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FARMERS PERCEPTION AND CRITERIA FOR CASSAVA VARIETY PREFERENCE IN CAMEROON

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ABSTRACT To assess farmers' perception and criteria for cassava variety preference prior to the dissemination of improved varieties in Cameroon, field visits were organized at the Mbalmayo research farm of International Institute of Tropical Agriculture (IITA) during the vegetative and harvest periods, and a sensory quality test was conducted in a participatory manner. Parameters recorded were statistically analyzed using analysis of variance procedure (ANOVA), resulting in the selection of five varieties for multilocational testing and demonstration. To complement this effort, thirty cassava farmers in Ebolowa, Bertoua, Bamenda, Ngaoundere making a total of one hundred and twenty were interviewed following structured questionnaires, and their fields assessed. Results show that farmers cultivate many varieties of cassava for different uses but prefer early maturing variety (96.7%), high yield (89.2%), and resistant to pests and diseases (88.3%). In addition, there was regional preference. Farmers in Ebolowa and Bertoua preferred leafy, sweet roots and early branching varieties (TMS-92/0326, TMS-96/0023) while those in Bamenda and Ngaoundere preferred tall, drought tolerant (TMS-92/0057), fibrous (TMS-96/1414) for gari (roasted cassava granules) and in some cases flowering varieties (M94/0121) for apiculture. Results served as feedback information to research, extension, policy makers and other stakeholders. This constitutes an attractive scheme for deployment of the improved varieties and complements programs of the Cameroonian government for roots and tuber (PNDRT), with the main objective to increase the productivity of cassava.

Key Words: Cassava; Improved variety; Farmers perception and preference; Cameroon.

INTRODUCTION

Cassava is an important perennial storage root crop grown in most African countries. It provides a basic daily source of dietary energy to the smallholder farmers and small income from processed products (CIAT, 1996; Nweke, 1998). Its ability to produce a high amount of starch per unit area compared to other starch crops (Tonukari, 2004) and its tolerance to marginal soils and flexibility in harvesting dates make it a popular crop amongst smallholder farmers (Henry & Hershey, 2002). Its production worldwide has increased from 1.8×10^8 t in 2000 to 2.3×10^8 t in 2010 (FAOSTAT, 2010) and is expected to increase fur-

ther due to the increasing demand for food, as well as a raw material for industrial products, particularly in Africa (Nweke, 2004).

In Cameroon, cassava ranks first amongst root and tuber crops in terms of total production and consumption and yearly production is estimated at 2.3 M t, with the Centre, East and South regions being the most productive areas (PNDRT, 2005). It is the main starchy staple with 80% of rural and urban households consuming cassava and cassava derived products on a daily basis (Essono et al., 2008). Currently, however, there is a growing awareness of the potential of cassava as a source of food and of income but the majority of cultivated varieties are susceptible to pests and diseases causing significant yield losses (Hahn et al., 1989). Cassava and its products e.g., baton, paste, flour, fufu, gari, chikwangue and starch are being sold both in Cameroon and elsewhere in Central Africa for the rapidly growing urban populations (Njukwe et al., 2012b). This increase in demand for cassava has led to increased prices in Cameroon and an increase in production exceeding the previous traditional subsistence systems. Its ability to grow and produce reliable yields in areas where cereals and other crops do not perform well has also contributed to its popularity. Cassava is consumed in many forms particularly, fresh, boiled or processed but also for its leaves which serve as vegetables and is largely grown by smallholder farmers, with the main production system being intercropping (Agwu & Anyaeche, 2007). Smallholder farmers in Cameroon grow various cassava cultivars and there are marked producer and consumer preferences as to the type of variety grown and these determine the uptake of new varieties (Zundel et al., 2010). Early maturing variety with high yield has increasingly become more important in situations where there is mounting pressure on land and farmers need to intensify production, as well as in semi-arid regions where harvesting is after only one cycle of rain (Kamau et al., 2011). However, most of the farmers in the rural areas still depend on local cassava varieties for their planting materials which in turn result in a very poor yield at harvest (Njukwe et al., 2012a). Adoption of improved cassava varieties and production technologies by farmers (Imo, 2006) is the main solution to increased productivity for food self-sufficiency.

