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CURRENT KNOWLEDGE ON DIOSCOREA SCHIMPERIANA TRADITIONAL DRYING TECHNOLOGY IN CAMEROON

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ABSTRACT

Dioscorea schimperiana is an endangered yam species in Cameroon and the future of it traditional drying technology is questionable. This study was carried out to evaluate the sustainability of D. schimperiana drying sector in a constrained environment like the West region of Cameroon. A survey was conducted in four of the six divisions of the west region: Bamboutos, Menoua, Nde and Upper plateaus. A typology was carried out to create homogeneous groups to appreciate the diversity and the functional dynamics of the dried yam production systems using survey dataset. The results of this analysis classify the sample into three groups. Type I production systems in Bamboutos and Menoua divisions where household consumption is the main objective of processing. Type II production systems in Upper plateaus division where the processing target is selling. Type III production system in Ndé division where yam producers have primary education level with selling as the main goal for processing. The analysis of dried yam production system reveals that it is endangered as the yam since the producers are mostly elderly (70.31%) and illiterate (72.3%) women. Most producers (72.3%) abandon the cultivation of yam. This situation reduces the performance of the sector in processing yam for markets or subsistence since producers remain dependent on yam availability and/or accessibility for processing. Hard labor is the major constraint for yam cultivation. D. schimperiana is a value-added food significant for food security (53.85 %). This yam is even more a source of income (45.15%). Increasing work capacity appears as a significant indicator in improving the technical performance of the dried yam production systems in term of an intensification of the production. Hence, there is need to encourage youth involvement in dried yam production for the revival of this sector. From now, building production systems that deliver intensification and welfare is a necessity. This will entail broader diversification strategies. Dried yam slices are the only products obtained after processing. Food diversification resulting in the production of new foods other than pounded yam as a strategy of intensification is income generating since several derivatives products can come from yam flour. This new orientation can interest young people faced with unemployment and poverty. D. schimperina is a food which can play a significant role in food diversification in order to fight against food insecurity and malnutrition. Therefore, it is imperative that global strategic actions should be taken to avoid the disappearance of this phytogenetic resource and it drying technology.

KeyWords

West region, D. schimperiana, dried yam production systems, endangered yam, food diversification, food security, global strategy, intensification.

INTRODUCTION

Dioscorea schimperiana is one of the nine yam species consumed in Cameroon [18]. In the west highlands of Cameroon, this yam has an important socio cultural status. It is used as food in traditional ceremonies like widowhood, birthday ceremonies or skull worship [26]. The dietary contribution of this commodity is focused mainly on mineral, vitamin and energy intake because the tuber is rich in carbohydrates, vitamin and minerals [7], [26]. Therefore, this yam plays an important role in the diet of people in an environment where there is an energy and micronutrients deficiencies [15]. *Dioscorea schimperiana* is an integral of food security in the region. It remains the only yam which has a traditional and well defines post harvest processing technology. Indeed, the people of west Cameroon have developed in an empirically manner a drying technology to preserve the yam. In family farming, *D. schimperiana* is transformed into dried yams slices by drying for direct or indirect consumption during starvation [5], [26]. If the possibility of producing dried slices from this yam allowed him to play a significant role in food habits of the west Cameroonians people, one of the current preoccupations is the sustainability of the yam sector in a constrained environment (scarcity of land, valorization of cash crops, development of off farm activities income generating...). The environmental and economical sustainability of family farming depends on their ability to used (in the form of products sold on market) in an efficiency manner the available resources and also on their own ability to adapt to changes in the environment [24], [20]. *D. schimperiana* is an endangered yam species in Cameroon [5], [26] and nothing is knows about the traditional dried yam sector in regard of the disappearance of the yam. Even more, no study has been conducted to assess the sustainability of this sector. Therefore, the evaluation of the sustainability of dried yams sectors requires knowledge of the actors and the challenges that they face every day to make strategic choices in their productive activities. Then, the objective of this work is to assess the sustainability of the dried yam sector through a field survey. Specifically, it aimed at analyzing the existing systems. In this context, the socio-economic characteristics of dried yam producers will be ascertained and the diversity of production systems swept through a typology. The traditional yam process will be analyzed. The performance analyses of production systems will be developing in order to identify major constraints and propose actions for tackle them.

