detail sale of potash is less than 4000 CFA francs with a frequency of 75.4%.



Figure 4: Histograms showing marketing for artisanal potash

*a – Purchase price; b – Retail price; c – Wholesale utensils; d – Daily sales quantity; e – Retail measuring utensils.*

### 3.1.5. Area of use, uses and action of artisanal potash

The actions of artisanal potash are multiple. It enhances the taste, increases the digestibility, reduces acidity and expensive food (food uses). It has antiseptic, foaming action (cosmetic uses), antibiotic, antifungal, leads to nasal geese, regulates the insulin levels, drop blood pressure (medicinal use), fertilizer (agriculture) and pigment fixator (art and textile). However, the most recognized action is antiseptic action with a proportion of 49. According to the survey, artisanal potash is used in several areas. Indeed, 59 people use potash in the food field, 50 in cosmetics, 34 in the medicinal field and 20 people in other areas such as maintenance products (10 people), art (2 persons), agriculture (6 people), the textile industry (1 Person) and the preparation of tobacco (3 people). In the food field, it is used for seasoning (17 people), to soak cereals 37 people and for the preparation of glutinous sauces such as "kopê" or "Cloala" or "Tchôrô" (47 people). As for the field of cosmetics 44 people use potash for the manufacture of black soaps and 24 people for the manufacture of antiseptic white soaps. As for the medicinal field 13 people investigated use artisanal potash to treat bacterial skin infections (teekends, dartors, ganglia), 11 for the treatment of nose

inflammation (cold and sinusitis). It is also used by 5 people for high blood pressure treatments and 3 people to treat type 2 diabetes and also 4 people to treat some spiritual diseases. As for the other areas the potash serves as additives and fixative pigments in the textile (used by 2 people) and in the art (painting of sculptures and other wooden object: mortars and pestle) by 2 people. It is also used by 6 people as fertilizers in agriculture (potassium fertilizers) and as detergents to whiten hyper tainted objects (bowl, chairs, tiles and linen) by 6 people and for the preparation of tobacco by 2 people. Finally, the artisanal potash precisely the one made from leaves of yams is used as a poison for the mice. However, potash is more used in the food field for the preparation of glutinous sauces.



Figure 5: Histograms showing area of use, uses and action of artisanal potash

*a – Applications for artisanal potash; b – Uses for artisanal potash; c – Action of artisanal potash according to use.*

### 3.1.6. Cultural Aspects of Potash

People surveyed in this study were mostly Baoulé 35, however there are other ethnic groups that produce potash. It is the Agni, the Sénoufo, the Koyaka, the Bété, the Yacouba, the Malinkes, the Abouré, Wan and foreigners such as Burkinabe (Moré) and Nigeria (Igbo). The vernacular names of the artisanal potash are: heck up in Malinke, Saikè in Yacouba, Gôh in rearing, Blô in Baoulé, Zimn in More / Burkinabé, Kan-Hou in Nigerian (Igbo), Mblô in Abouré Gbangué in Sénoufo and Owi in Wan. However, the most used is "Blô". There is a very significant difference in the values, with  $1-p = 99.99\%$ .

