



(REVIEW ARTICLE)



## Variability of agricultural income for empowerment: Case of cucumber and potato leaves producers in Goréké (San Pedro – Côte d'Ivoire)

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### Abstract

Female entrepreneurship in rural areas in French-speaking Africa is more related to rural, processing and marketing activities. The objective of this study is to present the variability of agricultural income of female producers for their empowerment. To this end, fifty female producers from the village of Goréké were interviewed. The areas, poultry droppings + sawdust, NPK 12 22 22, masses and incomes were observed. A Principal Component Analysis showed that on a hectare of cucumber, reasonable amounts of NPK 12 22 22 (80 kg) and organic residue (6,000 kg) provided the best mass (16,000 kg). At the level of potato leaves, 1,600 kg of organic residue and 20 kg of NPK provided the best mass (1,600 kg). Furthermore, the potato leaf producer had an average income during the shortage period of 2226,642 ± 1602,093 CFA francs compared to that of cucumber which is 584,714 ± 296,718 CFA francs. On the other hand, during the abundance period, the average incomes are respectively 713,793 ± 536,983 for potato leaves and 467,771 ± 237,374 CFA francs for cucumber. This difference is explained by the higher selling price per kilogram of potato leaves. In conclusion, the potato leaf producer would be more financially independent. In perspective, training will be provided to market gardeners to optimize the masses produced by rationalizing the masses of fertilizer used for an improvement in income.

**Keywords:** Average income; Côte d'Ivoire; Cucumber; Poultry droppings; Potato leaf; Producers

### 1. Introduction

Women have always been an essential link in society. They economically support households by carrying out various activities (Sissoko *et al.*, 2023). The new business models of female entrepreneurship in rural areas in French-speaking Africa are diverse and more linked to rural, processing and marketing activities (Ouattara, 2020). Entrepreneurship consists of being a creator of informal or professional activity. Nowadays, entrepreneurship allows a certain freedom and self-realization (Degeorge and Messegheem, 2016). (Ouattara and Kikouta 2019, 206) have shown that female entrepreneurship promotes the economic empowerment of women. Also, the United Nations Industrial Development Organization (UNIDO, 2003), has indicated that developing female entrepreneurship is a way out of poverty for women. In Côte d'Ivoire, according to Silué, 2020, 90 % of women are entrepreneurs in the food sector. Their agricultural activities are diverse and include production, processing and marketing (Fall *et al.*, 2023). They require investments such as the purchase of inputs, payment of labor, transport of harvested products, etc. (Delame, 2016). There are few articles that present the income of women producers after deducting their expenses, especially those related to fertilizers. Monetary income is obtained after deducting the expenses of the activity carried out and allows women to meet their needs (Piet and Hérault, 2021). In this context, the objective of this study is to present the variability of

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agricultural income of female producers for their empowerment. In this article, the variation of fertilizer charges, marketed masses and income of market gardeners following the application of combined doses of poultry manure + sawdust and NPK on crops will be presented. The poultry manure + sawdust combination is an organic residue that comes from livestock farming. It has used as organic fertilizer on crops, because it is rich in nitrogen (N), phosphorus (P) and potassium (K) and at a lower price than NPK (Gomgnimbou *et al*, 2019, Ruf and Kiendré, 2016). NPK, which is a chemical fertilizer, also composed of nitrogen, phosphorus and potassium. It is combined with poultry manure + sawdust by cucumber (*Cucumis sativus* L., Cucurbitaceae), potato leaf (*Ipomoea batatas* L. leaf, Convolvulaceae) and chive (*Allium schoenoprasum* L., Alliaceae) market gardeners in the village of Goréké to optimize their yields. Yet, what better combination of these two products? However, what better combination of these two types of fertilizers can achieve the benchmark yields of the crops they grow for significant income for the empowerment of market gardeners? Thus, the specific objectives are to present: i) entrepreneurship and variation of fertilizer charges and harvested masses, ii) entrepreneurship and variation of income depending on the crops grown.

