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Tuber Yields Associated with the Production Systems of Sweet Potato (*Ipomoea batatas* L.) in the Locality of Bini-Dang at Ngaoundere, Cameroon

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

In Cameroon, the consumption of bakery products, especially bread, occupies a preponderant place in the diet of populations, even in non-wheat-producing countries. These bakery products are becoming increasingly dependent on wheat-producing nations, particularly during economic crises where wheat is very expensive to import. To remedy this situation, technologies are increasingly being developed to replace wheat flour with flour obtained from local food resources. Our research aimed to study the sweet potato (*Ipomoea batatas*) production system at the locality of Bini-Dang in Ngaoundere, Cameroon through a descriptive study that took place over a period of four months

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from July 20 to November 29, 2019. The data were collected on a survey by interview and additional explorations. A total of 60 farmers were interviewed leaving in the study area. A survey was conducted to determine the farmers profile relative to the sweet potato sector, the type of varieties grown, crop techniques as well as production constraints. Results show that all producers are men with a frequency of 100%. In cultural practice, ridges are used more with a spacing of 15-20 cm between them, which is 66.60% of their frequency. 57.10% of the population uses cow dung to fertilize the soil, and thus to improve sweet potato yield. However, the tuber yield of sweet potato varies between 24 to 55 t/ha. The harvested products are sold to traders and consumers. This information would be used as a database to improve the availability of sweet potato cultivated in the locality of Bini-Dang to install a bread-making industry.

Keywords: Bini-Dang; bread industry; farmers; Ipomoea batatas; Ngaoundere-Cameroon; production system.

1. INTRODUCTION

Ipomoea batatas (L.) Lam belongs to the Convolvulaceae family. It is auto-hexaploid (2n = 6x = 90) and cultivated in tropical and subtropical areas [1]. World production of sweet potatoes is reported to be 105 million tons/year [2]. It is the third most important root and tuber crop after potato and cassava in the world [3]. Native to tropical America, sweet potato is propagated by cuttings [4], for human consumption and provides energy to more than 100 million people worldwide [5]. The tuber plays a vital role in alleviating hunger [6] and malnutrition especially in African and Southeast Asian countries where the population increases every year and exerts pressure on land utilization [7]. African yields are estimated to be 4–5 tons per hectare, which is low and roughly one-third of Asian yields, indicating enormous potential for future sweet potato yield increase in Africa [8].

Projects are undertaken to make sweet potato tubers a raw material for fuel-grade ethanol, biogas, biodegradable and plastics, food and income security, and the baking industry in many African Countries. A baseline survey to appraise the current sweet potato farming systems in the Adamawa and West regions of Cameroon was conducted by the GIZ-funded project (ONE WORLD – No Hunger, or SEWOH) titled "Green Innovation Centers for the Agricultural and Food Sector" (ProCISA) [9]. In this context, the analysis of the Sweet Potato tuber production system is essential for increasing production in the Bini-Dang site Adamawa region. The Sweet potato production system in the Bini-Dang basin is not mastered. We have no information on the performance of these productions, the problems that the farmers face, the technical itineraries, in short, the following questions continue to arise: what is the production capacity and yield of sweet potato in the Bini-Dang production area? And what are the factors that limit the production capacity and yield? Answering this question requires a study of the potato production system in this area and the factor associated with the production yield.

The production system is defined as the set of material and immaterial elements that are necessary for production. This definition then integrates the biological, physical, and socio-economic dimensions at the farm level. As such, the analysis of the *Ipomoea batatas* production system must be able to answer the following questions: (1) What are the socio-economic characteristics of the production? (2) What is the technical itinerary for sweet potato production (inputs, varieties, seasons, tools)? (3) What are the constraints associated with the production of sweet potato tubers and possible solutions? (4) What is the yield and associated factors, and the purpose of the tubers?

Data on the sweet potato production system in Africa are scarce. Similarly, data on the sweet potato production system in Cameroon and Adamawa are not enough or are missing. These data are important if the Bini-Dang sweet potato production area is to become a center for agri-food development.

This work aimed to evaluate the production yields associated with farming parameters with the view to improve the availability and the technical itineraries for the *Ipomoea batatas*. The importance of this study relies on that information from this work will serve as a database for the improvement of the sweet potato sector.

2. MATERIALS AND METHODS

2.1 Study Area

The study was conducted during the cropping season of 2019 in Ngaoundere (Cameroon),

especially in the Bini-Dang locality (Fig. 1). The Ngaoundere agro-ecological zone II of Cameroon is characterized by a High Guinean Savannah with five-month dry season (November to March) and seven months of the rainy season (April to October). The average annual temperature and total annual precipitations are 25.75°C, and 1 898.6 mm [10], respectively.

2.2 Methodology

2.2.1 Investigation and data collection

A descriptive correlational type of study was used and took place over a period of 4 months from July 20 to November 29, 2019 through survey and direct observation on sweet potato farms. The population of the study was farmers that cultivate sweet potato in the locality of Bini-Dang. A questionnaire was designed to collect data on sweet potato producers. Any farmer that produces sweet potato in the locality of Bini-Dang was included in the study. A total of 60 farmers were interviewed using a questionnaire and the questions were either opened or closed. Demographic data related to gender, age, marital status, and ethnic origin were collected. The profile of producers, the varieties of sweet potato cultivated, knowledge on sweet potato, the method of sowing, the use of fertilizers, the phyto-technical treatment, the harvesting methods, the transformation and the tubers yields were equally collected.