The National Program for Development of Root and Tuber Crops in Cameroon (Programme National de Développement des Racines et Tubercules (PNDRT)) was conceived in 2001 and became operational in 2003 in the Ministry of Agriculture and Rural Development (MINADER) to improve the productivity of roots and tubers to meet the need of the growing population. The specific objectives of PNDRT were:

a) Develop root and tuber production technologies to increase productivity,
b) Rapidly multiply and distribute improved planting material of cassava, yam and sweet potatoes,
c) Develop processing technologies and marketing activities,
d) Collaborate with research institutions and NGOs to provide improved planting material and technical backstopping to farmers.

To achieve these objectives, priority was given to cassava because cassava ranks first amongst root and tuber crops in terms of total production and consumption and cassava is a crop that has the potential to increase farm incomes,

reduce rural and urban poverty, and help close the food gap if improved technologies are adopted such as the use of improved cassava varieties. PNDRT then entered into an agreement with IITA to provide high yielding cassava varieties and associated technologies. In the course of disseminating improved cassava varieties in Cameroon, it was necessary to assess farmers' criteria for preference that lead to adoption of new varieties from the beginning. This paper discusses how farmers' perception to improved varieties was taken into account in the scheme, and its effectiveness.

MATERIALS AND METHODS

I. Study Area

Cameroon is located on the west coast of Central Africa and covers an area of 475,400 square kilometers (183,695 square miles). The topography of Cameroon is varied, ranging from tropical rain forests in the south to mountainous highlands in some western central regions, and semi-arid savanna in the far north. The population was estimated at 15,421,937 in July 2000 and is growing at an annual rate of 2.47% (PNDRT, 2005).

Cameroon has ten regions with distinct regional culture, religion as well as ethnic differences. The division of the country into British- and French-ruled League of Nations mandates after World War I created Anglophone and Francophone fractions. The English-speaking fraction consists of the Southwest and Northwest regions and the educational system and legal practices derive from those of England. The French-speaking fraction consists of the remaining eight regions and the French school system is used, and the legal system is based on the statutory law of continental Europe. Cameroon has a diverse population comprising approximately 250 ethnic groups that form 5 regional/cultural groups. These are western highlanders (also called grassfielders), which include the Bamileke, Bamoun, and many smaller groups in the northwest; coastal tropical forest people, which include the Bassa, Douala, and many smaller groups in the southwest; southern tropical forest people, which include the Beti, Bulu, Fang, and Pygmies; the northern semi-arid regions and central highlands, which include the Fulani; and the Kirdi people of the northern desert and central highlands. In most areas, women are responsible for feeding their families. They grow staple food crops, while men clear the land and provide meat and oil as they grow the cash crops. Among the pastoral populations, men herd the livestock and women process dairy products. To understand farmers' perception and criteria for cassava variety preference, farmers in Ebolowa, Bertoua, Bamenda, Ngaoundere exhibiting cultural differences were interviewed.

1. Ebolowa

Ebolowa (2^{o} 53' N, 11^{o} 08' E, 520 m asl) with average temperature of 24^{o}C and average annual rainfall of 1,628 mm is in semi-deciduous forest with bi-

modal rainfall. The soil type is Haplic Ferrasols (Jones et al., 2013). Cassava is quite important and its leaves consumed as vegetable. Mixed cropping and relay cropping are the usual cultivation practices in the semideciduous forest. The area cultivated by a single farmer is usually relatively small (0.1–0.5 ha) because of the difficulty in clearing the land. After the trees are felled and burned, groundnuts are sown and allowed to establish. A superficial hoe plowing is done and under this cover, maize is sown. Cassava stakes are then planted symmetrically in relation to the already sprouted maize with some plantain, yam, and cocoyam. On fertile land, melon and other vegetables are integrated as well. After the 1st season, groundnuts, maize, melon, and legumes are harvested while cassava is continuously maintained. Cassava is harvested according to the needs of the family as at 12 months after planting. After harvest, field is either left fallow or planted again with cassava or sweet potatoes. Religion is largely Christian and the region is culturally dominated by the Beti peoples, which include the Ewondo, Eton, and Bulu, and are linguistically and culturally related to the Fang of Gabon. They are patrilineal and grow cocoa as a cash crop.

