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Survey on the Sales and Consumption of Leguminous Beans (Soybean, Niger Bean, Lima Bean and Pigeon Peas) in the District of Abidjan

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Abstract **Original Research Article**

In Côte d'Ivoire, undernutrition is primarily characterized by a deficiency in animal protein. This study aimed to promote leguminous beans (soybeans, cowpeas, Lima beans, and pigeon peas) in the fight against protein-energy malnutrition. To this end, surveys on the consumption and sale of legumes were conducted in the Abidjan District. The results of the sales survey reveal that cowpeas are the most sold (62%), followed in descending order by soybeans (31.5%), and Lima beans (7%). Pigeon peas are absent from the markets in the Abidjan District. Purchase and sale prices are set based on the seasonal availability of the products. According to the data, these legumes found on the markets mostly come from rural areas. During the consumption survey, it was found that dishes based on legumes are occasionally consumed, with soybeans being consumed by 67.5%, and Lima beans (88.3%), the Angolan peas (98.3%) and the cowpea (75.8%) by the Abidjan residents. Northerners consume more cowpea, soy is appreciated by those in the center while the lima bean and the Angolan peas are more favored by residents of the East.

Keywords: Leguminous beans, survey, sales, consumption.

INTRODUCTION

Leguminous beans constitute a large family (Fabaceae) that includes plants aimed at food. These are divided into three groups: dried leguminous beans, oilseeds, and podded vegetables (Cullis and Kunert, 2017). They play a very important role in food security in developing countries. Additionally, legume seeds are characterized by both high energy density and high nutritional density. These foods provide fiber, protein, carbohydrates, B vitamins, iron, copper, magnesium, manganese, zinc, and phosphorus. Beyond strictly covering nutritional needs, legume seeds, particularly dried legumes, offer undeniable health benefits (Rémond and Walrand 2017). Leguminous beans are sources of beneficial phytochemical compounds that combat free radicals. The nutritional benefit of adding leguminous beans to cereals has been the subject of many studies (Hama-Ba *et al.*, 2016). Several studies have been conducted on the chemical composition of these leguminous beans Soybeans emerge as a nutrient-rich food, followed by cowpeas, the Pigeon pea, and Lima beans (Konan Behiblo *et al*., 2020). Indeed, the diversity of chemical compositions contributes to their popularity as food. However, their marketing circuit is generally poorly understood, and their consumption is not appreciated at its true value. Therefore, the aim of this work is to contribute to a better understanding of these legumes.

I. MATERIAL AND METHOD

I. 1. Material

I.1. 1. Plant material the plant material studied in this work consists of dry seeds of leguminous beans, namely, cowpea, Lima bean, Angole pea, and soybean (Figure 1)

I.1. 2. Technical material

Questionnaires were used as a data collection tool on the marketing of leguminous beans and the consumption of leguminous beans based dishes in the district of Abidjan. This questionnaire helped gather information from residents of the different municipalities of Abidjan. It consists of a series of questions grouped into two categories:

1. Identification or socio-demographic profile of the respondent
2. Detailed information on the sale of leguminous beans and the consumption of leguminous beans -based dishes.

Figure 1: Différents leguminous beans (A) lima beans; (B) Soybeans; (C) Pigeon peas; (D) cowpeas (Konan Behiblo *et al*., 2020)

I.2. METHODS

II.2.1. Study Environment The surveys (sales and consumption) were conducted in the 10 municipalities of the Abidjan district (Yopougon, Koumassi, Abobo, Port-bouet, Attécoubé, Plateau, Treichville, Marcory, Adjamé, and Cocody) from July 2 to August 19, 2021. Data collection took place in the main markets of each municipality. In the municipality of Yopougon for example, the markets in the neighborhoods "Sideci", "Wassakara" and "Niangon north" were selected. As for the municipality of Koumassi, the markets visited were in the neighborhoods "Djê Konan", "Progrès" and "Sicogi". In the municipality of Abobo, the markets visited were those in the neighborhoods Samanke, Anonkoi 3, and Sicogi.