2.3 Statistical Analysis Data

The Sphinx Plus²-Edition Lexica-V5 software was used to design the questionnaire and to analyze the collected data. The graphs, tables and curves were drawn using Excel version 2016 software. Frequency calculation and Chi² parametric test were done to establish the link between the production and farming system parameters. The Student t test was applied to compare the means between two groups of variables. The test was considered statistically significant at $p \leq 0.05$.

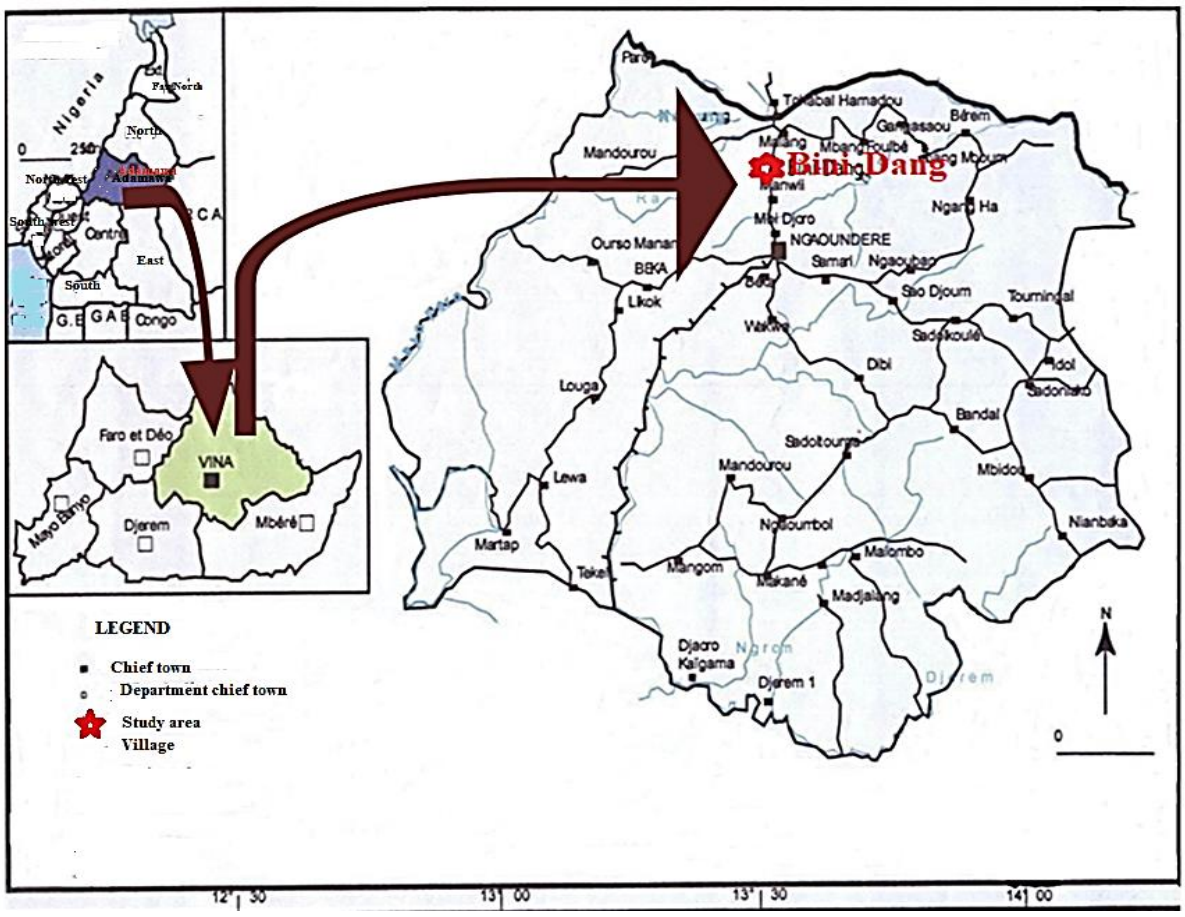

Fig. 1. Study area

3. RESULTS

3.1 Socio-demographic Characteristics, the Experience of Sweet Potato Producers, and Cultivated Area

The socio-demographic characteristics of sweet potato producers in the locality studied are presented in Table 1. All farmers (100% sweet potato producers) of the Bini-Dang locality were male. In the Adamawa region, populations are mainly of the Muslim religion which considers fieldwork as reserved only for men, while women are not involved in agricultural practice to feed the family. In addition, sweet potato production is mainly for commercialization to provide money, a job that is devoted to men. The most represented family size is the family where there no child (26.70%) followed by the family which has 3 children (25.00%). Farmers with family sizes of 2 and 4 children represented 20.00% and 8.30%, respectively. The Age of most interviewed farmers (66.60%) ranged between 20-40 years while farmers between 40 -50 years and less than 20 years were represented at 25% and 8.30%, respectively. Also, the survey revealed that 48.70% of farmers were married, 48.70% were single and 6.70% were divorced.