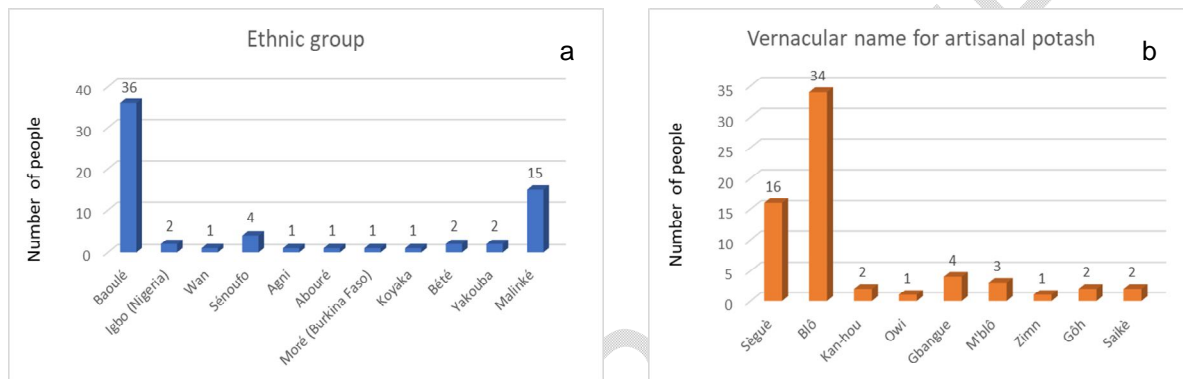


Figure 6: Histograms showing culturel aspect for artisanal potash

*a – Ethnic group; b – Vernacular name for artisanal potash.*

### 3.1.7. Co-produces used for the manufacture of artisanal potash

Investigations made in the cities of Man, Béoumi, Aboisso, Yaou, Séguéla, Korhogo, Gonaté, Issia and Daloa have Shown that there is a variety of coproducts that are used for the manufacture of artisanal potash. Indeed, the coproducts listed were the numbers of twenty-three. These include: coconut branches; cocoa chops, the ashes of cooking wood fire, cashew nut; Coconut bark; the coconut case, the leaves of forest fig tree; the ignane leaves; palm flowers; palm seeds; Plantain banana skin; The coffee pairs; rice straw; banana 's hamp; corn raids; palm branches, reeds; palm regimes; the cotton stem; the rotten cheeseer trunks; the millet stem; Palm rotation trunks and corn rods. Also, some of these coproducts are used recurrently by rural populations. From the survey is highlighted that cocoa chops are the most used with a proportion of 13.8%. There is a very big significant difference in the values, with probability = 99.99%.

**Table 2 : Table showing the proportions of the various agricultural co-products used to manufacture artisanal potash.**

CO-PRO  
 Rotten  
 Cocoa p  
 Parchm  
 Reeds  
 Casfew  
 Rotten  
 Palm flc  
 Coconu  
 Rice str  
 Plantair  
 Coconu  
 Corn st:  
 Foresr f  
 Yam lea  
 Fireplac  
 Cotton  
 Banana  
 Corn ra  
 Palm se  
 Coconu  
 Millet s  
 Palm ke  
 Total: 2