II.2.2. Development of survey questionnaires

At the end of several research activities, the questionnaires for the survey forms were developed. In fact, two types of surveys were conducted, one focusing on the marketing of legumes and the other on the consumption of dishes made from legumes. The questions asked were of the closed type (answered with 'yes' or 'no') and open type (allowing the respondent to express their viewpoint). The time dedicated to each interview was 5-7 minutes for each seller and consumer of legumes. These questionnaires covered several areas according to Tchumou *et al.* (2017).

II.2.2.1. Questionnaire sent to traders

The questionnaire included questions related to: - the sociodemographic characteristics of the respondents (Gender, Nationality, region, Level of education, Marital status, and age group). - the commercial sector of legumes, which focused on reasons for sale, quantities sold, purchase price, selling price, places of origin, and the production season of legumes.

II.2.2. 2. Questionnaire addressed to consumers of dishes based on leguminous beans

The questionnaire concerned questions related to:

- The sociodemographic characteristics of the respondents.
- The consumption of legumes (overall consumption rate, form of consumption, daily consumption rate, reason for consumption, place of acquisition.).

II.2.3. Survey on the Marketing of Leguminous beans

To conduct this survey, a sampling was carried out. The target population consisted of leguminous beans traders from the various markets in the 10 municipalities of the Abidjan District. 390 people were surveyed, with 39 individuals per municipality. This survey was conducted using a non-probability method, which made it impossible to know exactly the selection probability of the elements that made up the population due to the absence of a sampling framework and the lack of

information on the parent population; regarding the traders, they were chosen through random sampling. The total duration of the sales survey was 25 days, from July 2 to July 26, 2021. The surveyed individuals provided information on their sociodemographic profiles and the sale of legumes (Yoboué *et al.*, 2018).

II.2.4. Survey of Consumption of Leguminous beans -Based Dishes

This study was conducted using a questionnaire, where information was collected on the sociodemographic characteristics and consumption of leguminous beans -based dishes among the respondents. The target population consisted of the residents of the 10 municipalities of the city of Abidjan. 400 individuals were surveyed, with 40 people from each municipality. Consumers of leguminous beans -based dishes were chosen randomly. The responses to the various questionnaires were recorded. The total duration of this survey was 22 days, from August 28 to September 19, 2021.

II.2.5. Data Analysis

The various responses obtained from each questionnaire are converted into quantitative data (codes) and processed using SPSS 17.0 software. The quantitative values allowed for the realization of descriptive statistics, which consisted of numbers or percentages of respondents. Similarly, the influence of sociodemographic parameters on the choices of respondents is determined by the Chi Square test (Chi 2).

II. RESULTS AND DISCUSSION

II.2. RESULTS

I.1. Survey on the marketing of leguminous beans

I.1.1. Sociodemographic profile of leguminous bean sellers

Among a total of 390 people surveyed, 56.7% were women and 43.3% were men. These sellers are composed of individuals of Ivorian nationality (96.6%) and foreign nationality (3.4%). This profitable activity is not limited to a single region of Côte d'Ivoire. In fact, all regions are represented (33.5% Center, 21.4% North, 17.8% East, 12.7% West, 10% South, and 4.6% foreigners) (Table I). Most of the respondents who engage in this activity are illiterate, with a rate of 42%, followed by those with a primary education level (30%) and secondary (23%). Those with higher education account for about 4% (Figure 2).