2. Bertoua

Bertoua (02° 16' N, 12° 16' E, 600 m asl) with average temperature of 23°C and average annual rainfall of 1,479 mm is in the Forest-Savanna transition. The soil type is Dystric Nitisols (Jones et al., 2013). Cassava is quite important especially in the eastern and northern parts, consumed 2 to 3 times on average daily including cassava leaves as vegetable. In the savanna, cassava is monocropped or relay-cropped with groundnuts or maize. Plantain, cocoyam (*Xanthosoma sagittifolium*) and yam (*Dioscoreaceae*) are mostly cultivated on newly cleared forest because they have greater nutritional requirements than cassava does. In the northeastern savanna, taro (*Colocasia esuculanta*) and cocoyam are intercropped with groundnuts, maize, and melon. Peoples in this region include the Maka and Gbaya, both with relatively egalitarian forms of social organization in which reciprocity is a key value. Forestry and tobacco farming are important sources of income. The East region is also home to the Baka, a tropical forest forager (pygmy) group of about thirty thousand to forty thousand living in small camps that exchange forest products with nearby farmers.

3. Bamenda

Bamenda (6° 03' N, 10° 07' E, 1,239 m asl) with average temperature of 21°C and average annual rainfall of 1,402 mm is in Western highlands with monomodal rainfall. The soil type is Umbric Ferrasols (Jones et al., 2013). Cassava is mostly planted around or in coffee fields and around houses where it is associated with maize, cocoyam, taro, beans, bananas, and vegetables. It is rarely cultivated above 1400 m asl, where cocoyam, taro, sweet potatoes, and yams (principally *Dioscorea dumetorurn*) are given priority. In very densely populated areas, cassava cultivation is reduced. Because of the landscape architecture and heavy rainfall, ridging and mounding are practiced to improve drainage and to prevent soil erosion. Irish potatoes gain in importance with altitude and may be consid-

ered a local cash crop. Cassava root is mostly consumed processed with little or no interest in leave consumption. In this region, land is held by Fons, with use rights devolving to specific patrilineages and matrilineages.

4. Ngaoundere

Ngaoundere (7° 21' N, 13° 34' E, 1,104 m asl) with average temperature of 22°C and average annual rainfall of 1,497 mm is in Sudano-Guinea which is a ranching area. The soil type is Haplic Alisols (Jones et al., 2013). Cassava is main staple in this region consumed 2 to 3 times on average daily and it is planted mostly in pure stands on large areas (> 1 ha) and can be maintained in the field for 15–18 months (sometimes 2 years). Religion is largely Muslim and culturally dominated by the Fulani. An important subgroup are the Bororo, noted for the size of their cattle herds. With their Hausa colleagues, they engage in long-distance trade involving cattle. Other northern ethnic groups include the Mandara, Kokoto, and Arab Choa. Major crops include cotton and millet and among the Fulani, land is inherited patrilineally.

II. Cassava Evaluation

IITA breeding scheme (Fig. 1) was adopted for cassava evaluation and performance based on plant growth, crop production and root quality. Selected seedlings from IITA Ibadan were planted for Preliminary Yield Trials (PYT) in Mbalmayo. Poor clones in terms of establishment, growth and resistance to diseases and pests were discarded. In the second year, the best clones selected through preliminary yield trials were incorporated in advanced yield trials, which was conducted at various locations in Mbalmayo covering a range of environments. Here, the clones are evaluated for yield, resistance to diseases and pests, root characteristics, dry matter and consumer acceptance. In the third year, the most promising clones from the advanced yield trials go into uniform yield trials for conformation. In the fourth year, elite clones from uniform yield trials are planted for farm-level testing and farmer evaluation while in the fifth year, clones most popular with farmers are multiplied for distribution. Physical characteristics of representative clones are presented in Table 1 and cassava cooking methods in Table 2.

On-station participatory cassava variety evaluation was conducted between May 2001 and April 2006 at the research farm of IITA in Mbalmayo (3° 25' N, 11° 28' E, 640 m asl) with mean temperature of 28°C. The average annual rainfall is approximately 1,500 mm falling in a bimodal pattern, the heavy rains occurring from February to June and the light rains between September and November. Over 200 cassava genotypes introduced from IITA Ibadan in 2001 undergone yearly on-station evaluation and in 2003/2004, eleven improved cassava (TMS-92/0326, NR8085, TMS-96/0023, NR88071-3, TMS-92/0057, TMS-95/0109, NR880447-2, TMS-96/0102, M94/0121, TMS-96/1762 and TMS-96/1414) varieties were selected from the lot for further evaluation in comparison with one preferred local (LMR) cultivar for yield stability, pests and disease reaction. They were established in three replicated plots of 3 x 5 plants spaced 1 x 1 m with

regular manual field maintenance for participatory evaluation. Cassava Mosaic Disease (CMD), Cassava Bacteria Blight (CBB) and Cassava Anthracnose Disease (CAD) were evaluated monthly in a scale of 1–5 where 1 is no symptom and 5 very severe symptoms. Harvesting was done 12 months after planting for yield components which included; number of tubers, number of marketable tubers, tuber weight, tuber fresh weight and tuber dry matter content. Parameters recorded were statistically analyzed using analysis of variance (ANOVA) procedure, and five varieties were selected with respect to yield, pest/disease.