MATERIAL AND METHODS

Area of study

The western high plateau is the study area. This area lies between latitude 4°54" and 6°36" 'in the north and longitude 9 ° 18 'and 11 ° 24' in the east and covers the Western and the Northwest region of Cameroon. The west highland has a Sudano-Guinean climate modified by the altitude ranging between 1100-2000m with volcanic soils in some places. Temperature varies between 16 and 27 °C. The single rainy season lasts between March and November with annually rainfall in the range of 1800-2000mm. The west highlands are a succession of stepped plateaus separated by escarpments. Three plateaus are found: the Bamun plateau (1100-2000m), the Bamileke plateau (1400-1800m) and Grass fields plateau (1500-2000m). The survey was conducted in the west region especially in the Bamiléké plateau which has a relief varying from 1400 to 1800mm up to the Mount Bamboutos boundary (2740mm). This part of Cameroon highland constitutes the hub of the nation's population, with a rural density of more than 200 inhabitants per km². In this context, population is facing several problems including scarcity of land, water availability (excess and shortage) etc. The Bamiléké plateau covers six divisions: Bamboutos, Upper Nkam, Upper plateaus, Khoung-chi, Mifi, Menoua and Nde divisions. This region is the leading area for *D. schimperiana* dried yam production. To capture variability in dried yam production systems, the study was undertaken in four divisions of the six according to a sub regional geographic position: Upper plateaus division in the Nord, Nde division in the south, Menoua and Bamboutos in the Ouest.

Data collection

Collection of information was obtained by direct interviews expresses by means of a well structured questionnaire. The data on socioeconomic characteristics of the respondents were relative to the age, sex, level of education, division and village belonging. The agricultural data refer to knowledge and cultivation of the yam. The post harvest data concerned the preservation methods and the drying yam technology. The economic data were related to the objective of commercialization.

Selection of the respondents

The target for this study was the *D. schimperiana* dried yam producer. Annual agricultural statistical data are insufficient in Cameroon to know exactly the number of farmers who cultivate the yams. In the absence of data base, the networks or snow bowl sampling method was adopted. It is in this context that the respondents were identified and recruited in women's associations and in rural markets. Table 1 below shows the distribution of respondents according to the divisions and villages.

Table 1: **Distribution of *D. schimperiana* dried yam producers**

Divisions	Villages	Frequency	Percentage (%)
Bamboutos	Bangang	15	23.1
Upper plateaus	Baham	7	10.8
	Bamendjou	19	29.2
Menoua	Bassesa	14	21.5
Ndé	Bazou	5	7.7
	Bamena	5	7.7
Total		65	100

Statistical analysis

Descriptive statistics was used to analyze the survey data. Multiple correspondence analysis (MCA) was selected to construct a typology of the dried yam production system. Typologies give a snapshot of farm situations at a certain period of time [3]. Multiple correspondence analysis (MCA) is often used as a tool for classifying agents into various types after selecting key variables [3].

RESULTS AND DISCUSSION

SOCIOECONOMIC CHARACTERIZATION OF THE RESPONDENTS

Table 2 shows that all of the respondents (86.6%) are female. The majority of dried yam producers are aged above 65years (70.31%). They are followed by women (18.76%) between the age of 50-64 years and then by 35 to 49 years old women (9.38%). Few (1.56%) of the respondents are between 18-24 years. Dried yam producers are getting older and if nothing is done, this traditional processing technology might disappear in a context where values are transmitted from mother to daughter. This is in line with Verter and Becvarova (2014) when they report that the more elderly population engaged more in yam production than the younger population in Nigeria. As a result, the future of dried yam production is threatened as the yam. Hence there is need to encourage youth involvement in dried yam production in the region. The presence of older producers will negatively impact on labor availability and in new technology transfer [1]. According to Table 2, 14.06% of yam producers have primary education level while 85.94 % do not have any formal education. The low level of literacy could negatively affect the adoption rate of new improved technologies in the region.