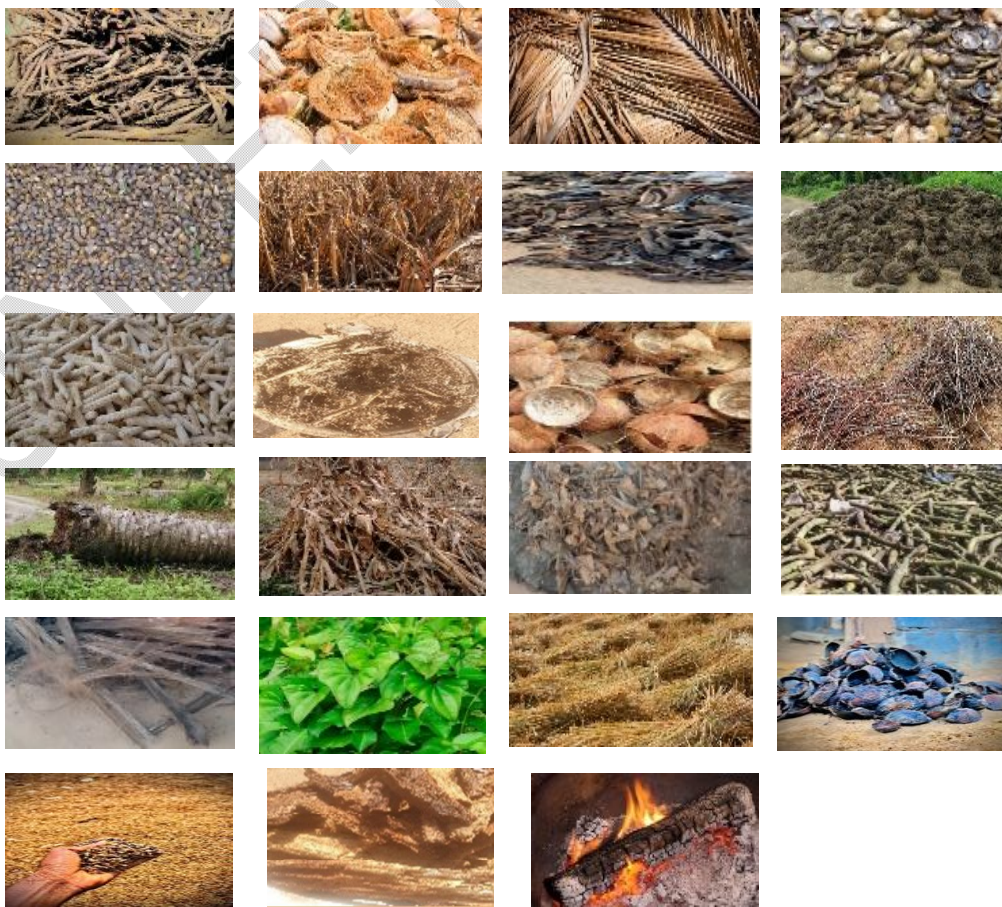


Figure 7: Some co-produces used for the manufacture of artisanal potash

*a: Palm blossom; b: coconut bark; c: coconut branch; d: cashew hull; e: palm seed; f: millet stem; g: banana skins; h: seed diet; i: corn raids, j: reeds; k: coconut shell; l: cotton rod; m: palm rot trunk; n: corn rod; o: figsteau leaf; p: banana hampe; , q: palm branch; r: ignane leaves; s: rice straw; t: cocoa patches; u: coffee packs; v: bark rotten cheeseer; w: cookwood lights ashes.*

### 3.1.8. Artisanal potash manufacturing technology

The surveys conducted revealed that potash manufacturing technologies differ than by choosing the co-product. Indeed, the process includes ten steps. These are: the collection of the co-product; the incineration of the co-product; the collection of ashes; the wetting of the ash with water; the dripping of wet ashes; the collection of the potash solution after drip; the decantation of the solution; the separation of the pellet supernage; the preparation of the supernarent and the collection of potash after solidification. Also, every step of this technology is done in a time that differs from each other. The minimum time to make potash is twenty-four hours. However, the time of the manufacture of potash depends on the quantity and nature of the co-product. These factors such as the quantity and nature of the co-producer significantly influences the step of incineration and also the amount of water used for dripping. They also have an influence on the performance of potash. The survey also revealed that the drainage phase is a delicate phase of the production of artisanal potash and the color of it depends on it. In addition, when the production is small-scale, the device of the device consists of a bucket to collect the filtrate, a colander, a white cloth, and grass for the wetting and draining. While on large scale the filtrate collection container is a basin and laundry and grass are replaced by a bag of rice or cocoa and all is supported by an experimental device has been determined. The size and composition of the device depend on the quantity of the raw material (co-produced) and the amount of water used to wet the ash. Stones (fireplace) and solid tree branches that can withstand the weight of the colander containing wet ashes