To select varieties in compliance with farmers' criteria for preference, field visits to IITA Mbalmayo experiment site by farmers were organized during the vegetative and harvest stages and a sensory quality test was conducted in a participatory manner. The purpose for the field visits was for farmers to assess plant growth and vigour, leafiness and plant canopy cover, branching habit and height, root yield, root quality in term of number, size, shape, peel colour and processing options.

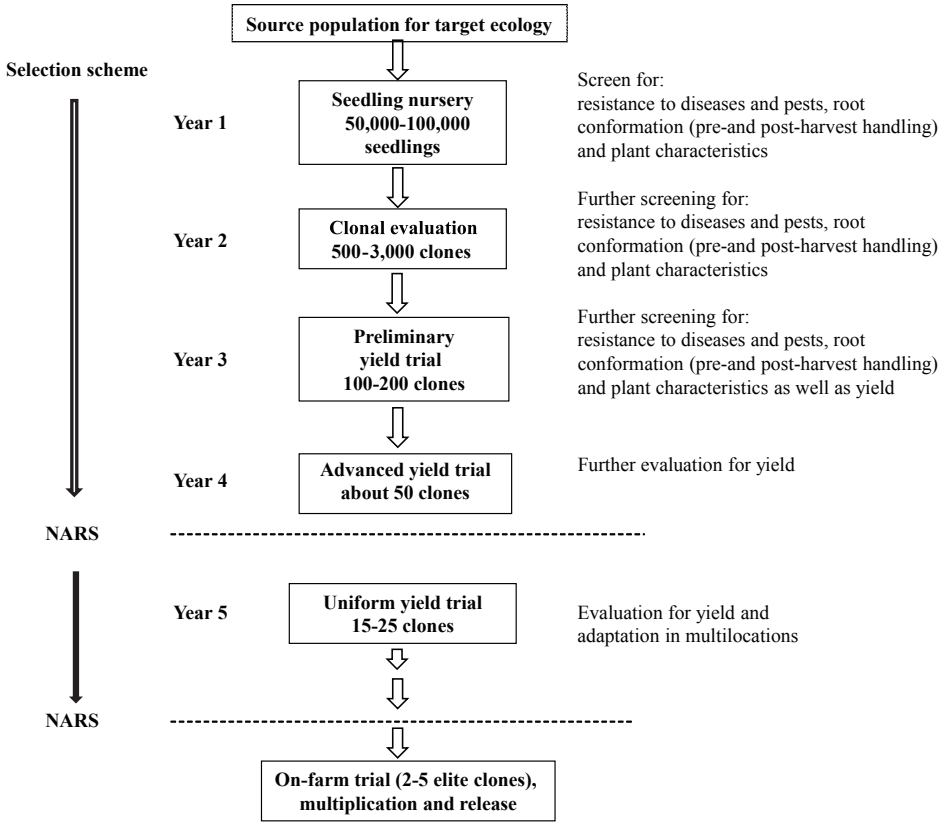

Fig. 1. Genetic improvement scheme of cassava

Table 1. Physical characteristics of representative cassava clones

Varieties	Physical characteristics of cassava varieties					
	Mature period (months)	Branching	Leafiness	Flowering	Peel color	Stem storage
TMS-92/0326	12	< 1m	High	Medium	White	Moderate
NR8085	15	< 2m	Medium	Medium	White	Poor
TMS-96/0023	12	< 1m	High	Medium	White	Moderate
NR88071-3	15	> 2m	Low	Low	White	Poor
TMS-92/0057	12	> 2m	Low	Medium	White	Moderate
LMR	15	> 2m	Medium	Low	Red	Poor
TMS-95/0109	15	> 2m	Medium	Medium	White	Poor
NR880447-2	15	> 2m	Low	Low	White	Moderate
TMS-96/0102	15	< 2m	Low	Medium	White	Poor
M94/0121	15	> 2m	Medium	High	White	Moderate
TMS-96/1762	12	> 2m	Low	Medium	White	Moderate
TMS-96/1414	12	> 1m	Medium	Medium	White	Moderate

Leafiness and flowering were scored visually based on reference check (LMR) varieties with moderate stem storage between 10 and 15 days.

