

# Preference and Uses of Banana and Plantain in the Former Province of Equateur in Democratic Republic of Congo

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**Abstract**— In order to contribute to the knowledge of the preferences and the uses of banana and plantain, a survey was carried out in the purpose to contribute to the improvement of the culture not only for increasing the production, but also to increase the income and, therefore, reduce poverty. This study was conducted in the former province of Equateur, a region located in the northwest of the Democratic Republic of Congo. The former province had five districts which currently correspond to the provinces. The taste, preferences, choice and uses of banana and plantain were evaluated. Cultivars were evaluated according to their preference and usages. These preferences are related to certain criteria. Among the plantains studied, the French type is the most preferred because of the good taste and the high number of hands, the False Horn type presents fingers more appreciable in terms of length and size and it constitutes the most marketed bananas on the local markets. The Gros Michel was the most preferred because of its taste among dessert bananas. Banana is above all a food crop. It can be eaten fresh or dried, the heart of the stem is highly prized in India and Ethiopia, the bud as salad, the pseudo stem used for swimming and livestock. In addition to the above-mentioned uses, banana also enters into other uses such as the production of indigenous soap, the production of alcohol, the food of nursing women, curative treatment and cultural ceremonies.

**Keywords**— Knowledge, cultivars, selection, criteria.

## I. INTRODUCTION

Bananas are part of food as well as cash crops. Their fruits are constituted by 25% of carbohydrates in West Africa, while in East Africa and in particular in the Great Lakes countries (Uganda, Rwanda, Burundi and Eastern DR Congo), annual consumption is between 200 and 400 kg per person (INIBAP, 1993, Novethic, 2004, Dheda, *et al.* 2011).

In addition to the fruit, the plant is used for its medicinal properties and in several rites, for example, the wedding rite. It also plays an important environmental role in the agricultural system by controlling soil erosion on the steep hillsides and preserving soil fertility in the long term. Once established, the banana enters a phase of continuous growth, creating a kind of "tropical forest" that induces beneficial microclimate effects for the soil (Tothill, 1940, INIBAP, 1986, Price, 1995).

World banana production amounts to 125 million tons per year, of which only 13% is exported and represents an important source of income for many developing countries. The 87% of non-exported bananas play an important role in the diet

of African, Latin American and Asian countries (CIRAD-GRET, 2002, Dheda, *et al.*, 2011).

In the Democratic Republic of Congo (DR Congo), banana and plantain represent crops of great food value. They are cultivated in the lowlands of the central basin. Annual production is estimated at 1.700.000 tons (FAO, 2020). The former province of Equateur is one of the provinces that occupy the central basin of DR Congo and where bananas are an integral part of agro-ecosystems. Overall production is estimated at 16.780,325 tons (Ministry of Planning, 2005). However, no study has been able to establish the criteria that are used by farmers in the former province of Equateur in the selection of banana and plantain cultivars, taking into account nutritional, socio-economic and cultural values.

The objective of this research work was to determine the different uses of bananas and the banana and plantain cultivars preferred by farmers according to the main uses in the former province of Equateur. The results obtained should enable agricultural research to concentrate its efforts in priority on cultivars of high importance in order to improve their production, but also to diversify their uses for their best valorization.

Considering the multiplicity of ethnic groups and the diversity of banana and plantain in this region, it would be obvious to see the difference in cultivar preferences and uses between the different tribes. In addition, as a result of changes in people's farming and eating habits, some cultivars would be preferred by farmers over others.

## II. MATERIALS AND METHODS

### 2.1. Study environment

This study on the preferences and uses of banana and plantain was carried out in the former province of Equateur. It covered 16 territories in 5 districts in the province as follows: 3 territories in Mongala (Bumba, Lisala, Bongandanga), 1 territory in North Ubangi (Bodobe), 4 territories in South Ubangi (Budjala, Kungu, Gemena, Libenge), 2 territories in Equateur (Mankanza, Bomongo) and 6 territories in Tshuapa (Djolu, Befale, Boende, Monkoto, Bokungu, Ikela). A total of 21 villages were selected in the different territories for the diagnostic surveys.