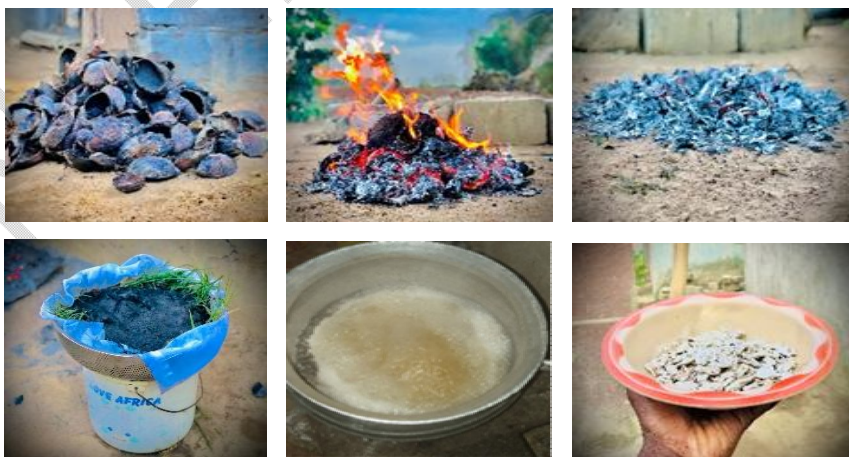


Figure 8 : Example of potash manufacturing technology based on cocoa pods

*a – Collection of the co-products; b – Incineration of the co-products; c - collection of ashes; d - the wetting of the ash with water and the dripping of wet ashes; e- The preparation of the supernatant; f - collection of potash after solidification*



Figure 9 : Drainage systems

### 3.2 Discussion

This study has been leaned to make a state of knowledge of craft potash based on agricultural co-producers in Côte d'Ivoire. Surveys were housed in the markets and villages of the cities of Béoumi, Man, Daloa, Aboisso, Korhogo, Séguéla and Gonate with 65 producers and traders of the potash from March 2021 to March 2022.

The results show that the respondents were mostly manufacturers or traders aged over 40 and married to a level of primary study. Being family mothers, they have easy access to co-producers from culture and households. These results corroborate with those found by Kouamé et al in 2018 where the population involved was dominated by 82.86% are women and the production and marketing activity was carried out exclusively by women with an age group that varies from 20 to 50 years old. And more. Regarding the method of aprovisioning and organoleptic characteristics of potash women themselves produce their potash to resell them then. The potasses produced are mainly powder and white color. However, potash in liquid form is that produced is for personal consumption. The solid form is produced for commercial purposes [3].

The people surveyed during this study were various ethnic groups, which produce potash. Also, the name of the potash differs according to people. These vernacular artisanal potash names are: man as a Malinke, Saikè in Yacouba, Gôh in rear, Blô in Baoulé, Zimn de Moren (Burkinabe), Kan-Hou in Nigerian (Igbo), Mblô in Abouré, Gbangué in Sénoufo and Owi in Wan. These results are confirmed by [3]. These authors have found after investigations that artisanal potash is called "Blô" in Akan, "Sêguê" in Malinke, "Gbongue" in the Sénoufo language and "Gô" in a rearing language.

For the preservation of potash surveys revealed that producers and traders utilized hermetically closed sachets and buckets, glass bottles and cocoa bags or rice. The most recurring preservation time is 6 to 1 year. These packages are identical to those cited by Kouamé et al in 2018. Their studies have shown that the respondents used plastics, rubber box, empty bottle and rice bag (polypropylene bag) are used to preserve potash. Moisture, air and water that melts its contact. Which keeps its nutritional quality for many years.

Regarding the marketing of artisanal potash, it is sold in detail on the market with less than 400 CFA francs in pouches and wholesale at a price that varies from [10000 to 20000 CFA francs] gained in basins of 20 liters. The daily sale of potash is estimated at less than 4000 francs. Indeed these results show that potash represents an excellent source of revenue. For example Belaruskali since December 2014, would have sold more than 170,000 tons of potash on the American market. And with the turnover of the Petrikov mine, which in 2019, the production capacity of the company will increase by three million tonnes by 2024 [21].