Table I : Sociodemographic characteristics (gender, nationality, and regions) of leguminous beans sellers in the District of Abidjan

Gender (%)	Nationality (%)	Régions (%)
Men 41,3	Ivorian 96,6	Center 33,5
Woman58,7	Non ivorian 3,4	North 21,4
		East 17,8
		west12,7
		South 10
		Outside 4,6

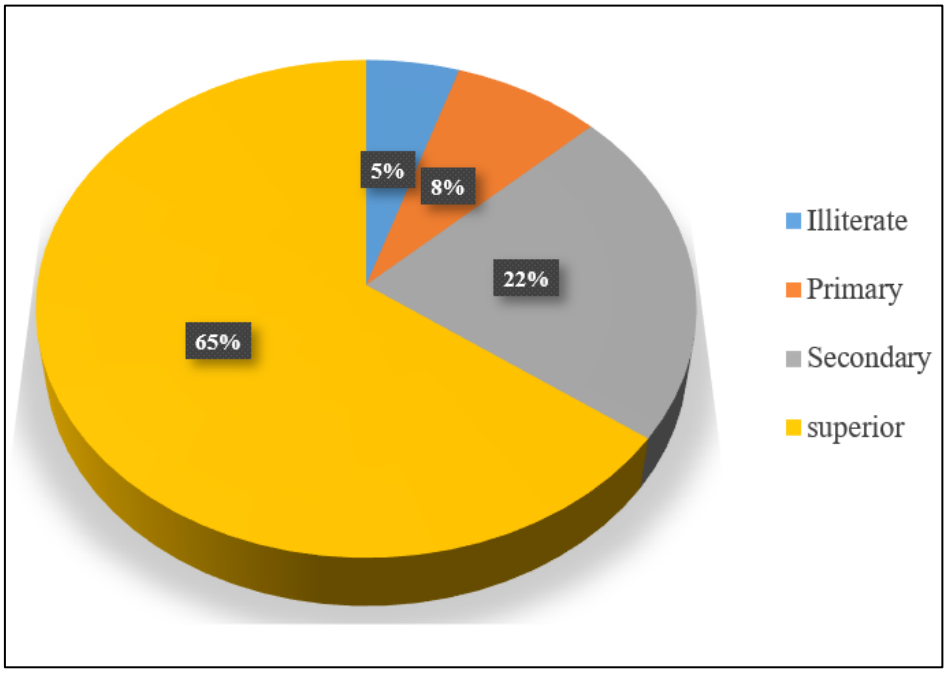

Figure 2: Distribution of leguminous beans sellers according to the level of education.

I.1.2. commercialization of leguminous beans

This study reveals that cowpeas are mostly sold by almost all respondents (62%), followed by soybeans (31.5%), and then Lima beans (7%), while the Angolan peas is absent from the market in the District of Abidjan (Figure 3). According to information gathered from sellers, leguminous beans are sold in 100 kg bags at wholesale and in smaller quantities at retail. Indeed, the purchase price of cowpeas per kilogram (kg) at wholesale varies between 350 FCFA and 500 FCFA or more depending on availability (season), so the purchase price of the product per 100-kilogram bag (kg) ranges from 35,000 FCFA to 50,000 FCFA or more. The price of a kilogram (kg) of cowpea ranges from 500 to 700 FCFA. As for soybeans, the price of a kilogram (kg) fluctuates between 500 F and 1500 F or more depending on availability (50,000 F and 130,000 F per 100 kg sack). Lima beans are sold by kilogram (kg) or in bundles for 400 to 800 F CFA per kilogram (kg) or 200 to 500 FCFA per bundle (Table II). The quantities sold vary from week to week: 1 to 3 sacks for cowpea, 1/2 to 1 sack for soybeans, and 1/2 sack for Lima beans.

Table II: selling prices and purchase prices of leguminous beans

leguminous beans	Selling price (FCFA)	Purchase price (FCFA)
cowpea	500-700	35.000-57.000
Soybean	1200-1500	100.000-150.000
Lima bean	400-800	30.000-57000