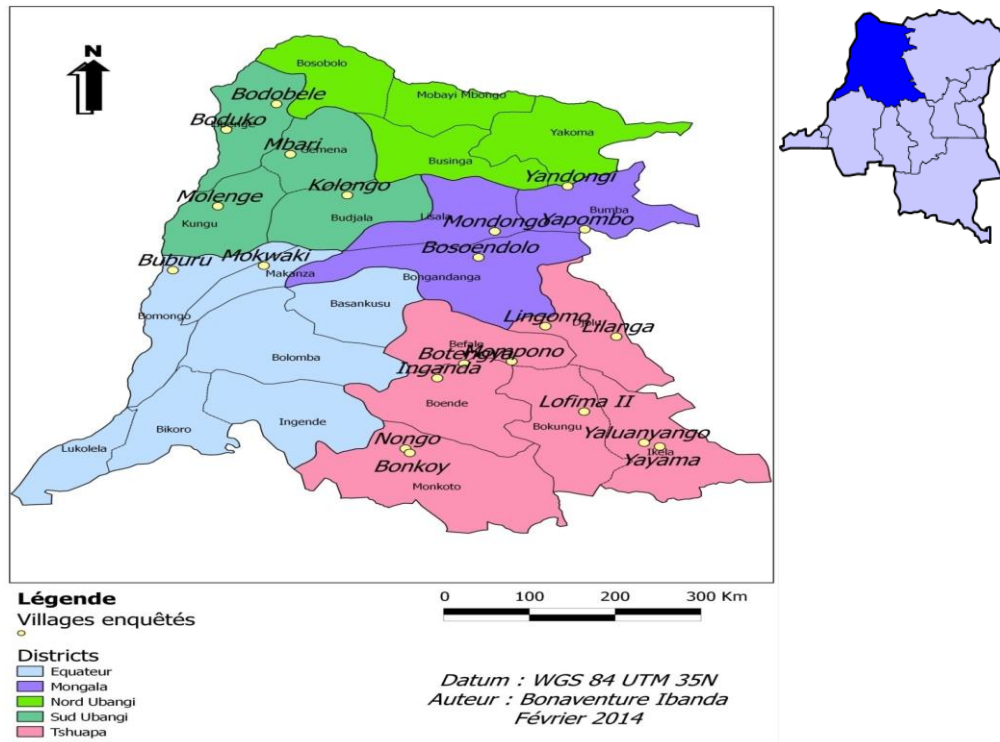


Fig. 1. Map of the former province of Equateur

The names of districts, territories and villages are shown in figure 1.

The province has vegetation classified into two phytosociological units, namely the secondary savannah at *Imperata cylindrica* and the semi-caduous mesophilic and peri-Guinean leafy forests.

The field visit was carried out in the presence of the farmer in charge of the banana plantation. Before that, an interview was conducted with a group of farmers to establish a list of cultivars in the region for morphological characterization in hut, fallow and forest cultivation on the dieting plants. On the basis of this list, all banana and plantain cultivars found in the villages surveyed were identified. New suspected cultivars were also identified and described using a synoptic descriptor proposed by De Langhe (1961).

Observations were made on all cultivated banana and plantain cultivars in the region. Images of all varieties were taken using a digital camera and the geographical coordinates of each field were taken by GPS. Observations were made in 10 households per village and at least 30 clumps were observed per household. In total, more than 300 clumps per village were made by considering cultivars with diets to facilitate the variety identification key (Daniells, *et al.*, 2001).

All harvested cultivars were collected in the field of the Faculty of Science of the University of Kisangani, for morphological characterization. This identification key is based on the following elements: availability of planting material, size of diet, resistance to low soil fertility, drought resistance, taste, sustainable production, market demand/price, short production cycle and others.

The index was used to determine the diversity of cultivars in the different districts and the similarity coefficient was calculated

to estimate the level of similarity, the way in which the cultivars were distributed in the districts.