Artisanal potash is used in many fields such as food field, cosmetics, medicinal and other fields such as art, agriculture, the textile industry. The potassium contained in the potash gives it multiple capabilities. These results consistent with those of [20]. It states that almost all (95%) of the potash produced results in the agriculture sector in the form of mixed fertilizers and the remaining production is used in consumer products such as detergent and soap, glass, the glass. Pharmaceuticals and de-icing and water softening agents. Also it is used as an ingredient of certain sauces (Okra, Klala, tomato) and artisanal potash is one of the most used additives in the production of cereal flours for the confection of the "tôh"; This corresponds to a percentage of representativity of 75.35% [22] and also to cook certain foods (corn, beans, hard meat) or to recover a fermentation sauce. In addition, potash is used as a medicine of scabies. Of ringworm, constipation, pain with stomach, wounds and cough, and also as complement to many medications [3].

The diversity of co-produces used for the manufacture of artisanal potash were composed of coconut branches; cocoa pods (the most used), cookwood ash, cashew nut; Coconut bark; coconut case, forest fig leaves; of yam leaves; palm flowers; palm seeds; Plantain banana skin; Coffee papers; rice straw; banana's hamp; corn raids; palm branches, reeds; palm schemes; cotton stem; rotten cheeseer trunks; of millet stem; rotten palm trunks and corn rods. These results are confirmed by [3]. These authors found after investigations that artisanal potash is produced with a multitude of agricultural co-producers and the most commonly used are cocoa pods. This is due to the fact that the country is the world's largest producer of cocoa [6]. In addition, the products burned to obtain ash are most often plants, sometimes food, which have been cultivated or picked: small millet and certain sorghums, cucurbit stems, oko, tobacco., Amarantaceous, cotton trees, seafood hulls (mahogany of Senegal), films of nére, rovers, mango cores, baobab fruits ... among the by-products reduced in ash, we will also notice the feces of small cattle that are mainly used by some mountain populations [8]. The wood of some woods and the palms of some palm trees are also commonly used: palm finish or rovers; "Trunk" of papayers [9]. The raw materials consumed to obtain the ash largely determine the chemical composition and the organoleptic properties of the salts that are extracted [10] [11] [12] [13].

Indeed, these results corroborate with those of [9] who found that the ash can be obtained by regularly picking up the grass residues used to light the domestic fire, or even be collected in the fields, at the foot of certain trees in favor of Burn. It can also be produced in specific foci. As for the steps such as wetting and dripping the ash, they allow to leach the ash to obtain a solution without precipitate and without impurity. Indeed, they consist of filtering the ashes to obtain a liquid. Water is generally paid several times on the cunt ash, until a filtrate has sufficiently pronounced [9]. The device used to perform these steps is sometimes consisting of a bucket to collect the filtrate, a colander, a white cloth, and grass when the production is small-scale and consists of a pond container, a bag of rice or cocoa and all is supported by stones (fireplace) and solid shaft branches that can support the weight of the colander containing the wet. This device is identical to that described by [9], according to them the filter consists of a "container" with a bored bottom, in which a minced straw handle has been deposited, a fragment of mat, a leaf pierced or even nests of weavers. This utensil can be directly deposited on another or rest on a wooden frame. Even today, potters are fluent in filters and containers specifically dedicated to manufacturing. These specialized utensils are, however, more and more often replaced by old pottery, which is pierced by the bottom, or even by basins gnawed by rust. Filters only made of perishable materials also exist. Some tupuri women thus pour ash in a basket in *Pardonaea Confoensis* (a long and resistant grass) in which a permeable film (now often cut in a woven plastic fiber bag) was previously placed. It should also be noted that until the end of the 1960s, in the Kadzell Plain (West Lake Chad), the wood ash was sifted with a straw funnel with a quarter of a cubic meter ", the water flowing in A pottery. However leaching ash does not necessarily imply the use of pierced pottery. We can use "a straw barrel" [15]. Moreover, pottery specifically intended for the production of Cukkuri are always commonly made north of Cameroon. Two types of utensils can be distinguished: filters, recognizable with their perforated bottom (a central hole in the diameter of a finger or a series of small perforations), and containers intended to receive the filtrate [9]. However, it should be recalled that this production does not require the use of specific pottery. Any container with a wide-opening, a pottery, but also a sheet metal basin, or a calabash can be used to filter the ash, as long as it is pierced or split, as well as any container can receive the brine, provided that it is sufficiently waterproof. On the other hand, we have seen that plant fiber filters, therefore in perishable material, were used by some populations in West Africa, such pottery are thus used to cook the "couscous" steamed [16] [17]. On the other hand, it is commonly practiced by the Arabs Showa which, to do this, seem rather to use pottery whose broken background has been replaced by a piece of mat [12]. Two types of utensils can be distinguished: filters, recognizable with their perforated bottom (a central hole in the diameter of a finger or a series of small perforations), and containers intended to receive the filtrate. It is therefore possible to specify the most usual features of the pottery shaped to produce the ash salt. Potteries similar to those we have just described are commonly discovered in the archaeological levels of the Diamée sites [18].