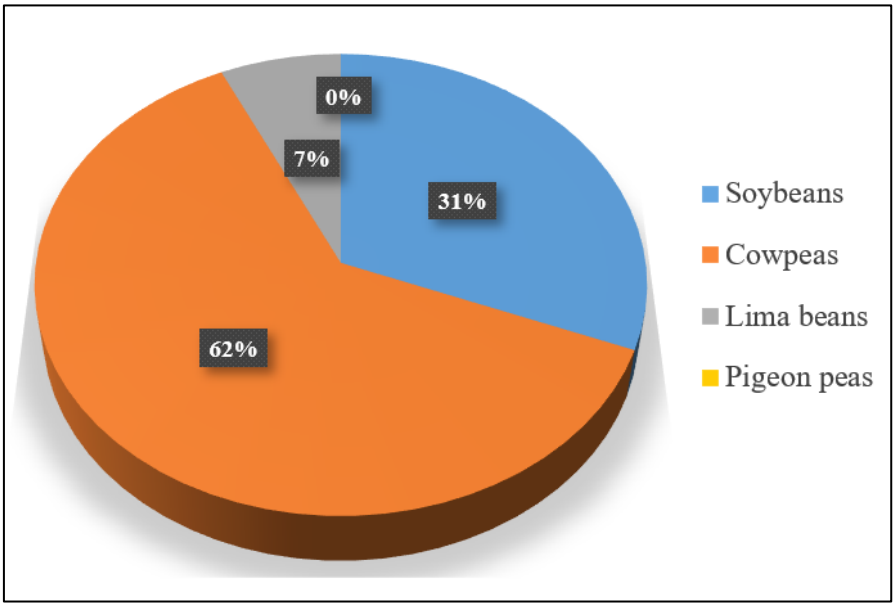

Figure 3: Relative proportion of leguminous beans sold in the markets of the Abidjan District.

II.2. Survey on the consumption of leguminous beans -based dishes

II.2.1. Socio-demographic profile of leguminous beans consumers

Among a total of 400 consumers surveyed, 50.8% were men and 49.2% were women. Leguminous beans consumers are comprised of Ivorian nationals (94.2%) and foreigners (5.8%). All regions of Côte d'Ivoire are represented (10.6% North, 15% South, 31.9% Center, 15.5% West, 26.5% East, and 5.8% foreigners) (Table III). All levels of education are represented (5% uneducated, 8.3% primary level, 21.7% secondary level, and 65% higher education (Figure 4).

Table III: Socio-demographic characteristics of the dishe

Gender (%)	Nationality (%)	Régions (%)
Men 50,8	Ivorian 94,2	North 10,6
Woman 49,2	No ivorian 5,8	South 15
		Center 31,9
		West 15,5
		East 26,5
		Outside 5,8

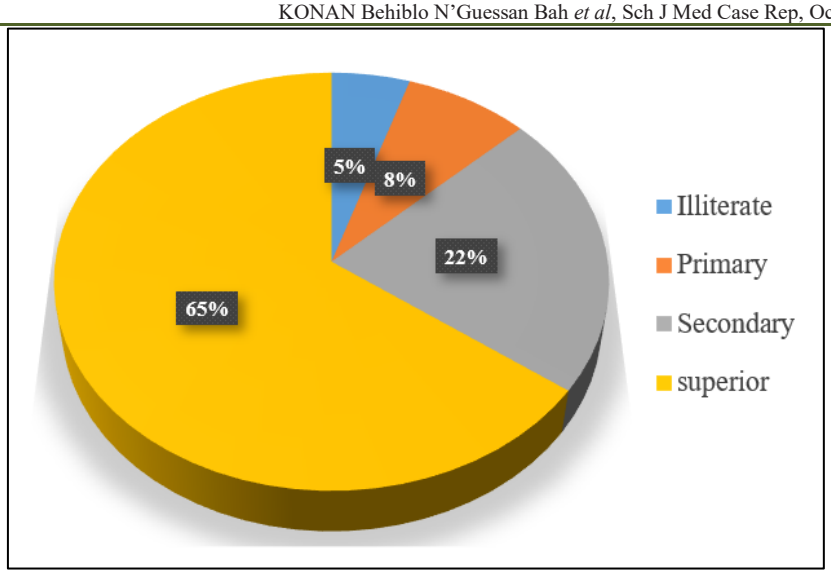

Figure 4: Distribution of consumers of leguminous beans -based dishes according to the level of education