Table 2: Frequency distribution of dried yam producer according to gender, age and educational qualification

Sex		
Modality	**Frequency**	**Percentage (%)**
Male	0	0
Female	65	100
Total	65	100
Age		
Age categories	**Frequency**	**Percentage (%)**
18-24	1	1.56
25-34	0	0
35-49	6	9.38
50-64	12	18.76
65+	45	70.31
Total	64	100
Educational qualification		
Modality	**Frequency**	**Percentage (%)**
No formal education	55	85.94
Primary education	9	14.06
Total	64	100

AGRICULTURAL DATA

Knowledge and cultivation of the yam

D. schimperiana is known by several common names (Table 3). It can be called "Loung" (44.62%), "Long" (40%) or "Nlen" (15.38%) according to the localities. It's a yam with a colored flesh which can vary from yellow to black. The majority of respondents (89.23%) cited the yellow color as common then follows the red (44.62%) and the orange (41.54%). White (9.23%) or black (3.08%) flesh yams are not common. In the knowledge of the common color encountered, most of the respondents (93.85%) said to know two ecotypes although some cited one (3.08%) or three (1.54%). The two dominant ecotypes encountered are yellow and red (45%) or yellow and orange (45%). Most of the yam producers (72.3% of respondents) do not cultivate this yam. This reduces the performance of the sector in processing yam for markets or subsistence since they remain dependent on farmer for yam availability and/or accessibility for processing. In answering why they do not cultivate the yam, no reason is given by 40% of respondents. However 20% of the respondents cite the difficult labor, the taste (7.7%) and the taste and difficult labor (4.6%) at the same time. Yam cultivation is one of the

most laborious crops [22]. This cultivation abandonment can be explained by the old age of producers unable to overcome stress due to labor.

Table 3: Frequency distribution of respondents according to the knowledge and cultivation of *D. schimperiana*

Common name		
Common name Modality	**Frequency**	**Percentages (%)**
Loung	29	44.62
Long	26	40
Nlen	10	15.38
Total	65	100
Yam flesh colour		
Modality	**Frequency**	**Percentages (%)**
Yellow	58	89.23
Red	29	44.62
Orange	27	41.54
White	6	9.23
Black	2	3.08
Total	65	
Ecotypes knowledge		
Number	**Frequency**	**Percentages (%)**
1	2	3.08
2	61	93.85
3	1	1.54
Total	65	100
Common ecotypes		
Modality	**Frequency**	**Percentages (%)**
Yellow and red	27	45
Yellow and orange	27	45
Yellow and white	3	5
Yellow	1	1.64
Noir and white	2	1.67
Red Yellow and white	1	1.67
Total	60	

Yam cultivation		
Modality	**Frequency**	**Percentages (%)**
Yes	18	27.7%
No	26	40%
No because of difficult labor	13	20
No because of the taste	5	7.7%
No because of the taste and difficult labor	3	4.6%
Total	65	100

POST HARVEST DATA

Preservation of yam before processing

D. schimperiana is easily handling before processing. It does not need to be preserved since the tubers can be left in the ground until required (40 % of respondents). The yam does not require special storage before processing (20.31 %). This highlights the storage facility of yam in comparison with others tropical fresh food [22], [8]. However, yams can be stored (39.06 % of respondents) in farmland, at home, in store or in attic. The most commonly practiced method is preservation in farmland on dried dead banana leaves (17.19 %).

Yam processing

Yam processing is intended to extend the shelf life (64.6% of respondents). It also improves the taste. Indeed, 16.9% of respondents improve the taste and extend shelf life by processing and 15.4% simply improve the taste after processing. Dried yam slices are the only products after processing. They are obtained after pre-cooking and drying yam in sun or on racks. The dried products can be store more than one year (72.3%). They are used to cook pounded yam after re-cooking in water and pounding with leguminous and palm oil. During processing, tubers are washed (peeled or not) and the root 'hair' removed. They are cut into pieces and put in a pot. Enough water is added to cover the tubers and they are then cooked over the fire. After cooking, unpeeled yams are first peel then cut into strips or thin slices. Before drying, the slices can be threaded into sticks bamboo or metal rods so as to be spaced from each other. The slices are then dried in rank or in sun spread on an aluminum sheet. The process flow diagram is shown in Figure 1.