More than half of farmers (66.70%) had less than 5 years of experience in sweet potato cultivation while 8.30% of sweet potato farmers in the Bini-Dang had 10 to 15 years of cultivation experience. This statistic is interesting because the young population in agriculture has more energy in this practice while the older and more experienced in the practice have lost their vigor because of age (Table 1). Regarding to the growing area, no individual had a farming area exceeding 5 ha and the majority (55.3%) cultivated 1-2 ha, while 20% of them cultivated a surface area of less than 1 ha, 15% cultivated between 2-3 ha, and 11.70% cultivated 3-4 ha.

Table 1. Socio-demographic characteristics, experience, and surface area of sweet potato producers

Categorical variables	Number of respondants	Percentage (excluding missing values)
Farmer's gender		
Male	60	100
Female	0	0
Farmer's age (year)		
20	5	8.3
20 to 40	40	66.6
40 to 50	15	25.0
Number of children		
0	16	26.7
1	5	8.3
2	12	20.0
3	15	25.0
4	12	20.0
Marital status		
Married	28	46.7
Single	28	46.7
Widow/Widower	0	0.0
Divorced	4	6.7
Farmer's experience (years)		
< 5	40	66.7
[5-10]	7	11.7
[10-15]	5	8.3
>15	8	13.3
Cultivation area (hectare)		
1	12	20.0
[1-2]	32	53.3
[2-3]	9	15.0
[3-4]	7	11.7
5	0	0.0

3.2 Main Varieties of Sweet Potato Cultivated by the Farmers

The farmers who live in Bini-Dang use many varieties of sweet potato (Fig. 2). The main sweet potato varieties cultivated on this site were MARIMAR, CHINESE, IRAN/N°2 variety, and, MOROCCO.

MARIMAR variety has a particularity in that its development cycle is between 3.5 to 4 months maximum and has a tastier yellow flesh, mealy and resistant to pests. The size of the tubers is not too big, and the plant has a good ability to resist fungus and insect attacks.

CHINESE variety is characterized by the green color of leaves. Tubers are white flesh et white skin. this variety is much more suitable for the dry season. its development cycle is 4 months maximum.

N°2 variety/IRAN is characterized by the dark green color of the leaves and wide hairs at the level of the leaves. The local name of this variety is « daneyel » which means 'white' due to the particular white flesh color of the tuber. The stem of this variety has a green color. The fresh tuber has a yellow color when cooked. Its life cycle is 3 to 3.5 months maximum and it is grown much more in the rainy season and has high tubers yields.

MOROCCO variety is also called ANGELINA. The only difference is that the stem and leaves of Angelina are red in color and white flesh. It has a life cycle of 3 to 3.5 months maximum and it is grown much more in the rainy season.

Three other varieties of sweet potato locally called Vaïgorédjii, Follérédjii, and Dankali Aslii were also cultivated but in very limited quantities. Vaïgorédjii tuber looks like *Cucumis melo* fruit. The stem has a red color while the leaves are rather green. When cooked, the tuber has an orange color. Its development cycle is 3.50 to 4 months maximum. Follérédjii leaves are green in color resembling those of *Hibiscus sabdariffa*, and the stem is red. Dankali Aslii is characterized by white color, is unsweetened, and has a development cycle of 3 to 4 months maximum. According to a producer, the unsweetened sweet potato variety is also called Diabetic Dankali based on its recommendation for diabetic patients.

3.3 Used of Sweet Potato

Table 2 presents the usefulness of sweet potato in the study site and the parts used. The distribution of the frequencies showed that the sweet potato is mainly (86.70%) for food consumption, few cultivated potato tubers for animal feeding (8.30%), and for therapeutic purposes (5%). Regarding the parts used as seeds for planting, the study revealed that the stem is the key element for sweet potato production with 86.70% of the population using the stem for planting while 5% used the roots and 8.3% the tubers.

3.4 Technical Production Routes

Few technical itineraries are used during sweet potato farming. This includes many operations such as land preparation, plant materials, etc.

Land preparation: During land preparation, farmers spray the grass and crop residues of previous crops with an herbicide. After spraying, the grasses decompose and serve as humus or organic fertilizer for soil fertilization. Then ridges are constructed by heaping soil up. A spacing of around 50 centimeters is recommended to obtain ridges large enough for the underground part of the crop Planting materials: Farmers propagate sweet potato vegetatively, using stem sweet potato cuttings. Cuttings from the stem are the best planting material. The stem cuttings are taken from healthy stems free from viruses (Fig. 3). They should be 30 to 40 cm and have 3 to 4 nodes. The younger the cuttings, the better their success.

3.5 Planting of Stem Sweet Potato Cuttings

The steps for planting the cuttings are as follows:

(1) Allow the cuttings to dry (wilt) slightly in the shade before planting them; drying in the shade limits the rotting of the cuttings when they are planted;
(2) Usually, the leaves of the 2 base nodes are removed, but in some cases, the cuttings are completely stripped (removing all the leaves);
(3) Cuttings are generally planted without undergoing any pre-treatment; however, some farmers soak the cuttings in fungicides or insecticides solutions before planting;
(4) finally, 2/3 of the cuttings are buried in the growing soil and the space between 2 consecutive holes varies between 15 and 20 cm depending on farmers.