#### 4. Conclusion

It resorts results obtained that women over the age of 40 are the main producers of artisanal potash. These use the co-produces of foods from crops, businesses and households for the manufacture of potash with a process comprising several steps. These coproducts are diverse but the most used is cocoa pods. Also, this potash produced is used in several fields whose food, cosmetics, medicinal field and others such as art, agriculture, the textile industry. Food with

multiple uses and actions. Glass bottles represent the most appropriate conservation equipment and marketing of artisanal potash remains a good source of revenue.

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Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Details of the AI usage are given below:

- 1.
- 2.
- 3.

## 10. References

- [1] Prud'homme M. (2009) potash. The Canadian Encyclopedia, last modification on March 4, 2015.
- [2] IPI (2013). An essential element for life. Baumgärtlistrasse 17, p.o. Box 260 CH-8810 Horgen, Switzerland, [ipi@ipipotash.org](mailto:ipi@ipipotash.org), [www.ipipotash.org](http://www.ipipotash.org), [twitter.com/IPI\\_potash](https://twitter.com/IPI_potash); Facebook.com/IPIpotash/flickr.com/Photos/IPI\_potash/sets
- [3] Kouamé K.B., Diomandé M., Koko A.C., Konaté I. & Assidjo N.E. (2018). Diversity and Use of Artisanal Potash from Agricultural Co-Products in Ivory Coast. International Journal of Advanced Research (Ijar), 6 (2): 1619-1630.
- [4] BAFD / OECD (2006). Economic Outlook in Africa. 249-263 P, [www.oecd.org/dev/publications/perspectivesAfrican](http://www.oecd.org/dev/publications/perspectivesAfrican).
- [5] Boucherba N. (2015) People's Democratic Republic of Higher Education and Scientific Research Abderrahmane University Mira of Bejaia Faculty of Nature Sciences and Life Microbiology Department Enhancement of Agro Residue Valor -Industrial academic year 2014/2015
- [6] Sangaré A., Koffi E., Akamou F., & Fall C. (2009). State of phylogenetic resources for food and agriculture: second national report. In National Report on the State of Phylogenetic Resources for Food and Agriculture, PP 23-35.
- [7] Seignobos C. (1979). Fats and agrarian civilizations (Chad and North Cameroon), Annals of the University of Chad. Letters Series, Live Languages and Human Sciences, Special Number, 120 p.
- [8] Hallaire A. (199). Mountain peasants North Cameroon: Mandara Monts, Paris, Orstom, 253 p.
- [9] Langlois O., Seignobos C. et Anderson P. (2013). Towards a history of "potash salt" in northern Cameroon Crossover views on plants related to the work of plants. An interdisciplinary Focus on Plant-Working Tools, pp.279-295).
- [10] Alexandre D.Y. (1989). Sodium wealth of the ashes of some Guyanese palms, Cayenne, Orstom, 7 p. multigr. [http://horizon.documentation.ird.fr/exl-doc/pleins\\_textes/pleins\\_textes\\_6/b\\_fdi\\_43-44/010004381.pdf](http://horizon.documentation.ird.fr/exl-doc/pleins_textes/pleins_textes_6/b_fdi_43-44/010004381.pdf).

