



# Cocoa Pod in the Ivorian Plantations: Green Gold Neglected and Bulky ?



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**Submission:** June 03, 2018; **Published:** July 23, 2018

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## Abstract

The aim of this study is to emphasize the capacity of cocoa pods in sustainable development, agri-food, agro-pastoral and agronomy.

Agricultural by-products, cash crops such as cocoa are abundant in production areas. With a national production of cocoa valued to 2.01 million tons, more than 50.25 billion pods are destroyed each year in Côte d'Ivoire instead of being valued. In addition, these pods attract flies and other pests against cocoa.

In order to find effective means for their valorization, this work was initiated for the development of simple and inexpensive techniques of these agricultural by-products. To do this, the cocoa pods were cremated, and their mineral content determined. The results put before the exceptional nutritional properties of the pods (the gangues containing the cocoa beans). The ashes obtained from cocoa pods are significant sources of mineral elements (91.9%).

The ashes analyzed are rich in potassium (43.7%), calcium (0.91%), sodium (0.4%), phosphorus (0.23%), iron (54.8mg/kg), copper (36.04mg/kg), zinc (16.2mg/kg), magnesium (4.9mg/kg) and manganese (4.6mg/kg). It could help fighting hunger in cocoa-producing countries and can be considered as an outstanding nutritional supplement, useful in the fight against malnutrition in rural areas. As a result, cocoa pods could be valued for their nutritional potential.

**Keyword:** Cocoa nuts; Sustainable development; Malnutrition

## Introduction

The important place occupied by cocoa in the economy of Côte d'Ivoire compels farmers to practice intensive farming. As a result, population growth is creating a lot of pressure on the land, involving shortage of arable land [1]. The consequence of this pressure is the decline of fallows leading to soil degradation and low crop yields [2].

Furthermore, one of the target of the food self-sufficiency policy, started over many years, is to increase food production by limiting the use of new land. Thus, the farmer must resort to modern agricultural methods like the rational use of pesticides and chemical fertilizers for a good yield [3].

Yet some products such as cocoa pods are dumped in the fields and become harmful for a good agricultural yield. Their use for organic farming therefore becomes necessary. This

study aims to evaluate the nutritional quality of the cocoa pod for plants but also for humans.

## Materiel and Method

### Matheriel

Ivorian cocoa pods were used in this study

### Method

**Chemicals analysis:** All the analysis have been made in triple Carbohydrates and ash The carbohydrates are obtained by the differencing the measured out elements and the first sample. The content in ash is obtained by weighing 5g of the sample incinerated at 550 °C during six hours in an oven (select horn, pselecta) [4].

Tenor in minerals Iron (Fe), zinc (Zn), Potassium (K), calcium (Ca), phosphorus (P), copper (Cu) magnesium (Mg) and manganese (Mn) are dosed by the atomic absorption spectrometry of flame photometer (PFP 7) from the sample of ash filtered [5].



Figure 1: Cocoa plantation.



Figure 2: Cocoa nuts.



Figure 3: Cocoa pods.

The use of chemical fertilizers, because of their immediate beneficial effect on crop productivity, is one of the solutions. However, their high cost and unavailability make them almost inaccessible to a large number of farmers. In addition, they have a negative impact on the environment and the health of populations. One of the inexpensive solutions would be the use and valorization of biological fertilizers obtained from the pods left abandoned in the fields. This organic fertilizer could restore nutrients from the crop to the soil. In fact, large tonnages of agricultural commodities such as cocoa beans

(2.01 million tons), lead to large quantities of agricultural by-products (50.25 billion pods) [1] (Figures 1-5).



Figure 4: Fresh cocoa beans.



Figure 5: Dry cocoa beans.

Whether pod debris, dry cocoa leaves, agro-pastoral exploitation, fertilizer, food, energy and industrial interests are proven. The average ash percentages of the pods analyzed were 91.9%. The studies undertaken mainly concern cocoa pods, and the data found are close to those obtained with [4] [5]. Cocoa pods contain significant sources of mineral elements (91.9%). The ashes analyzed are rich in potassium (43.7%), calcium (0.91%), sodium (0.4%), phosphorus (0.23%), iron (54.8 mg/kg), copper (36.04mg/kg), zinc (16.2 mg/kg), magnesium (4.9 mg / kg) and manganese (4.6 mg / kg). The study shows that the pod contains a high potash rate (43.7%) and iron (54.8 mg / kg). Minerals play an important role in soil acidity. They promote the stability of the soil structure which is essential to optimize its fertility. Indeed, the stability is improved by the presence of divalent cations such as calcium, able to make bridges between the micro-aggregates of the soil [2] [6]. Soils with low calcium content and a texture dominated by fine silts have a structure that is not resistant to disturbances such as the passage of machinery and precipitation. Thus, the leaching of calcium can lead to acidification of the medium and saturation of the cation exchange capacity in H<sup>+</sup> ions [4,6].

Ca-rich ash can compensate calcium loss and improve soil pH. The by-products of culture analyzed contain macrominerals (potassium, phosphorus) essential for the growth of plants. Thus, some plants such as market gardeners

(carrots, potatoes, beetroot, onions) can be very sensitive to a deficiency in K and P while others (corn, soybeans, oats, sorghum) are less sensitive [6,7]. In 2011 [9] used cocoa husks as an organic amendment to fertilize the degraded clay and sandy ferrallitic soils of the Oumé cocoa zone in Ivory Coast. Ashes can also be used in the biological control of some pest-ravaging slugs because of their hygroscopic nature [6-11].

### Conclusion

The results of the study undertaken have shown that agricultural by-products, often unused, are good sources of mineral salts. Among the by-products, pods are rich in several minerals analyzed. This set, often present among planters, is a source of useful mineral salts that could be exploited on agronomic, food and industrial plants. Thus, the cocoa pod can be recommended to farmers for inexpensive use. The production of potash food may be recommended for commercial exploitation.

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DOI: [10.19080/NFSIJ.2018.07.555709](https://doi.org/10.19080/NFSIJ.2018.07.555709)

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