### 1.1. Study site

The study site is Goréké which is a village in San Pedro, near the University of the said city. It is located at 5° 1' 15" north latitude and 6° 46' 45" west longitude. It has 790.000 inhabitants according to the 2021 general population and housing census. It is an integral part of the commune which has been in full operation since 1985 by law n° 85-1085 of October 17.85 relating to municipal organization in the territory of the Republic of Côte d'Ivoire (Awal *et al.*, 2021). The other villages in the commune are Dimoulé, Djiro-Gnépahio, Grand-Gabo, Guiboué, Kablaké, Baba, Klou, Magné, Petit-Gabo, Petit-Pédro, Pont-Bascule, Poro and Taki. San Pedro, the capital of the department of the Bas Sassandra region, is located in the southwest of Côte d'Ivoire, 348 km from Abidjan by the coastal road (Awal *et al.*, 2021). It was highlighted in 1970 as part of the development of the economy of Côte d'Ivoire through the Development of the South-West Region (ARSO). It is home to the second port of Côte d'Ivoire, which is the world's leading cocoa exporting port (Awal *et al.*, 2021). The boundaries of the said department are the Atlantic Ocean to the south, and respectively the departments of Soubré to the north, Sassandra to the east and Tabou to the west (Awal *et al.*, 2021).

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## 2. Materials and methods

A questionnaire was developed, and fifty (50) female farmers from the village of Goréké have been maintained individually. The variables collected were crop areas, masses of organic residue (poultry droppings + sawdust) and NPK used. The areas were standardized to one hectare in order to make comparisons better. The masses of the products (cucumber and potato leaves) harvested. The data were analyzed with the Kolmogorov-Smirnov non-parametric independent samples test. The prices of fertilizers after purchase, products (cucumber and potato leaves) packaged for sale were evaluated.

1 hectare (ha) = 10,000 m<sup>2</sup>

1 kilogram (kg) = 1,000 grams (g)

One tonne (T) = 1,000 kg

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## 3. Results

### 3.1. Entrepreneurship and variation of fertilizer charges and harvested masses

The entrepreneurship of the women in this study is the cultivation and marketing of cucumber and potato leaves. The farmers who grow these crops have different fertilizer loads (poultry manure + sawdust and NPK) on a cultivation area of one hectare. Also, the masses produced were different (Figures 1 and 2). At the cucumber level, farmer "1" had a larger mass of products (16,000 kg) than the others (Figure 2). She used 6,000 kg of poultry manure + sawdust and 80 kg of NPK (Figure 1). The cost price per kg of fertilizers were respectively 20 CFA francs / kg for poultry manure + sawdust and 500 CFA francs / kg for NPK. Thus, the total fertilizer load was 160,000 CFA francs. Those who used above or below these quantities of fertilizers had low masses of harvested products. For example, farmer 17, who had a fertilizer load of 520,000 CFA francs, had a lower production of 8,000 kg than the first. At the level of potato leaves, farmer "22" had a higher mass of products compared to the others. She used 1,600 kg of poultry manure + sawdust and 20 kg of NPK. In sum, the fertilizer load of the latter is 42,000 CFA francs. Those who used above or below these quantities of fertilizers had low masses of harvested products.