II.2.2. Consumption of leguminous beans

Consumers are led to make one or more choices. The survey reveals that soy is consumed by almost all respondents (58%), followed by cowpea (31%), Lima bean (9%), and pigeon pea (10%) (Figure 5). Overall, the consumption of all leguminous beans by the respondents is occasional (67.5%; 75.8%; 88.3%; and 98.3%) (Table IV). The Pearson chi-squared test established a correlation ($p<0.05$) between ethnic origins and daily consumption of soy, Lima bean, pigeon pea, and cowpea (Table V); soy is consumed more by populations in the center, while cowpea is more consumed by those in the North, and residents of the East consume more Lima beans and pigeon peas. No correlation has been established between gender, education level, and daily consumption of leguminous beans-based dishes ($P<0.05$) (Figure 6). The main reasons for consuming or not consuming legumes (Table VI) are primarily the taste for soy, followed by the availability of soy, beans, and cowpeas, and then bloating for Lima beans, cowpeas, and pigeon peas. For consumption, soy and cowpeas are purchased from female vendors or at the market, while pigeon peas and beans are prepared at home (Table VII).

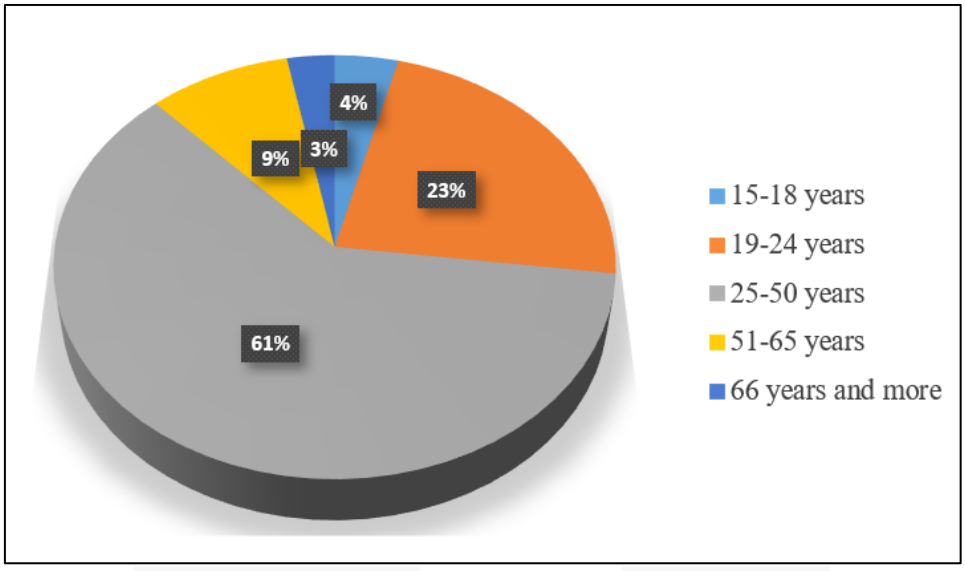

Figure 5: Distribution of leguminous beans consumers by age

Table IV: Frequency of consumption of leguminous beans-based dishes in the Abidjan District

Types of leguminous beans fréquency	soybean	Lima bean	Pigeon peas	cowpeas
day	10	0,1	0	4,2
week	10,8	5,8	0	12,5
month	11,7	5,8	1,7	12,5
causal	67,5	88,3	98,3	75,8

Table V: Relative proportion of daily leguminous beans consumption by ethnic origin in the District of Abidjan

Types of leguminous beans origin	soybean	Lima bean	Pigeon peas	Cowpeas
North	10	4,8	9,7	31,7
South	15	19	16,1	12,9
Center	32,7	23,8	16,1	11,9
west	15,3	11,9	19,4	16,8
East	26,4	40,5	38,7	26,7