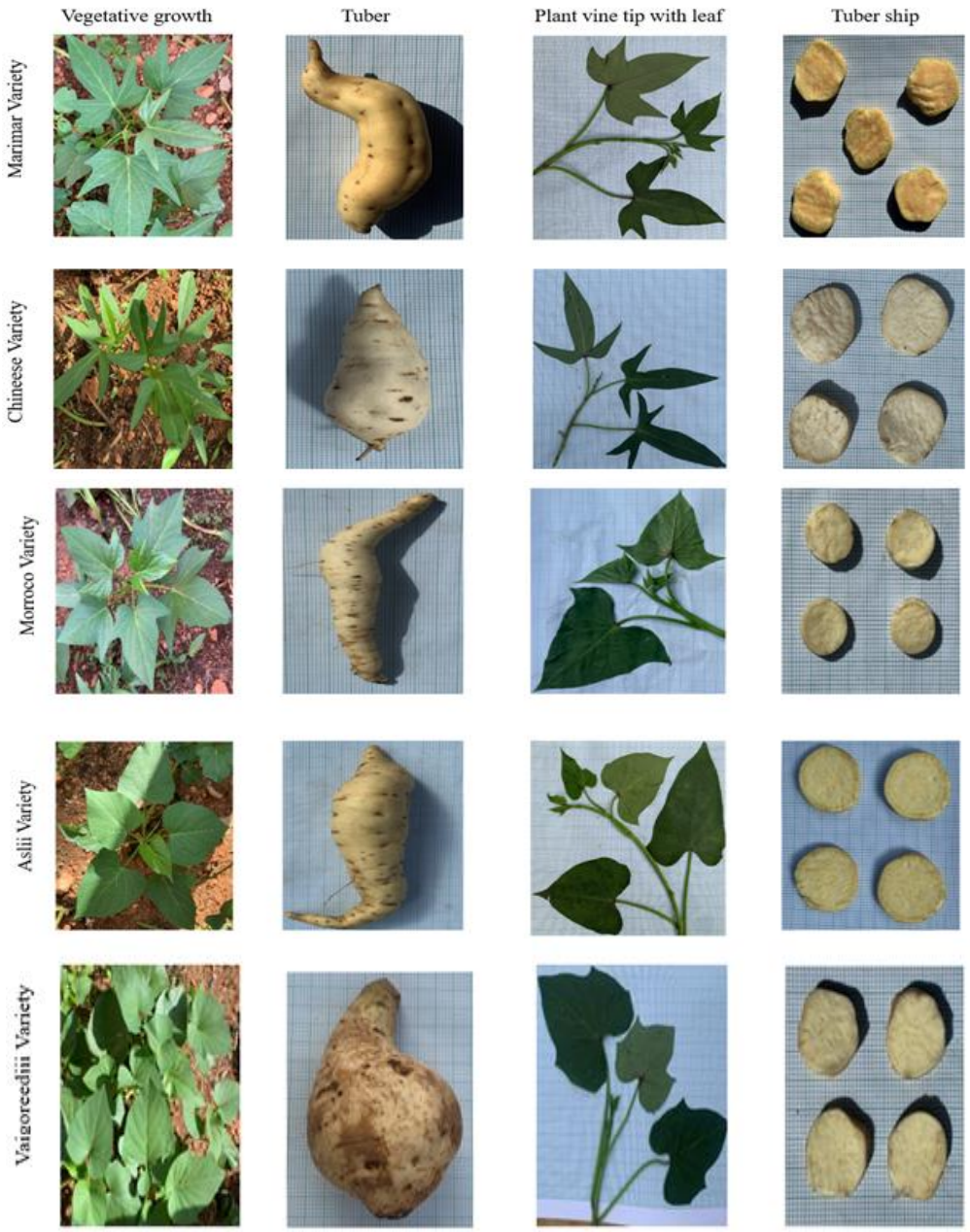

Fig. 2. Sweet potato varieties

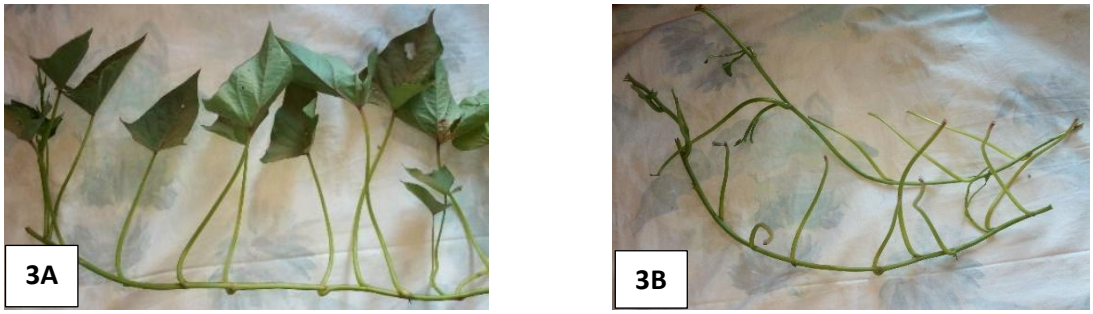

Fig. 3. Stem sweet potato cuttings with leaves (3A) and without leaves (3B)