Prior to the multilocational testing done in Ebolowa, Bertoua, Bamenda and Ngaoundere in 2006 thirty cassava farmers each making a total of one hundred and twenty exhibiting socio-cultural differences based on regions were randomly sampled and interviewed following structured questionnaires. Identification of respondents' farmers was facilitated by agricultural extension workers based on years in cassava production. Focus group discussions were held in order to obtain a general knowledge of the local cropping systems and farmers that use cassava cultivar selection criteria for the different cassava varieties they cultivate. The data collected were coded, entered and analyzed using Statistical Package for Social Scientists (SPSS), 16th version (Carver & Nash, 2009). Combinations of analyses, descriptive statistics, cross tabulations and percentages were undertaken. In parallel, selected varieties were mass propagated to establish a demonstration plot in each of the location as to reach out to many farmers since we could not bring farmers from all the regions to Mbalmayo and to confirm varieties selected in Mbalmayo. Farmers that were interested were invited to visit demonstration plots and to discuss the advantages and disadvantages of each variety. Each farmer in Ebolowa, Bertoua, Bamenda and Ngaoundere was asked to rank the varieties whether they would be useful under their own conditions in the village and give reason for preference. Farmers ranking varied from crop cycle, pest and disease resistance, short crop cycle, branching habit and plant height, leafiness and plant canopy cover, red petiole and tuber peel colour, long stem and root storage, tuber size, shape and number, ease of peeling and good taste/mealiness. The farmers then selected varieties of preference for testing in their own fields and there was regional preference.

Table 2. Cassava cooking methods

Item	Preparation	Way of consumption and preference
Gari	Peel and wash fresh cassava roots. Grate the root into a mash. Dewater the mash by pressing inside a clean bag. Break the pressed mash into fine granules Sieve. Add palm oil and fry in a metallic tray or oven to dry (yellow gari). For white gari, fry without adding palm oil. Package in airtight container.	Gari can be soaked instantly in cold water with or without sugar before eating or eaten with fried groundnut. It can also be cooked in hot water and eaten with stew, vegetable or groundnut sauce. Gari is very common among the Anglophones and is eaten in the Anglophone regions in Cameroon including Bamenda.
Fufu	Peel roots and wash. Soak in water (2–3 days). Remove from water, break in pieces and dry. Store in airtight container at room temperature. Note: For white fufu product, drying should be completed in one day.	Fufu is cooked in hot water and eaten with groundnut or vegetable sauce. It is common in all the regions in Cameroon but predominate in Bertoua and Ngaoundere.
Baton (also known as Bobolo and Chikwangue)	Peel and wash fresh cassava roots. Soak in warm water for 3–4 days to ferment (to facilitate fermentation, place container near the fire or cover with pawpaw leaves). Wash fermented product properly and put in a clean bag and press to dewater. Sieve to remove lumps and fibers. Grind to form a paste. Wrap in leaf and boil.	Product could be served with groundnut sauce, stew, groundnut and egusi pudding. This is very common in the forest zone where the leaf for wrapping is easily obtained. Baton is sold by the roadside with roasted fish in the forest zone including Ebolowa and Bertoua.
Cassava paste	Peel and wash fresh cassava roots. Soak in warm water for 3–4 days to ferment (to facilitate fermentation, place container near the fire or cover with pawpaw leaves). Wash fermented product properly and put in a clean bag and press to dewater. Sieve to remove lumps and fibers. Grind to form a paste.	Cassava paste is cooked in hot water and eaten with groundnut or vegetable sauce. It is common in all the regions in Cameroon but predominate among the Anglophones including Bamenda.
Starch	Peel and wash fresh cassava roots. Grate, or chip and grind smoothly. Mix with a lot of clean water. Filter through a fine mesh sieve or through muslin cloth. Allow the filtrate to settle. Decant the supernatant. Wash off the starch residue several times with water to get white, odorless, and tasteless starch. Put in a clean bag and press to dewater. Spread thinly on a tray and sundry. Mill the dried cake finely and sift if necessary. Package in airtight containers.	Starch is produced at a small-scale for commercial purpose and sold to clothe dry cleaners for hardening.
Flour	Peel roots and wash. Soak in water (2–3 days). Remove from water, break in pieces, dry and mill.	Cassava flour is produced at a small-scale for commercial purpose and sold to bakeries for bread making. It is common in the Anglophone regions including Bamenda.