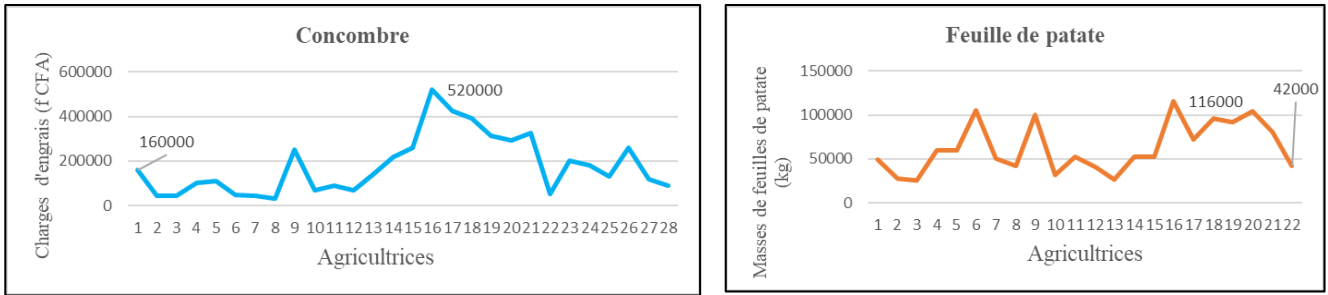
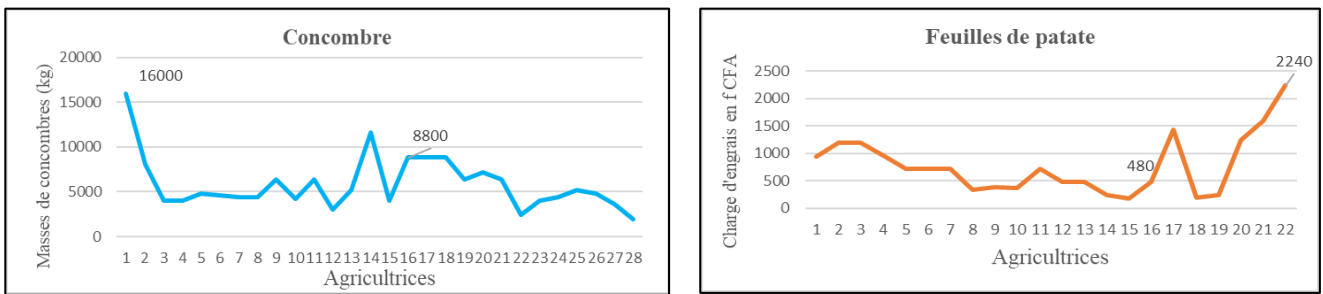


Figure 1 Fertilizer charges used for the production of cucumber and potato leaves produced



Source: Author

Figure 2 Masses of cucumbers and potato leaves produced

### 3.2. Entrepreneurship and income variation according to the crops grown

The Kolmogorov-Smirnov non-parametric independent samples test defined ten income classes. The interval of each class is 500 thousand francs. These classes were grouped into income levels (Table 1).

Table 1 Class and income level

Income class	Interval	Income level
1	Less than 500 thousand	Very low income
2	500 thousand - 1 million	
3	+ 1 million – 1.5 million	Very average income
4	1.5 million – 2 million	
5	+ 2 million – 2.5 million	Average income
6	2.5 million – 3 million	
7	+ 3 million – 3.5 million	High income
8	3.5 million – 4 million	
9	+ 4 million – 4.5 million	Very high income
10	5 million – 5.5 million and +	