Table 2. Utility of sweet potato

Categorical variables	Number of respondents	Percentages (excluding missing values)
Utility		
Therapeutic	3	5.00
Ornamental	0	0.00
Human food	52	86.70
Agricultural	0	0.00
Animal feed	5	8.30
Part used as seed		
Root apparatus	3	5.00
Stem	52	86.70
Leaves	0	0.00
Tuber	5	8.30
Inflorescences	0	0.00
Fruits	0	0.00

Growing soil: Table 3 revealed that the soil is a key parameter for sweet potato production and 93.3% of farmers choose the soil before allowing it to plant. The type of plowing is essentially based on the formation of ridges. The formation of ridges allows the soil to be aerated and thus encourages the tubers to develop freely without constraint and the distance between the seedlings was mainly (66.6%) between 15 to 20 cm, although some farmers (33.4%) preferred the distance of 20-25 cm between vine tips cuttings.

Sowing time: According to farmers, the sowing time varied depending on rainfall. Farmers in the localities surveyed responded that sowing begins in April (1.70% of respondents), but most of the farmers (51.70%) do it in June. The population of the locality prefers to plant their fields in June probably based on the availability of water, June being the month with maximum rainfall in the locality.

Types of fertilizers: The use of fertilizers is common in the locality. Most of the farmers (82%) fertilized their soil using either chemical NPK (10.2%) or organic (87.7%) while only 18% did not use fertilizer. The most common organic fertilizer used is cow manure with 57.1% of the respondents (Fig. 4).

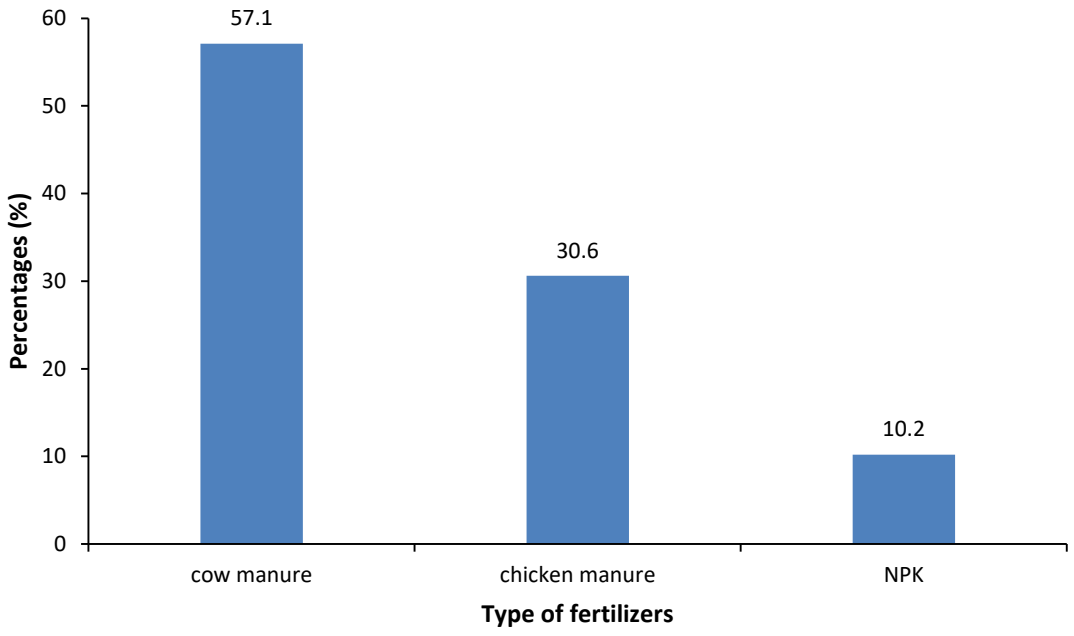

Fig. 4. Distribution frequency of the type of fertilizers

The time of application of the fertilizer varied from one producer to another, either at the start of production during land preparation (essentially for organic fertilizers) or at mi-production (essentially chemical fertilizer). As reported in Table 3, 61.70% of the population fertilized their soil before cultivation while 20% of farming fertilized at mi production, revealing that some organic fertilizers (about 10%) were applied during production. Generally, at the end of the harvest, the farmers buried organic waste in soil in order to wait for the next season. According to farmers, fertilization is aimed at increasing the yield of production (53.3%), increasing the tuber size (20%), and in some cases driving out pests (2%).

Harvest of sweet potato: Table 3 shows that the harvest period was between October and December with 56.7% from October to November and 43.3% between November and December. The harvesting period coincided with the end of the rainy season making the soil moist and easily exploitable. The harvesting period was recognized by the changing of the leaf color from green to yellow. For harvesting, farmers used to dig by shovel as the most applied technique (65.00%) while rigging up (28.3%) and digging by hand (6.7%) were less reported. The period was appropriate to avoid pest attacks and plant diseases.