RESULTS AND DISCUSSION

I. Cassava Performance and Evaluation

The result of eleven improved varieties and one local (LMR) cultivar is shown in Table 3. All parameters used for evaluating yield and diseases susceptibility were significant at 1% level. Number of tubers is variable among varieties ranging from 22 to 57 tuber/plant, and marketable tubers changed accordingly. Yield (fresh tuber) ranged from 18.5 to 36.7 t/ha and higher yield is usually correlated with high dry matter content. Based on tuber fresh and dry weight, four varieties (TMS-92/0057, TMS-92/0326, TMS-96/0023, and TMS-96/1414) which gave more than 25 t/ha and M94/0121 with 24.3 t/ha and exhibiting other potential traits were selected (Fig. 2). All selected varieties are early maturing, and also high in CMD, CAD and CBB resistance. Selected varieties were mass propagated to establish multilocational trials in four locations (Ebolowa, Bertoua, Bamenda, Ngaoundere) in 2006. The results of cassava performance in relation to environmental factors (climate and soil characteristics) are under preparation in separate papers.

Table 3. Yield and disease responses of cassava trial at Mbalmayo in 2003/2004

Clone	Number of Tubers*	Root yield (t/ha) *	Dry Matter Content (%)	Disease scores**		
				CMD	CBB	CAD
TMS-92/0326	45 (23)	30.1 (22.5)	35.0	1.2	1.5	2.8
NR8085	33 (20)	24.3 (21.5)	39.9	1.0	1.7	2.1
TMS-96/0023	37 (21)	25.1 (21.5)	38.3	1.1	1.5	1.7
NR88071-3	32 (16)	23.5 (17.7)	36.8	1.1	1.4	1.9
TMS-92/0057	46 (29)	36.7 (31.7)	44.1	1.3	1.8	2.5
LMR	22 (17)	23.7 (21.4)	41.8	1.0	1.7	1.9
TMS-95/0109	31 (24)	23.5 (21.2)	44.4	1.0	1.5	1.8
NR880447-2	57 (22)	21.9 (14.4)	42.7	1.1	1.4	1.4
TMS-96/0102	30 (17)	18.5 (15.1)	43.2	1.0	1.6	1.5
M94/0121	41 (21)	24.3 (16.1)	42.9	1.0	1.6	2.3
TMS-96/1762	39 (21)	20.2 (15.8)	36.7	1.0	1.6	2.3
TMS-96/1414	27 (19)	29.4 (27.0)	42.2	1.0	1.5	2.2
Means	29 (16)	19.5 (15.8)	40.9	1.2	1.6	2.0
SE(+/-)	12 (8)	7.8 (7.5)	3.2	0.4	0.5	0.7
CV	43 (48)	39.9 (47.3)	7.8	31.0	31.7	35.5
Fvalue	2.97 (1.98)	3.63 (3.14)	2.37	73.63	1.87	4.83
Pr > F	0.0002 (0.0144)	<.0001 (0.0001)	0.0028	<.0001	0.0054	<.0001