### III. RESULTS AND DISCUSSION

#### 3.1. The proportion of banana and plantain

Observations were made on a total of 7.527 clumps of banana and plantain in the districts of the former province of Equateur. In principle, 61 banana and plantain cultivars were recorded. The results showed the presence of dessert, wine and cooking bananas in some villages in the province, but found throughout the territories surveyed.

Figure 2 shows that French plantains are more diversified in all the districts surveyed in the former province of Equateur, with a proportion of 54%. They are followed by plantain of the False Horn type with 22%. A small proportion of wine bananas (2%) are recorded in this former province where the use of bananas in the manufacture of alcoholic beverages is no longer common. Farmers use much more maize, which they believe produces a high alcohol content, although all types of bananas can be used for this purpose.

In the 5 districts surveyed in the region, 61 cultivars were recorded, including 53 plantains (32 French, 14 False Horn and 7 Horn) and 8 bananas (5 Dessert, 2 Cooked and 1 Wine). Based on the literature, all registered plantains were of AAB genotype, while 3 different genotypes are represented by bananas. The Musa AAA groups are numerous and are represented by the cultivars Gros Michel, Petite Naine, Figue Rose, Yangambi Km5 and Bisamunyo. The Musa AAB group represented by the cultivar Kamaramasenge and Musa ABB occupies the last position with the cultivars Pisang Awak and Bluggoe.

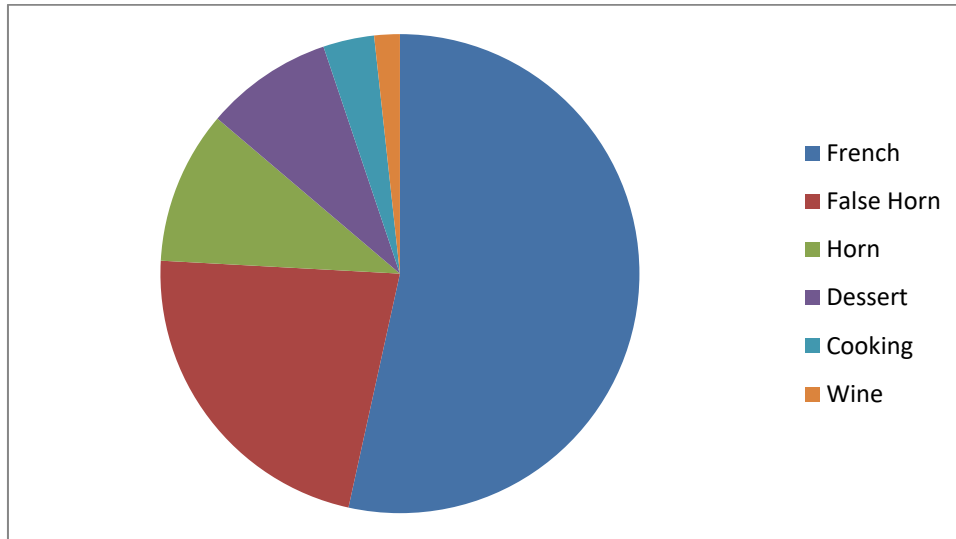


Fig. 2. Proportion of banana and plantain types in the districts of the former province Equateur

The same situation of dominance in terms of number of plantain and specifically of the French type was observed in the former Oriental Province by Adheka (2010) where 57 cultivars were found, 81% of which were plantain with a predominance of the French (46%), followed by the False Horn (23%), Horn (10%) and French Horn (2%) types. Bananas represent only 19% overall with 14% of dessert bananas, 3% of cooking bananas.

### 3.2. Evaluation of bananas and plantains

Cultivars were evaluated according to their preference and field performance by local communities.

#### 3.2.1. Preferred by bananas and plantain

The preferences of bananas and plantains were linked to certain criteria that are evaluated by the farmer for multiple reasons of interesting use. Table 1 shows the banana and plantain cultivars preferred by the Equatorial population.