Conservation and sailing of the tubers: 68.30% of the population surveyed sold their products after the harvest, while 31.7% of the population sold them in the field (Table 4). Selling after harvesting was reported to avoid disease attacks which generally start on the farm, but this needs space and structure for storage. About 83.4% of farmers produced the tubers for commercialization while only 13.4% do it for consumption. In addition, 91.7% of respondents conserved their products after harvesting. Then, conservation appears essential in the sweet potato production chain as it helps to sell the product at a competitive price in the market, with most of the tubers being exported to other regions for sale.

Table 3. Technical production system

Categorical variables	Number of respondents	Percentage (excluding missing values)
Type of soil		
Yes	56	93.3
No	4	6.70
Type of plowing		
Formation of ridges	60	100
Others	0	0.00
Distance between vine tips		
15-20 cm	40	66.60
20-25 cm	20	33.4
Application time		
Start of production	37	61.7
mi- production	12	20.0
Importance of fertilizers		
Increases tuber size	15	25.0
yield increases	32	53.3
drives out pests	2	3.3
Physiological maturity		
yellow leaf	60	100
Time of harvest		
October- November	34	56.7
November-December	26	43.3
Harvesting technique		
Digging by shovel	39	65.0
Ripping up	17	28.3
Digging by hand	4	6.7

Table 4. Sale and conservation of harvested products

Categorical variables	Number of respondents	Percentages (excluding missing values)
Sale		
Field sales	19	31.7
Post-harvest sales	41	68.3
Conservation		
Yes	55	91.7
No	5	8.3
Utility		
Sale	50	83.4
Consumption	10	16.6

Yields of sweet potato production: Results reported from the survey revealed that tuber yields were between 200 and 275 bags per hectare, a bag weighing an average of 120 kg. This makes the yields vary between 24 and 55 t/ha. The yield of potato products among the farmers surveyed varied from 200 bags to 275 bags per ha. About 40% of farmers reported harvesting 200-225 bags while 26.7% reported harvesting 251-275 bags/ha, and 33.3% reported harvesting 226-250 bags/ha (Fig. 5). The data represented an average yield in the area of 32.05 t/ha.

Limiting factors of production and local strategies used by farmers: The production is limited by a number of factors shown in Table 5. Diseases and pests appeared as the most represented with a frequency of 75%, overgrazing followed with a percentage of 16.70%, and finally rainfall with a percentage of 8.30%. These values showed that in the Adamawa region, potato cultivation is threatened by diseases and pests. It may then be hypothesized that the farmers do not master the means of combating these limiting factors of cultivation.

Some means are locally used by farmers to fight against the limiting factors of production. It appears that 60% of the farmers used pesticides/insecticides (CIGOGNE), to fight against diseases as well as pests that limit productivity and herbicides) while 38.30% of the farmers rather do weeding. Biological control was poorly represented with a frequency of 1.7%.

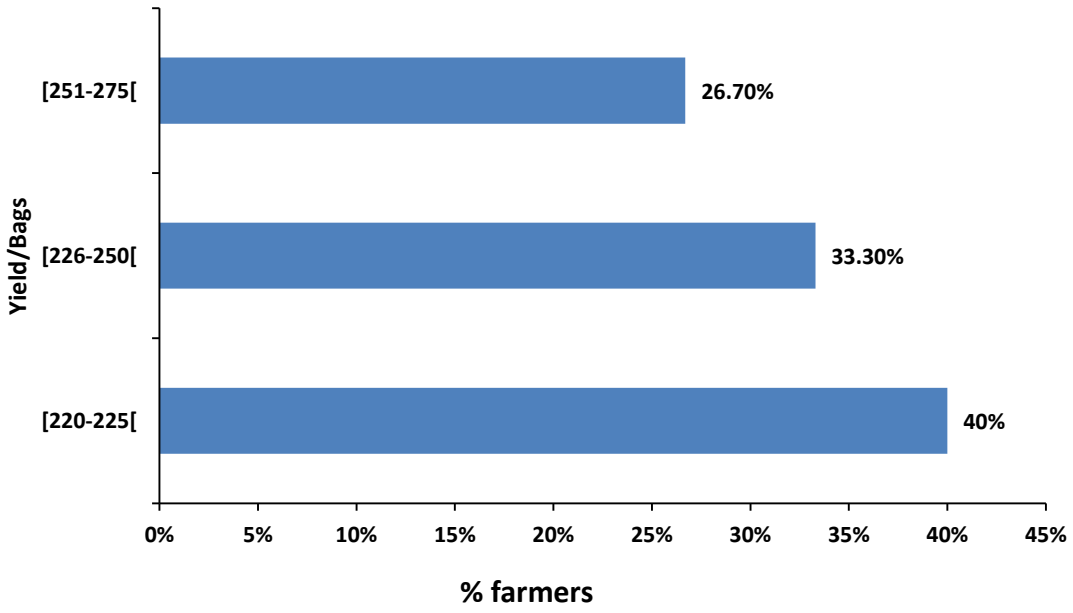

Fig. 5. Percentage distribution of sweet potato tubers (yield/bags)