- [11] Créac'h P. (1993). Feeding the Sahel. Food in Chad, 1937-1939, Paris, Harmattan, 298 p.
- [12] Waziri M., Akinniyi J. A., Chidi m. A. (2011). Elemental Composition of 'Dalang': a food condiment from Evaporated Extract of Borassus Aethiopum Fruit ASH, American Journal of Food and Nutrition 1, 3: 123-125.
- [13] Mianpeurem T., MBAILAO M., Nambatingar N., Yaya M., Ngarmadji A. (2012). Elemental Composition of Vegetable Salts from Ash of Oven Common Plants Species from Chad, International Journal of Pharmacology, 8, 6: 582-585.
- [14] Bouquet C. (1990). Islanders and residents of Lake Chad: a geographical study, vol. 2, Paris, the Harmattan, 464 p.
- [15] Gouletquer P., Kleinmann D. (1984). The Salines du Manga (Niger), Techniques & Culture, 3: 1-42.
- [16] Mayor A. (2011). Ceramic traditions in the Niger loop. Ethnoarchaeology and Story of stand in the time of precolonial empires, Journal of African Archaeology Monograph Series, Vol. 7, Frankfurt, Africa Magna Verlag, 292 p. + Appendices.
- [17] Thiam M. (2010). Ceramics in Senegambian area: an unknown heritage, Paris, the Harmattan, 216 p.
- [18] Langlois O. (1995). History of the post-Neolithic settlement of the Diamée (Northern Cameroon), thesis of the University Paris 1, 780 p.
- [19] Mohammadou E. (1982). Peoples and states of the Foubina and Adamawa (North Cameroon). Kurt Strumpell and Von Briessen Studies, Works and Documents of the Institute of Human Sciences, Yaoundé, Center for Anthropological Research and Studies, 215%.
- [20] Jasinski S.M. (2009). Potash. In Mineral Commodity Summaries, United States Geological Survey. <http://minerals.usgs.gov/minerals/pubs/commodity/potash/mcs-2009-potas.pdf> (Accessed March 2009). Natural Resources Canada (NRCAN). 2008. Preliminary estimate of the mineral production of Canada, by Province, 2008. <http://mmsd.mms.nrcan.gc.ca/stat-stat/prod-prod/pdf/2008p.pdf> (Accessed March 2009)
- [21] Jégoure Y, (2016). Potash: a well-common price war. OCP Policy Center Policy Brief March 2016 PB.
- [22] Nomel C. A. M, Kouadio Y., Dan G.C, Komadé T., Patrice Lucien Kouame P.L. (2019) Cereal flour survey and ingredients used in the preparation of traditional food pulp Called "Tôh" in Abidjan (Ivory Coast). Biocatalysis laboratory and bioprocess, Food Science and Technology, University Nangui, Abrogoua, Ivory Coast, European Scientific Journal February 2019 Vol.15, No.6 ISSN: 1857 - 7881 (Print) E - ISSN 1857- 7431. DOI: 10.19044 / ESJ. 2019.V15N6P508 URL: <http://dx.do.org/10.19044/esj.2019.v15n6p508>
- [23] Webb, T.C. and Smith, E.A. 2009. Potash. New Brunswick Department of Natural Resources, Minerals, Policy and Planning Division, Mineral Commodity Profile, no 4, 9 p.
- [24] Biego H.M.G, Koffi M.K.(2011). Determination of minerals from by-products of export and food crops of Ivory Coast. ResearchGate, Enero 2011,12(2):13-24
- [25] James L. LIII. (2023). General review of potassium (K) concentration disorders. MD, Brookwood Baptist Health and Saint Vincent's Ascension Health, Birmingham Verified/Revised September 2023.