In Table, it can be seen that Litete remains the most preferred cultivar among all plantains due to its taste and use (medicinal plant) by farmers in the region despite its long growing cycle, i.e. more than 12 months. However, the cultivar Litete is found as the important cultivar in Bandundu and the former Orientale province, while Egbe-o-mabese, Libanga Likale and Lokusu are important cultivars in Kasai Oriental and Maniema.

The cultivar Libanga Likale is popular in Equateur, Bandundu, Kasai Oriental and Occidental, Maniema, North Katanga, former Orientale Province and South Kivu (Adheka, *et al.*, 2013). In addition, the cultivar Gros Michel is more preferred than all bananas because of its large income generating diet. Since Yangambi Km5 is disease resistant and its cultivation in the field lasts longer than Bisamunyo and Bluggoe.

Surveys conducted by Muhindo (2013) in South Kivu show that Musheba among the French is more appreciated, followed by Musisa (Lokusu). In the cooking bananas, Bisamunyo takes first place than Bluggoe and Pisang Awak and in the dessert, Kamaramasenge is more appreciated than Gros Michel. Finally, in beer bananas, Nshikazi is more popular than Yangambi Km5.

TABLE 1. Banana and plantain type in the former province Equateur

	Type French	
1	Adili	A AB
2	Afati noir	AAB
3	Akanza*	AAB
4	Akpasi	AAB
5	Aleke	AAB
6	Alebampela*	AAB
7	Amakoko I	AAB
8	Amakoko II	AAB
9	Amakoko III	AAB
10	Bokate*	AAB
11	Bokuma Iyembe*	AAB
12	Bokuma Ambeme*	AAB
13	Boleko*	AAB
14	Bolomaise	AAB
15	Bondele*	AAB
16	Bofo noir	AAB
17	Bosakaraka I	AAB
18	Bosakaraka II	AAB
19	Bosua	AAB
20	Bozogbo*	AA B
21	Inekele Ikumi	AAB
22	Libangaliabo.	AAB
23	Litete	AAB
24	Magoma I	AAB
25	Magoma II	AAB
26	Molo	AAB
27	Nguku	AAB
28	Plantain rouge	AAB
29	Tchwatchwa	AAB
30	Yeli*	AAB
31	Yumba	AAB
32	Yumba noir	AAB
	Faux Corne	
1	Akoto	AAB
2	Amakake	AAB
3	Apoka	AAB
4	Apokamagbuke	AAB
5	Bokpeta	AAB
6	Egbe-o-mabeseI	AAB
7	Bolila*	AAB
8	Inganda	AAB
9	Lib.likale	AAB
10	Libanga lifombo	AAB
11	Libanga noir	AAB
12	Libanga vert sombre	AAB
13	Lingu	AAB

14	Lokolooto*	AAB
<b>Vrai corne</b>		
1	Ifelete	AAB
2	Ikpole noire	AAB
3	Ikpole rouge	AAB
4	Lokusu	AAB
5	Mpo*	AAB
6	Tala lola	AAB
7	Tala lola géant*	AAB
<b>Dessert</b>		
1	Figue rose	AAA

2	Gros Michel	AAA
3	Kamaramasenge	AAB
4	Petite naine	AAA
5	Pisang Awak	ABB
<b>A Cuire</b>		
1	Bisamunyo	AAA
2	Blugoe	ABB
<b>A Vin</b>		
1	Yangambi Km5	AAA

TABLE 2. Cultivar preferences, numbers, percentages in each type of banana by farmers in the former province of Equateur.