Table 5. Constraints in sweet potato production

Categorical variables	Number of respondents	Percentage (excluding missing values)
Constraint		
Diseases and pests	45	75.0
Overgrazing	10	16.7
Rainfall	5	8.3
Mechanism of control		
Biological control	1	1.7
Weeding with hand	23	38.3
Pesticide/insecticide	36	60.0

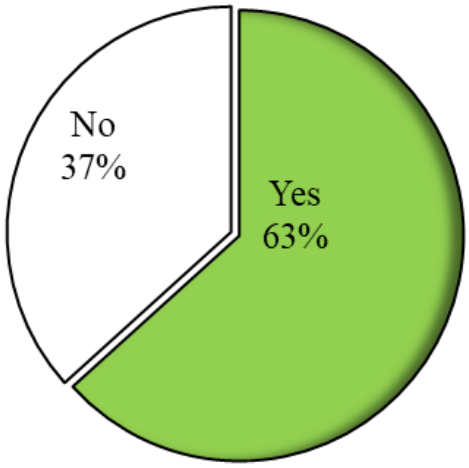

Fig. 6. Percentage of sweet potato transformation

Transformation: Fig. 6 shows that 63% of the producers surveyed processed sweet potato. This allows farmers to avoid losses due to tuber rot, for better preservation and for selling. The most important processing form of sweet potato is flour, while other forms existed including sweet potato chips.

Relationship between yield tubers and production variables: Table 6 presents the relationship between the yield of tubers and the variables age of the farmers, variety, type of fertilizer used, and the inter-pack spread. It appears that the age of farmers was not significantly associated to the age of the farmers. However, farmers with production 251-275 bags/ha were less represented in those of age <30 years (5.60%) compared to farmers age 40-50 years which reported higher frequency (33.30%). Although the variation was not significant, the high frequency observed for old farmers compared to youngers revealed the high experience of olders in the mastering of farming.

We equally found no significant relation with varieties grown specially between the white and yellow varieties. However, we may have highlighted the higher percentage of yield [251-275[for the white variety (27.90% for white vs 23.50% for yellow) and the lower percentage of yield [200-225[for the yellow variety (47.05 for yellow vs 37.20% for white).

The type of fertilizer was found significantly associated to yield (P≤0.01). Cow manure was found to produce a higher yield as compared to poultry manure. In fact, the data in the Table 6 show that the higher percentage of yield [251-275[for cow manure (37.5 for cow manure vs 17.79% for poultry manure) and the lower percentage of yield [200-225[for poultry manure (66.16 for poultry vs 25 % for cow).

Space between poquets was also found not significantly dependent on the yield production of potato tubers. However, medium yield [226-250[bags/ha were reported higher for distance 25-40 cm (50% for 25-40 cm vs 30.14 for 15-25 cm) while lower yield [200-225[bags/ha were reported higher for distance 15-20 cm (41.07% for 15-25 cm vs 25% for 25-40 cm).

Table 6. Relationship between tubers yield and sweet potato varieties

Categorical variables		Yield (bag/ha)		P-value
Age	**[200-225]**	**[226-250]**	**[251-275]**	
<30	9(47.36)	9(47.36)	1(5.26)	P=0.829
30-40	10(50)	6(30)	4(20)	ddl= 4
40-50	5(33.33)	5(33.33)	5(33.33)	
Varieties				
IRAN	16(37.20)	15(34.88)	12(27.90)	p=0.78
MARIMAR	8(47.05)	5(29.41)	4(23.53)	ddl=2
Types of fertilizers				
Cow manure	6(25)	9(37.5)	9(37.5)	P=0.01
Poultry manure	12(63.16)	4(21.05)	3(15.79)	ddl=2
Inter-pack spread				
15-20 cm	23(41.07)	18(32.14)	15(26.78)	P=0.739
20-25cm	1(25)	2(50)	1(25)	ddl=2

4. DISCUSSION

Production of sweet potato plays a central role in the survival of the population of Bini-Dang. The tubers are produced firstly for sale and few are used for their own consumption. The tubers are commercialized not only in Ngaoundere markets but also in the North region of Cameroon and over in Chad. The tubers are bought for food consumption and contribute to food security in Cameroon and sub-region of central Africa. While many food products are cultivated for family consumption, sweet potato appears to generate wealth, then to reduce poverty in the rural sector and, to contribute to social balance. The fact that the tubers are produced for sale justified that only men were associated with the culture of sweet potatoes in the area under study. Worth mentioning is the importance of experience in farming [11], and in this case, more than 30% of the farmers experienced more than 5 years of production and commercialization of the sweet potato tubers. In sub-Saharan African families, the role of men amongst many is to generate a budget for the family because women work on farms for feeding. Our findings seem to corroborate this traditional role attributed to men. Based on the role it plays in the social stability in the region, sweet potato production is an issue that needs to be addressed with interest in our production area.