Source: Author

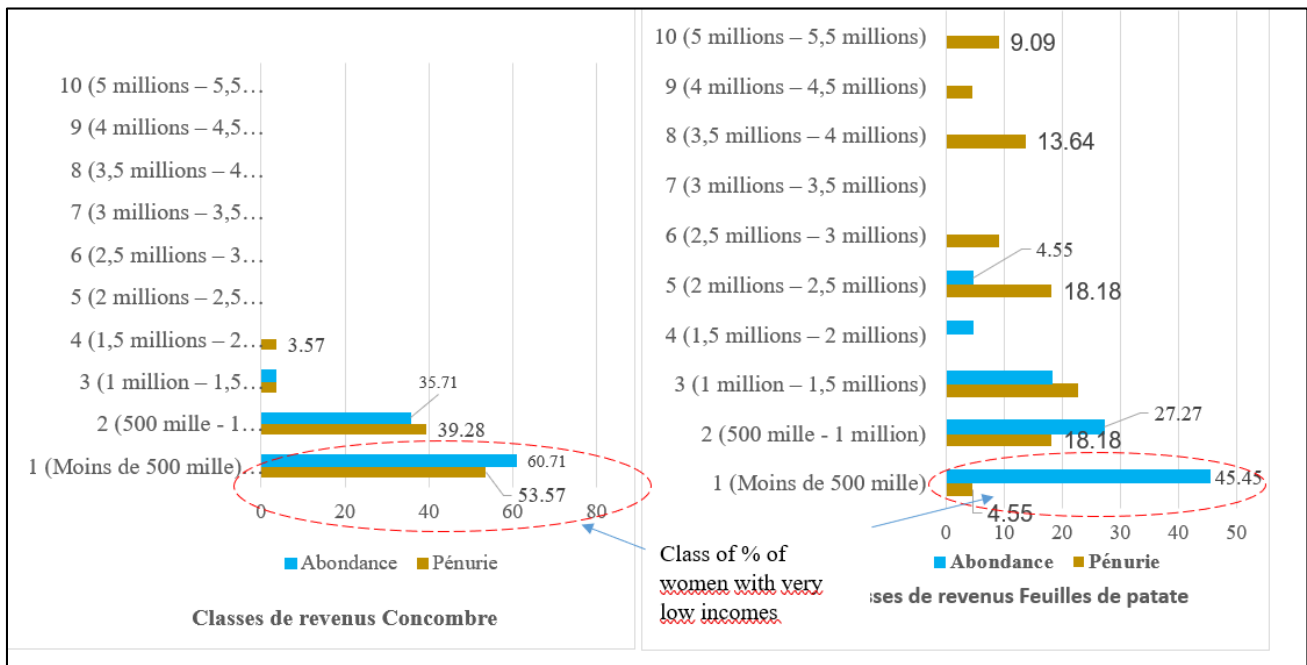
#### 3.2.1. Cucumber fruits

For cucumber fruits, the average income during a period of shortage is  $584,714 \pm 296,718$  CFA francs, i.e. a minimum of 192,000 and a maximum of 1,600,000 CFA francs. On the other hand, during a period of abundance, the average income is  $467,771 \pm 237,374$  CFA francs, i.e. a minimum of 153,600 and a maximum of 1,280,000 CFA francs. The Kolmogorov-Smirnov test shows a significant difference between the two production periods,  $p = 0.01 < 0.05$ . Furthermore, the distribution of producers by income class reveals that during periods of abundance and shortage, respectively 60.71%

and 53.57% of producers have very low incomes. At the same periods, 35.71% and 39.28% of the producers have low incomes and 7.5% and 3.51% of them have very average incomes. In short, the majority of the producers have low incomes. None of them have average and high incomes.

3.2.2. Potato leaves

For potato leaves, the average income during a shortage period is 2,226,642 ± 1,602,093 CFA francs, i.e. a minimum of 448,000 and a maximum of 6,678,000 CFA francs. On the other hand, during a period of abundance, the average income is 713,793 ± 536,983 CFA francs, i.e. a minimum of 140,000 and a maximum of 2,198,000 CFA francs. The Kolmogorov-Smirnov test shows a significant difference between the two production periods,  $p = 0.01 < 0.05$ . Furthermore, the distribution of producers by income class reveals that during a shortage period, 64% of producers have an income below the average. And among these, 4.55% have very low incomes. Furthermore, 36% have an income above the average. And among these, 13.64% of the producers have a very high income. In times of abundance, 64% of the producers have an income below the average. And among these, 45.45% have a very low income. Among the 36% who have an income above the average, none have a high income (Table 3).