Cultivars	Plantains		Cultivars	Dessert		Cultivars	Cooking		Cultivars	Wine	
	No	%		No	%		No	%		No	%
1. Litete	81	38.5	Gros M	96	45,7	Bisamun	10	4,7	Y`Km 5	100	47,6
2. Egbe	49	23.3	Kamara	54	25,7	Blugoe	10	4,7			
3.Lib.lik	41	19.6	Figue Ro	36	17,2						
4.Bosua	29	13.9	Petite N	15	7,1						
5. Bosa	10	4,7	Pisang A	9	4,3						
<b>Total</b>	<b>210</b>	<b>100</b>		<b>210</b>	<b>100</b>		<b>210</b>	<b>9,4</b>		<b>210</b>	<b>47,6</b>

Legend: 1 to 5: From most appreciated to least appreciated

- Egbe: Egbe-o-mabese ;
- Lib.lik : Libanga Likale ;
- Bosa : Bosakaraka I ;
- Gros M : Gros Michel ;
- Figue Ro : Figue Rose ;
- Petite N : Petite Naine
- Pisang A : Pisang Awak ;
- Bisamun : Bisamunyo.

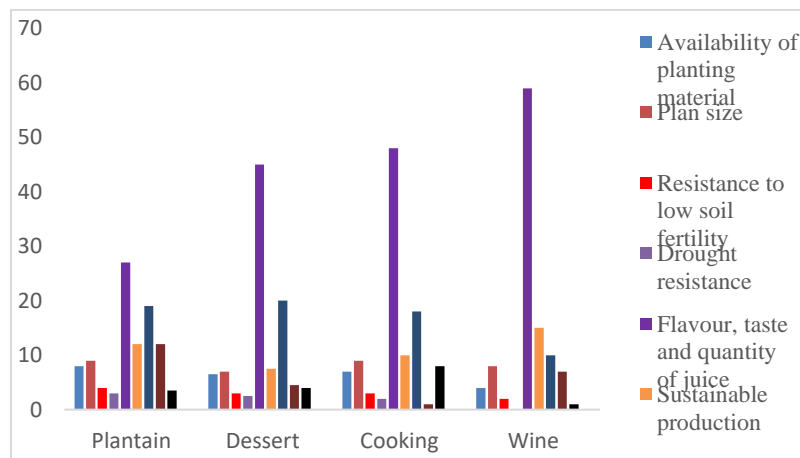


Fig. 3. The average of the selection criteria for bananas and plantain

### 3.2.2. Cultivar selection criteria

The selection criteria of cultivars by farmers in the former province of Equateur are presented in Figure 3.

In Figure 3, populations in the former province of Equateur choose banana and plantain cultivars on the basis of certain criteria, namely: taste (flavour), for self-consumption as the literature indicates that more than 87% of production is consumed by producing countries (Africa, Latin America, Asia) (INIBAP, 2001, Boof, 2003). Then, the demand and price on the market for basic necessities (salt, soap, oil, etc.).

The dark green Libanga variety (Mbudi) from the village of Yapombo, Bumba territory, former Mongala district, is grown for its stability, speed of production (short cycle) and drought resistance, regardless of the size of its diet. But the trade in bananas and plantains faces serious problems that can

encourage producers and the conservation of sales and harvest products.

As for disease resistance, cooking bananas show an interesting resistance character that bananas serve and wine. Equateur's populations confuse diseases with the problem of soil conditions (soil composition, erosion). The spread of diseases is due to the way planting material is selected (distribution from one neighbor, field or village to another).

### 3.3. The most cultivated varieties

The results of this figure show that, the plantain of the False Horn type, particularly Egbe-o-mabese and Libanga likale, is the most productive because of its early maturity, especially in the districts of South-Ubangi and Mongala, but a remarkable (exponential) increase is observed in the Tshuapa district.