Ipomoea batatas was probably introduced to Cameroon from tropical America at the end of the 19th century [12]. It is cultivated in all the five agroecological zones of Cameroun. We inventoried 6 varieties (N°2 (IRAN) variety, MARIMAR Variety, VAIGOREEDJI variety, DANKALI ASLII variety, MOROCCO / ANGELINA variety, and CHENESE variety) of sweet potatoes produced. A recent report by Ibrahima et al. [9] revealed some other names of sweet potato varieties cultivated in the Adamawa region: Dosa, Désirée, Cipira, Manate, and Banso. Among the 5 varieties observed, 2 (TIB1 and IRAD 1112) were introduced by IRAD (Research Institute for Agronomic Development in Cameroon) between 1980 and 1983 for making this area a basin of sweet potato production. During our investigation, we did not find varieties called TIB1 and IRAD cultivated. However, the most cultivated varieties MARIMAR (yellow flesh color) and IRAN or N°2 variety (white flesh color) probably represented based on their description of the varieties TIB1 and IRAD 1112, respectively. The new name is probably a consequence of the familiarity and beauty of the varieties, and their impact in daily life. Daneyel is also a local name that means 'white' due to the particular white flesh color of the tuber. Dankale aslii or dankali diabetes is also a local name that means unsweetened potato, and based on its low level of sugar is advised for diabetics. Generally, populations have mastered sweet potato production and consumption in order to improve their daily life: the type of soil and plowing used, the type of fertilizer, and the period and technic of cultivation and harvesting. While cultural techniques have been subjected to changes over time, many producers used fewer variable techniques.

Potato tubers are used for human consumption [13]. In industry, these tubers are used for the production of starch, alcohol, and acetic acid [14]. From this study, the tuber yield of sweet potato N°1 and MARIMAR variety are not statically different (32.05 t/ha as average tuber yields). This high yield of the two varieties cultivated testifies to the quality of the soil, the

climate, the temperature, and the fertilizers used. Although no relationship was found between the yield of the two varieties probably related to the small sample size (60), many other studies elsewhere showed that production yields are influenced by variety [15]. Sidiky et al., [16] studied the effects of different doses of mineral fertilizer on the yield of two varieties of potato in Bouaké, central Ivory Coast, and reported that the yield varied from 9.68 to 15.15 t/h depending on the variety and the dose of fertilizer used. This variability in yield according to variety suggests that these varieties have different genotypic [7,13] and are cultivated in the rainy season. It would therefore be interesting to carry out a molecular characterization of the potato varieties surveyed and cultivated for 2 seasons. Many farmers in the Santchou region of Cameroon cultivated sweet potato in two seasons by using irrigation techniques and in three seasons when the spaces were situated in the swamps [17].

There is not a significant correlation between the yield and the age of the farmers (P≤0.829). represented in Table 6. This results could be explained on the one hand by the fact that people in the 40-50 age group are likely to have a lot of experience in potato cultivation on the other hand, the availability of family labor and where the availability of financial resources to finance the agricultural activity of sweet potato. Previous studies supported that the farmer's age is a significant socioeconomic factor for crop production [18]. Middle-aged and young farmers have proved to be active and ready to provide the highest crop production [19].

From the result of the relationship between yield and fertilizers, it can be seen that there is a highly significant correlation between yield and fertilization (P≤0.01). From these results, we can say that cow manure contains important elements for soil nutrient supply. In our population study, most of the farmers (82%) fertilized their soil using either chemical NPK (10.20%) or organic (87.70%) while only 18% do not use fertilizer. This result corroborates those of Ibrahima et al. [9] show that all the interviewed farmers in the Adamawa Region used fertilizers, be it organic or mineral, and others don't fertilize their properly sweet potato. It was reported in this study that some farmers in Bini Dang use chemical fertilizers for sweet potato cultivation. However, several authors [20-22] revealed that chemical fertilizers have an immediate beneficial effect on crops yields, but are added continuously over a long period can decrease soil quality and, their high cost makes them inaccessible to poor farmers. Chandini et al., [23] stated that inorganic fertilizers may cause poor development of the root system which is very important for the tuber development of sweet potato. Moreover, chemical fertilizers pollute the environment and do not contribute to sustainable agriculture. In this context, the cultivation of sweet potato by using biological fertilizers in the Bini-Dang locality is a necessity. Thus, our future studies is focus on the study of the influence of biological fertilizers on sweet potato productivity in our locality.

5. CONCLUSION

This study assessed the sweet potato system of production in Bini-Dang (Adamawa Cameroon) for the establishment of a bread-making factory. Sweet potatoes are produced using cuttings. The cuttings come from tubers or stem put in nurseries by the producers themselves or by special multipliers from whom the producers buy. In the cultivation practice, the producers use more ridges than mounds with a 50 cm space between two consecutive holes. In most cases, the varieties with a cycle of 3 months are grown. In the study area, producers have been practicing this activity for more than 15 years. However, in sweet potato production, fertilizers such as NPK, cow, and chicken droppings were used to increase yields. In addition, yields vary from 27 t/ha to 32.05 t/ha in the cultivated area depending on the type of varieties. The harvested tubers are sold directly because of the lack of storage facilities. In the farming environment, most of the harvest is sold to consumers and traders from the region. To meet the requirements of buyers and consumers, producers prefer white tubers. Sweet potato production faces a difficulty related to diseases that attack the tubers. The results obtained in the present study would help to improve the availability of sweet potato tuber in Adamawa Cameroon, for the installation of a bread-making plant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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