Table 4: Frequency distribution of respondents according to *D. schimperiana* preservation and processing

Preservation method

Modality	Frequency	Percentages (%)
No preservation	26	40.63
Do not need a particular storage	13	20.31
Storage in farmland in dried dead banana leaves	11	17.19
Storage in farmland	6	9.38
Storage at home	3	4.69
Storage in attic	2	3.13
Storage in bulk in holes cover with banana leaves	1	1.56
Storage in store or in attic	1	1.56
Storage in farmland on banana leaves or in store	1	1.56
Total	64	100

Yam processing

Modality	Frequency	Percentages (%)
To extend the shelf life	42	64.6
To extend the shelf life and improve the taste	11	16.9
To improve the taste	10	15.4
For sell	2	3.1
Total	65	100

Processing products

Modality	Frequency	Percentages (%)
Dried yam	64	100%
Pounded yam	0	0,0%
Others	0	0,0%
Total	64	100

Shelf life of the dried product

Modality	Frequency	Percentages (%)
More than one year	47	72.3
One year	6	9.2
More than two years	6	9.2
Two years	4	6.2
Two years if the characin to not attack it	2	3.1
Total	65	100

Storage of the dried product		
Modality	**Frequency**	**Percentage (%)**
Storage in attic	65	100
Others	0	0
Total	65	100