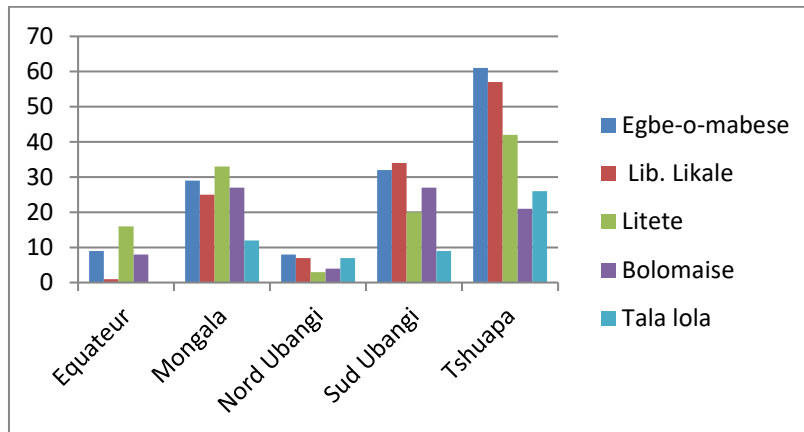


Fig. 4. The most cultivated plantains

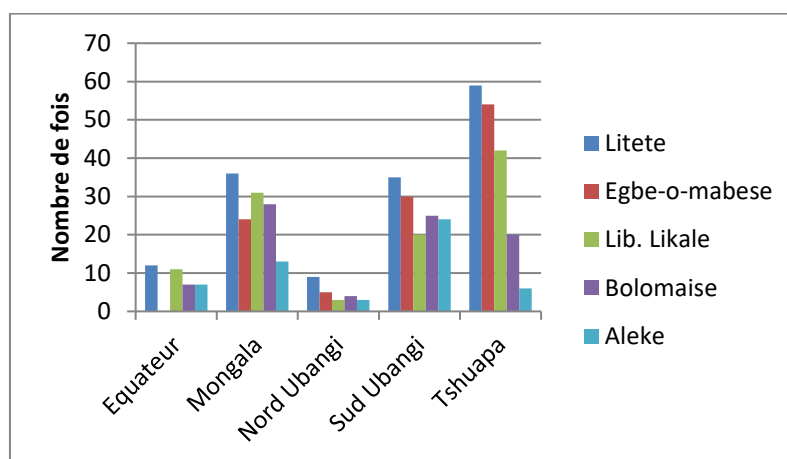


Fig. 5. Plantains with the best taste

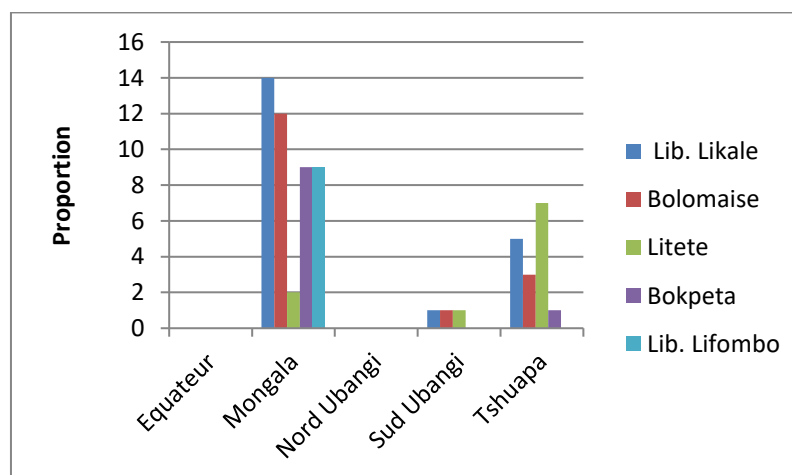


Fig. 6. Plantains with the best juice production

### 3.4. Varieties with the best taste

It appears from the results in the figure 5, Litete of the French type is the most preferred by its taste. Its fruits are best suited to dough alone or mixed with cassava (Lituma according to the Lokele tribe) and the other parts of the plant are used for indigenous treatments and traditional ceremonies. Then comes

the False Horn with Egbe-o-mabese and Libanga Likale for its availability on the market and its accessibility to consumption.

### 3.5. Varieties with better juice/beverage production

It should be noted in this figure that the distillation of alcohol from bananas is not only the business of Yangambi km5 but of all banana and plantain. This practice is no longer an aspiration of the people of Equateur because it is replaced by



maize, which produces high alcohol content. Therefore, the Mongala district uses Libanga Likale of the False Horn type and the Tshupa district uses the French Litete cultivar. However, beer bananas are more widespread because of the number of tufts, 73,04% according to surveys conducted by Muhindo. Among which, Yangambi km5 is famous followed by Pisang Awak (Muhindo, 2013).