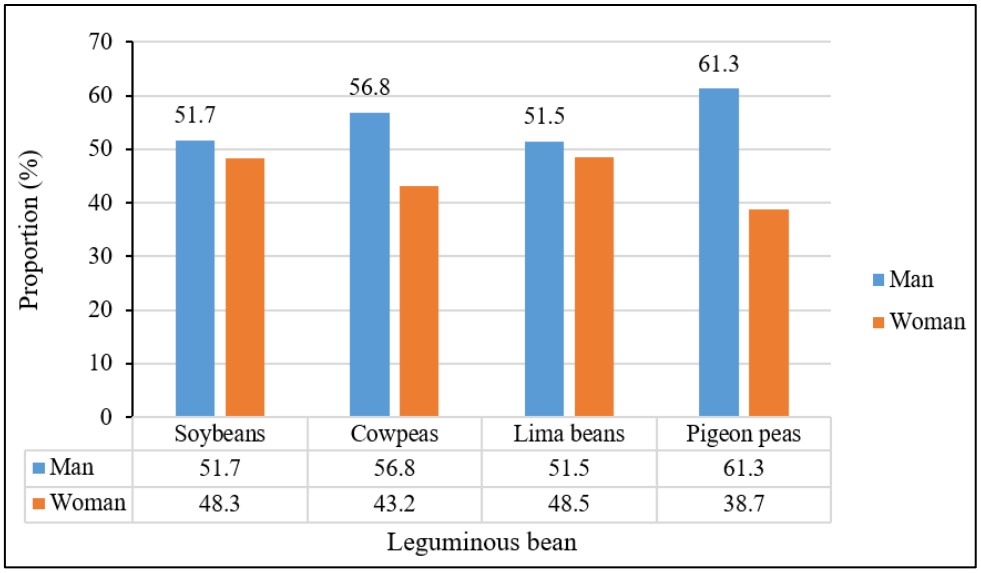

Figure 6: Relative proportion of daily leguminous beans consumption by gender in the Abidjan District.

Table VI : favorable or unfavorable factors for the consumption of leguminous beans-based dishes in the Abidjan District

Types of legumunous beans Attraction or rejection factor	soybeans	Lima bean	Pigeon peas	cowpeas
taste	59,2	20	5	18,3
Habit	3,3	13,3	17,5	10,8
price	1,7	5	2,5	0
Available	34,2	28,3	16,7	23,3
Bloating	1,7	33,3	58,3	47,5

Table VII: Places to obtain leguminous beans-based dishes in the District of Abidjan.

Put Places	soybeans	Lima bean	Pigeon peas	cowpeas
Home	42,5	6,7	17,5	56,7
Market	21,7	16,7	14,2	22,5
Saleswoman (condiment and bread)	74,2	0	10	56,3
Supermarket	5,8	5	0,8	1,7
Production area	0	6	8,9	17,6

II. DISCUSSION

The marketing activity of leguminous beans in the Abidjan district is carried out by both women and men. The leguminous beans (soybeans, cowpeas, and Lima beans) sold in the markets of the Abidjan district, according to the survey results, come from rural areas. These leguminous beans are collected from producers and then distributed to the various markets in Abidjan. Thus, there exists an organized supply and marketing chain (producers-wholesalers-retailers-consumers). These results align with those published by Cardell and Michelson (2023), which indicate that several actors are involved in the supply chains of leguminous beans. According to the results of this survey, soybean, Lima bean, and cowpea seeds are sold in all the markets visited. On the other hand, Angolan peas are not found in any market. According to the information gathered from traders, these seeds are grown endemically in the Zanzan region. And production is periodic. This information is consistent with that published by Akissoé *et al*. (2023). This is explained by the greater availability of legumes in the localities close to production areas. The results also indicate a large number of retail legume markets in the Abidjan District, which corroborates the