Source: Author

Figure 3 Percentage of women by income class by culture

- Abundance :This is a period when the harvested products are in large masses on the markets
- Shortage :It is a period when the harvested products are in reduced masses on the markets

4. Discussions

4.1. Entrepreneurship and variation of fertilizer charges and harvested masses

The reasons for the variations in fertilizer loads could be explained by a lack of training of producers in crop cultivation techniques. Each applies the fertilizer masses inconsistently, after some advice collected from their colleagues. To this end, the masses harvested are below the reference masses respectively 20 tonnes for cucumber and 12 tonnes for potato leaves (Sohindji et al., 2020; Bello et al., 2017). On this subject, (Rolland, 2016, p 259) showed the importance of training producers in cultivation techniques. In Côte d'Ivoire, public and private agricultural training schools exist, including two regional agricultural schools in Abidjan (ERA-SUD Bingerville) and Abengourou (L'Ecole Régionale d'Agriculture de l'EST (ERA-EST)), four specialization schools in livestock, forestry, wildlife and protected areas. Three (3) specialized learning and development centers provide diploma and qualifying training (INFPA, 2018). There is the Higher School of Agronomy (ESA) within the Houphouët Boigny National Polytechnic Institute (INPHB) in Yamoussoukro (INPHB, 2022). However, the aim here is to translate the knowledge acquired by graduates of these institutions to producers in rural areas. In this regard, there is a lack of supervision of rural producers by the structures responsible for doing so,

which is the National Agency Rural Development Support Agency (ANADER). This state of affairs could be due to insufficient fuel for the travel of technical agents. Also, there could be insufficient monitoring and evaluation to assess the effective coverage of the actions of the technical agents in charge of the villages. In this sense, (Kelgue et al., 2022, p 93) showed that in Chad, the coverage rate among producers of producer support services is 17.13% and in villages 1.95%. What about Côte d'Ivoire? This question would challenge more than one. Thus, there would be a gap to be filled that would require the training and support of these producers for food security and sovereignty in Côte d'Ivoire.

#### 4.2. Entrepreneurship and variation in income classes

The variation in income could be explained by the conduct of different activities of the producers. They do not have the same inputs such as fertilizer masses for their conduct (Dibi et al, 2019). In this study, 28 women grow cucumber and 22 for potato leaves. The two crops do not have the same fertilizer needs. According to (Legba et al. 2020,p) 20 tons of manure and 100 kg of NPK per hectare are required for cucumber. Furthermore, for potato leaves, 10 tons of manure and 100 kg of NPK per hectare are required (Sohindji et al., 2020). Also, the sales prices are different depending on the producers. Cucumber is sold at 80 CFA francs/kg in the abundance season and at 100 CFA francs/kg in the shortage season. As for potato leaves, they are sold at 1000 CFA francs/kg and 3000 CFA francs/kg. However, the mass produced for cucumber is greater than that of potato leaves. Consequently, the income of women who sell potato leaves is greater than that of those who sell cucumber. This is supported by the potato leaf farmer "22" who produced a lower mass of products (2240 kg/ha) and who obtained 6,678,000 f CFA /ha in the shortage season and 2,198,000 f CFA /ha in the abundance season of income than the cucumber producer "1" who produced 16,000 kg/ha and obtained respective incomes of 1,600,000 f CFA /ha in the shortage season and 1,280,000 f CFA /ha in the abundance season.

### 5. Conclusion

The objective of this study was to show that there is a diversity of income when women undertake the same activity and see different activities. The specific objectives made it possible to present fertilizer charges per crop, masses marketed and income per crop grown by market gardeners. The major crops grown are cucumber and potato leaves. This study shows that the Fertilizer costs are lower in potato leaf cultivation. Marketed masses are higher in cucumber. Income is higher in potato leaves because the selling prices are higher. Thus, women who produce potato leaves, with higher incomes, would be more autonomous than those who cultivate cucumber. In addition, these women will be supported to help them better maximize their entrepreneurship for their continued empowerment.

### Compliance with ethical standards

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#### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

#### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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