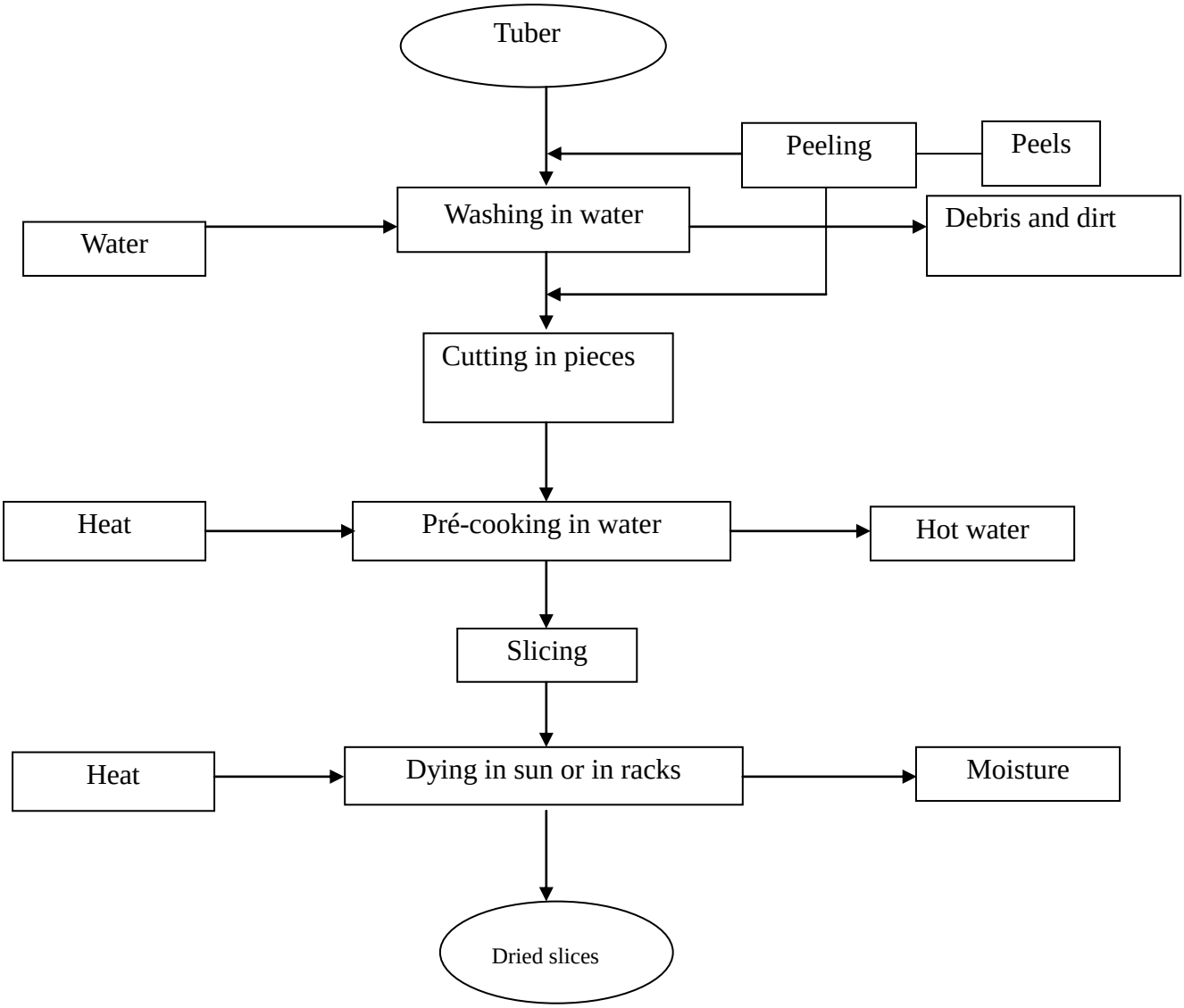

Figure 1: Flow diagram of *D. schimperiana* drying processing

Process analysis

Pretreatment

Peeling

The peeling of yam (Table 5) before cooking exposed the tuber to air and enzymatic browning occur as a result of reaction between polyphenols in yam and air oxygen. This reaction, catalyzed by polyphenol oxydase present in the tuber leads to the formation an ugly brown or gray color pigment, which polymerizes to form melanin responsible for off-flavors and sometimes bitterness in yam [2]. Peeling the tubers after cooking does not reduce completely the phenomenon because the tuber is cut in big piece and the action of the heated water is not enough to stop the enzyme activity since the operation is a pretreatment. The consequence is the loss of yam quality. Peeled tubers are usually dipped in water or in salt water even more in ascorbic acid solutions to limit browning [23].

Table 5: *D. schimperiana* process analysis

Unit operation	Hazards	Deterioration reactions	Control
Pre-treatment			
Peeling	Biology	Browning reactions	Dipping in water, salt water or in ascorbic acid solution
Precooking in water	Biology	Browning reactions	Action on substrates Action on enzymes
Drying			
	Physic	Dust, Flies, Human being	Reduction of the yam pieces size
	Biology	Thermosensitive nutrients deterioration	Drying in a control environment (oven, lyophilizator...)
		Resistance starch	
		Enzymatic deterioration	Control of air drying temperature and time
	Microbiology	Contamination by microorganisms	

Precooking in water

Precooking is carried out in boiling water. This heat treatment destroys enzyme systems (Table 5) responsible for deterioration reactions. In addition to its action on enzymes, it can also destroy microorganisms of contamination. The treatment improves the digestibility of starch. However, browning of the product after treatment can occur if the conditions are not in control. Appearance, flavour, texture and nutritional value are four attributes considered by consumers when making food choices. Appearance which is significantly impacted by colour is one of the first attributes by which consumers evaluate food quality [8]. This browning process leads to a change in flavour and a reduction in nutritional quality of yam. The control of enzymatic browning due to polyphenol oxidase, seems to be necessary [29].

Drying

During drying of yam slices in sun or under racks, hazards can be physical, biological or microbiological. The product takes long time to dry and can be contaminated by microorganisms, dust, flies and even human beings. This could have an impact on consumer health. Moreover, the long drying time allows biodeterioration reactions to continued leading to quality losses. Browning reactions can continue [16]. Thermosensitive nutrients deterioration can occur. Bell and Favier (1982) reported that losses of niacin during sun drying of *D schimperiana* rang between 59-71 %. Yam is a starchy food and production of resistant starch is a major constraint during drying of such food. The quality control during sun drying seems to be necessary.