findings published by Missihoun *et al*. (2012), who counted more than a hundred retail markets. The results revealed that cowpea is the most sold, with a sales rates of 62%, followed in descending order by soybean and Lima bean with respective rates of 31% et 71%. According to information gathered from traders, this high sales rate of cowpea is due to its availability, thus its production. This strong production of cowpea is observed worldwide (Fifali *et a*l, 2025); according to these authors, the annual global production of cowpea ranges between 3.1 and 3.3 millions tons of dry seeds, with over 64% in Africa. The results indicate that in all the markets of the Abidjan District, one kilogram (kg) of cowpea sells for 700 CFA, one kg of green or white soybeans sells for 1200 CFA (average price), and Lima bean grains are sold in small bundles of 200 g to 500 g or by kilogram, with variable prices (200 CFA to 500 CFA or more).Moreover, the trade in leguminous beans seeds is dominated by women of Ivorian nationality. The populations in the north and east are the most numerous. In Africa, and particularly in Côte d'Ivoire, most of these legumes are sold by illiterates and are dominated by women. The work of Tchumou *et al.* (2017) on lima bean seeds supports the findings presented. It is noted that cowpea seeds are predominantly the most sold in the markets investigated in the Abidjan District. Most of these leguminous beans are sold by illiterates. These cowpea seeds are highly sought after local food products by the populations of Northern Côte d'Ivoire. Meanwhile, other leguminous beans seeds are consumed in very small quantities in certaine area of the country. The results of the consumption survey revealed that all surveyed individuals consume or have consumed legumes. The significant consumption of leguminous beans has also been noted in Burkina Faso (70.15%) (Hama-Ba *et al.,* 2017) and in southern Madagascar, where leguminous beans represent about 75% of food consumption (FAO, 2016). The results of surveys in the city of Abidjan revealed that soybeans and cowpeas are consumed by the majority of respondents; followed in decreasing order by lima beans and pigeon peas. In southern Madagascar, it has been established that cowpeas, pigeon peas, and lima beans are 50% of children consume legume-based dishes as family meals (Randrianasolo, 2013). Respondents consume various legumes occasionally. These results align with those from households surveyed by (Yéboué *et al.*, 2018). These authors showed in their work that 29.34% of the Ivorian population consumes leguminous beans. Leguminous beans are not consumed at all times by households. According to these authors, the foods consumed by Ivorians are predominantly based on tubers and roots (87.27%). No significant correlation between the age of consumers and the consumption of legume-based dishes has been established. This is different from the work of Duah *et al*. (2016), whose study results showed that age significantly affected a person's knowledge and willingness to accept and consume yellow cassava. The consumption of cowpeas is higher among northerners, while soybeans are more consumed by people from the center, whereas Lima beans and Angolan peas are more appreciated by residents from the East of Côte d'Ivoire. This corroborates the work of Rurf (2010), who noted that staple consumption in Côte d'Ivoire was regionally distributed. Due to its very high consumption, soybeans are the most favored dish. the cowpea, the Lima bean, and the Angolan peas in order. The Angolan peas is the least consumed leguminous beans in Côte d'Ivoire. This corroborates the work of (Rakotondrasoa, 2016), which showed that only 3.63% of the Angolan peas is appreciated according to his survey on leguminous beans-based dishes in southern Madagascar. Soybean and cowpea are most often purchased at the market, at home, or from female vendors, while Lima beans and Angolan peas are made at home. Thus, these products are not obtained from supermarkets. Akissoé and collaborators reported in 2022 that 45% of households in southern Benin consume soybean in urban areas (Akissoé *et al.*, 2022). The same is true in Burkina Faso, where soybean and cowpea are among the main leguminous beans consumed in households (Hama-Ba *et al.*, 2017). Another factor such as age has been identified as being associated with the marketing of leguminous beans within the. households. It increases at the age of 25 to 30 years.

CONCLUSION

The leguminous beans trade is a profitable activity. The supply and marketing of the market is predominantly held by women. Legumes, particularly cowpeas, soybeans, and Lima beans, found in the various markets of the Abidjan district mainly come from rural areas (Ivory Coast) and abroad. It has been observed that legume-based dishes are consumed occasionally by Abidjan residents and are not an integral part of their diet..

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