### 3.6. Uses of bananas and plantains

The banana is above all a food plant; its fruit can be consumed in various forms, raw, cooked or dried. In addition, jams can be made, alcohol, medicines, paper, etc. can be produced and banana fruits are not only useful products, but also other organs play a very important role in everyday use (Dhed'a, *et al.*, 2011, Lassoudière, 2007).

In the former province of Equateur, in addition to the above-mentioned uses, bananas are also used for other purposes such as consuming male buds as a delicious meal, peelings are burned to extract bicarbonate that can be used in the preparation of manioc leaves and other parts of bananas as:

1. *The production of indigenous soap:* Palm oil is mixed with bicarbonate, after the heating and cooling operation, balls are obtained from a homogeneous paste.

2. *Alcohol production:* Alcoholic beverages are obtained from the fermentation, preparation and distillation of certain types of bananas. Here, the diets are still harvested green, yellowing is artificially caused by burial on the ground with a sachet or heating with a fire with a lot of smoke to initiate ethylene production.

3. *Food for breastfeeding women:* Medium yellow bananas are mixed with freshly ground peanuts. After cooking, a protein-rich porridge is obtained that even stimulates the production of breast milk for infants.

4. *Curative treatment:* The heated dry leaves relieve the sprain, in combination with the other fresh leaves cure malaria, fever, flu. The apex of the burning finger mixed with native salt, applied to the cavity, would alleviate the pain.

5. *Cultural ceremonies:* The dry or fresh leaves are sewn into a hat and belt to welcome a chef. At the presentation of the twins, the leaves accompany the ceremony, so the fake stem represents a dead man outside his family roof and is buried. Before going into battle, a test is done. The fighting man lies on the fresh leaves and others cover him, a knife is removed alive in the fire and cut, there will be victory if the leaves are not damaged and the man is not wounded. A piece of pseudo trunk would find a corpse with a stream of water, if it is thrown at the place where the man was drowned.

## IV. CONCLUSION

The purpose of this research work is to determine the different possible uses according to the different tribes and to identify the cultivars most preferred by farmers according to the main banana and plantain uses in the former province of Equateur. Thus, the new cultivars that have constituted all the nutritional, agronomic, socio-economic and cultural values have been placed in the regional collection of banana genetic resources capable of national and international trade. But, farmers have benefited from knowledge in order to protect this

genetic resource from bananas and plantains of cultural, social and economic interest.

All the results obtained showed that the genetic diversity of banana and plantain in the 5 districts surveyed in the former province of Equateur is represented by 61 cultivars, including 53 plantains and 8 bananas. The results made it possible to add 8 new cultivars of the French type, 2 new cultivars of the False Horn type and 1 new cultivar of the Horn type to the list. This is what makes this research study an interesting work that attracts the attention of researchers.

These results also show that plantain is more represented in the surveyed districts of the province with 32 cultivars of the French type, 14 cultivars of the False Horn type and 7 cultivars of the Horn type. The banana contains the rest of many of the cultivars, including 5 dessert cultivars, 2 cooking cultivars and 1 wine cultivar.

The results also showed that farmers value plantain cultivars in their fields according to the following main criteria, in descending order: taste, market price, sustainable production, short production cycle and diet size. This is also done with bananas. The cultivar Litete (French) is the most appreciated by its taste and market price because of its large diet and Egbe-omabese (False Horn) is appreciated by the size of its finger, its production which is sustainable but also the size of the diet. Also the cultivar Gros Michel (Dessert) meets the same criteria as Litete.

In addition, the surveys revealed uses of banana and plantain that are commonly used in the former province of Equateur. The cultivar Litete (French) has multiple uses such as cultural ceremonies, treatment of various diseases (dental caries, malaria, influenza...) and alcohol production including Libanga Likale (False Horn) and Bolomaise (French) are used for this purpose, but especially Yangambi Km5. This shows the farmer's commitment to make a wise choice among a variety of banana and plantain in the province.

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