Process Control

The analysis of the drying process highlights two critical points to control for consumer health and product quality: the pre-cooking and drying treatment. Pre-cooking is an essential and critical step in product quality [12]. Control of browning is generally done by action on substrates (oxygen and polyphenol) or enzyme. In this context, packaging under vacuum or an immersion treatment in a liquid to reduce the oxygen content of the medium is recommended [19]. The use of reducing gents such as ascorbic acid, mercaptoethanol or antioxidants like SO_2, sulphites salts or buthylhydroxyanisole (BHA) is a common practice [29]. Enzyme inactivation may be done by heat. For this purpose, treatments such as bleaching or drying are the common methods applied traditionally [5]. Freezing also allows enzyme inactivation [19]. This enzyme inactivation may be effected by the use of chelating agents such as EDTA, Zn acetate, sorbic acid, or enzyme inhibitors such as cysteine, honey etc. [30], [29]. Jia and al. (2015) used electrolyzed oxidizing water (EOW) to inhibit enzymatic browning in yams. Acidification or lowering the pH by the use of organic acids such as citric acid also reduces the enzymatic activity. Yapi and al. (2015) have inhibited the PPO activity by the use of onion or garlic extracts. Other unconventional methods use anti-enzymes. Anti-enzymes are enzymes which are able to destroy some cofactors necessary for enzymatic activity. These include: proteases, catechol transferase oxygenases. Inactivation of genes encoding PPO may also be performed [19]. Drying on sun or over racks is too long and the drying time depends on product characteristics (shape, thickness, diameter, etc.). Research efforts and innovation on improving the drying conditions recommend the use of oven, dryer, ventilated oven or lyophilization. The air temperature of the medium should be 70 °C in average because beyond, flour becomes brownish [4]. Forienze and Morini (2000) proposed a drying under controlled atmosphere at a temperature between 45 and 50 °C to maintain product quality and reduce the cost of drying in terms of energy. In reducing browning of yam during pre-cooking and drying process, the authors suggest a reduction of yam pieces size in form of slices or small thick of low thickness [11]. In order to increase the potential development of *D. schimperiana* and diversify it uses, precooking and drying process control appears as a crucial step. Whatever the method of control used, an optimization of the pre-cooking and drying process for browning reduction, enzymatic inactivation or product quality is necessary. This optimization should take into account the major factors which influence the success of the operation in relation to the expected result. Those factors are related to the raw material (thickness, diameter, shape, PPO content, phenol content...) and to the process conditions (temperature, time, pH, oxygen availability, water/slices ratio ...). In pre-cooking and drying processes control, the find out of a couple of time and temperature for a well defined raw material characteristic (thickness, shape, size, flavor, texture and color etc) should be capital.

ECONOMIC DATA

The primary objective of producing dried yam slices is consumption (food security) follow by income generation (Table 6). Indeed, the majority of respondents (53.85 % of respondents) produce dried yam for household consumption. This underlines the subsistence farming characteristic of the Cameroonian agriculture [17]. However, 46.15 % of the surveyed produce dried yam for sale. This implies that yam is not only grown as the major source of food security, but also as the main source of income to the farmers. This is in line with Verter and Becvarova (2014) observations in Nigeria. The majority of respondents (36.9% of respondents) sell their product part of a year because of low availability. The measure unity is variable. The plate is the most common measure unit (50.8 % of respondents), then comes the kilogram and finally the heap. The plate price is generally fixed (43.75 % of respondents) and is 500 CFA (26.56 % of respondents).

TYPOLOGY OF THE PRODUCTION SYSTEM

The subject of our analysis is "dried yam slices" product. In this context, the study of the dried yam production systems aimed at understanding the functional dynamics of the productive activities in social, economic and technical level. Thus, a typology was carried out to create homogeneous groups to appreciate the diversity and the dynamics of production systems using survey dataset. The method classifies agents based on the similarity or dissimilarity of their characteristics. Initially, twenty two (22) variables were studied. The "gender" variable has been eliminated in the analysis since all producers are women. The classification of production systems adopted is made 21 variables (Table 7).

Table 6: Frequency distribution of respondents according to the issue of processing products.

Issue of the processing products		
Modality	**Frequency**	**Percentages (%)**
Household consumption	35	53.85
Sale	30	46.15
Total	65	100
Commercialization		
Modality	**Frequency**	**Percentages (%)**
No selling	36	55.4
Selling part of the year because of low availability	24	36.9
Selling all the year	3	4.6
Selling part of year	2	3.1
Total	65	100
Measure unit of selling		
Modality	**Frequency**	**Percentages (%)**
Plate	33	50.8
No selling	26	40
kilogram	4	6.2
heap	1	1.5
I don't know	1	1.5
Total	65	100
Measure unit price		
Modality	**Frequency**	**Percentages (%)**
500F a plate	28	43.75
No selling	22	34.38
I don't know	2	3.13
500-600 francs a plate	2	3.13
Fluctuation of heap price according to the purse of the buyer	2	3.13
300-500 francs a plate	2	3.13
450 franc a plate	1	1.56
600 francs a plate	1	1.56
200 francs for 500g	1	1.56
300 francs for 500g	1	1.56

500 francs for one kilogram	1	1.56
200-500 francs for 500g	1	1.56
Total	64	100

Price stability

Modality	**Frequency**	**Percentages (%)**
No selling	24	37.58
Yes	17	26.56
No	14	21.88
I don't know	9	14.06
Total	64	100

Variables used

Table 7: Variable used in topology analysis

Variables	**Names**
Demographic	Age; level of education; division; village
Agriculture	Common name; Yam flesh ecotype colour; Ecotypes knowledge; Most common ecotype; Yam cultivation; Cultivation abandonment
Postharvest	Preservation method before processing; Yam processing; Selection of ecotype before processing; Processing products; Shelf life of dried yam.
Economic	Issue of the processing products; Commercialization; Selling measure unit; Measure unit price, Annual selling price variation; Price stability.

Multiple Correspondence Analysis (MCA) was carried out to identify homogeneous groups using selected variables. The results of this analysis classify the sample into three groups (Table 8):

Table 8: **Typology with 3 production systems in the area of study,**

Type	Divisions	Villages	Keys characteristics
1	Bamboutos	Bangang	'Loung' is the common name; Presence of white-fleshed yam; No cultivation of yam by the majority of dried yam producers because of difficult labor; No storage before processing; Household consumption.
	Menoua	Bassessa	
2	Upper plateaus	Baham	'Long' is the common name; No cultivation of yam by the majority of dried yam producers; processing target is selling; Selling is made one part of a year because of low availability; Plate is the measure unit and the selling price is 500FCFA
		Bamendjou	
3	Ndé	Bamena	'Nlen' is the common name; Primary education level; Tuber are keep on attic before processing; Processing target is selling; Selling is made one part of a year; Plate, kilogram or heap are the major measure units; Seasonal variation of the price; Plate price variation is between 500 to 700Francs; The heap selling price varies according to buyer's purse.
		Bazou	

The Type I production systems: This group characterized the dried yam producers of Bangang and Bassessa villages in the Bamboutos and Menoua divisions respectively. In these regions, *D. schimperiana* is called "loung". The presence of white-fleshed tubers particularizes this area. Most dried yam producers do not cultivate the yam because of difficult labor. According to them, the yam does not require special storage before processing. Processing is only intended for self-consumption (household consumption).

The type II production systems: This group characterized the dried yam producers of Baham and Bamendjou villages in the Upper plateaus division. In these villages, *D. schimperiana* is called "Long". The majority of dried yam producers do not cultivate the yams. However, production is intended for sale. This discriminates it against the group I. Selling is done part of a year due to the low availability. The measure unit is the plate and the selling unit price is 500 Francs.

The type III production systems: This group characterized the dried yam producers of Bazou and Bamena villages in the Nde division. The primary education level particularized these producers from type I and II production systems. In these villages, *D. schimperiana* is called "Nlen". Dried yam slices processing is intended mainly for sale. Selling is done one part of a year. Plate, heap and kilogram are the measure unit. The measure unit price varies according to the season. This discriminated them against type II system. The plate price varies between 500 and 700 francs. The heap price fluctuates according to the buyer's purse. The dried yam producers usually keep their tuber in attic before processing.

Performance analysis of the dried yam sector

The analysis of the different production systems shows that the dried yam sector has an undeniable potential for development. Dried yam products are food which can alleviate hunger and poverty. They are value-added food significant for food security. Indeed, they can be produced and consumed during starvation. Theses observations are found in the three production systems (I, II and III). This yam is even more a source of income especially in type II and III production systems where the processing target is selling. Nevertheless, dried yam producers are mostly elderly and illiterate women. This situation has an impact on production factors such as labor capacity, access to information or capital. Most producers (Table 9) abandon the cultivation of yam without any reason (66.2%). However, 23.1% of respondents do not cultivate the yam because of difficult labor, 6.2% because of the taste and 4.6% of respondents judge it as an invading culture.

Table 9 Frequency distribution of respondents according to cultivation abandonment of yam

Cultivation abandonment		
Modality	**Frequency**	**Percentages (%)**
No answers	43	66.2
Difficult labour	15	13.1
Taste	4	6.2
Invading Culture	3	4.6
Total	65	100

The analysis of all these statements lead to believe that hard labor is the major constraint for yam cultivation and the old age of producers unable to overcome stress explains partly the cultivation abandonment of this yam. Crop cultivation abandonment makes dried yam producers dependent on fresh yam availability and accessibility

for processing. This dependency has an impact on the performance of this sector. Resources availability in sufficient quantity is one of the factors that determine the apparent growing potential of a production system [6]. In this context, the performance of the dried yam sector and its development remains limited in terms of production. Thus, increasing work capacity appears as a significant indicator in improving the technical performance of the dried yam production systems in term of an intensification of the production. Therefore, rejuvenation and revitalization of the actors of this sector is imperative for it revival. The dried yam products can meet the challenge of food security and development even in a constrained environment like the west region of Cameroon. From now, there is a need to build production systems that deliver intensification without simplification. This will entail broader diversification strategies. In building of a diversification strategy one should measure effects on factors such as cultural preservation, health and incomes, and vice versa [10]. Food diversification resulting in the production of new foods other than pounded yam as a strategy of intensification can be a source of farm incomes since several derivatives products can come from yam flour. Yam flour can be used to make bakery products, confectionery or baby food etc [27], [25], [21]. By improving living conditions at the household level, this new orientation can interest young people faced with unemployment and poverty since those products can be easily sold. *D. schimperiana* and it derivative product are food. Improving living condition should not be seen only as earning money but also as promoting strategies for sustainable diets for human nutrition and health. The change in eating habits combine with the persistence of poverty have contributed to the loss of value adding and/or to the cultivation abandonment of some crops formally sources of nutrients and well being in favor of cash crops or off-farm income generating activities. Nowadays, this has a significant impact on agricultural biodiversity resources and food security. Agricultural biodiversity resources should be taken into account in the fight against food insecurity, micronutrients deficiencies and others forms of malnutrition [14], [10]. For this, food diversification in a way of nutrients complementarities should be advocated particularly for crops available locally as one of the strategy for sustainable diet. In this context, all the agricultural resources should be recognized and well kept for a common interest which is utilization and health. Hence, better deployment of agricultural biodiversity in areas that have lost it must receive greater attention [10]. The dried yam sector is endangered as *D. schimperiana* tuber and it is imperative that global strategic actions should be taken to avoid the disappearance of this phytogenetic resource and the indigenous knowledge. This call up researchers, policy-makers of public and private sector for actions toward the revival and sustainability of this sector formally sources of nutrients and well being.

Conclusion

D. schimperiana drying sector is endangered as the yam because the dried yam producers are mostly elderly and illiterate women. Most producers abandon the cultivation of yam and this situation limits the performance of this sector and it growing in terms of production. Thus, increasing work capacity appears as a significant indicator in improving the technical performance of the dried yam production systems in term of an intensification of production. Therefore, rejuvenation and revitalization of the actors of this sector is imperative for it revival. The dried yam products can meet the challenge of food and nutrition security, poverty alleviation and development even in a constrained environment like the west region of Cameroon. From now, there is a need to build strategic actions to avoid the disappearance of this phytogenetic resource and it drying technology.

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