* Marketable tubers

** On a 1-5 scale, where 1 = no disease, 5 = very severe.

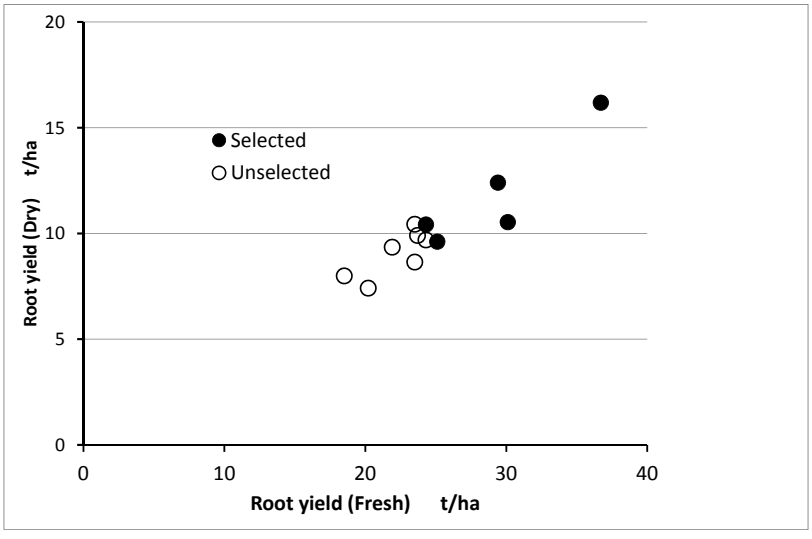

Fig. 2. Relationship between fresh root yield and dry root yield

II. Farmers' Preference

Farmers generally preferred early maturing varieties, high yielding, and resistant to pests and diseases. In addition, traits related to cultural values such as red petiole and peel colour, long stem and root storage, stem thickness, leafiness and ease of peeling, fibrous root was observed including the relative role of men and women in production and processing. These traits was recorded and scored as a percentage of number of respondents (farmers) with preferences (Table 4). Some farmers in Bamenda and Ngaoundere preferred varieties with good growth and vigour that can withstand adverse weather condition like drought while those from Ebolowa and Bertoua preferred early branching varieties with dense leaf canopy for vegetable. Others indicated interest in plant height for mixed cropping systems and variety (TMS-92/0057) was preferred while early branching varieties (TMS-92/0326 and TMS-96/0023) with dense canopy cover was preferred for sole/mono cropping systems to suppress weeds. All farmers preferred high yielding varieties and in some cases multipurpose varieties with high yields and dense leaf canopy for both root and vegetable. Root quality traits like number, size, shape, peel colour, ease of peeling, fibrous, mealiness and dry matter content also accounted for farmers' preferences. In addition, there was regional preferences, farmers in Ebolowa and Bertoua preferred leafy, sweet roots and early branching varieties (TMS-92/0326, TMS-96/0023) while those in Bamenda and Ngaoundere preferred tall, drought tolerance (TMS-92/0057), fibrous (TMS-96/1414) for gari and in some cases flowering varieties (M94/0121) for apiculture (Table 5). The most significant and underlying factor in the entire process is the active participation of farmers. One of the constraints usually faced with the introduction of new varieties is their adoption by farmers (Tresh, 2003) but this was not the case

with these varieties. Formal cultivar selection and crop improvement programs often focus on few economically important traits such as yield or disease resistance (Hahn et al., 1989; Manyong et al., 2000). This project considered other potentially important traits such as traits related to culture and consumers taste preferences. The pioneer farmers readily accepted these varieties and over 20 organizations benefited from 50,000 free planting materials of superior quality with an acute need for more. Those who wanted to adopt the varieties from demonstration plots were encouraged and supported to adopt these practices on a large scale in their production fields. In 2005/2006, 2,000,000 cuttings of the improved varieties (TMS-92/0326 and TMS-96/1414) were multiplied and distributed to farmers to establish 200 ha of cassava in 221 villages (Fig. 3) through PNDRT. Training farmers through regular extension visits for good quality planting material and agricultural practices would help to create a better awareness and appreciation (Bakia te al., 1999).

Table 4. Percentage of farmers that use cassava cultivar selection criteria in four sampled locations

Criteria for selection	Sample location				
	Ebolowa	Bertoua	Bamenda	Ngaoundere	Mean
Tuber yield	93.3	80.0	100.0	83.3	89.2
Good taste / mealiness	76.7	83.3	30.0	56.7	61.7
Pest / Disease resistance	90.0	73.3	96.7	93.3	88.3
Short crop cycle	100	90.0	96.7	100.0	96.7
Early branching (short)	83.3	63.3	43.3	30.0	55.0
Late branching (tall)	36.7	23.3	73.3	86.7	55.0
Leafiness	100.0	100.0	56.7	43.3	75.0
Drought tolerance	23.3	30.0	83.3	100.0	59.2
Fibrous root	0	0	73.3	0	18.3
Dry matter content	36.7	30.0	43.3	53.3	40.8
Flowering variety	10.0	46.7	30.0	73.3	40.0
Red tuber peel colour	56.7	43.3	46.7	53.3	50.0
Long root storage in soil	46.7	36.7	0	0	20.9
Long stem storage	36.7	36.7	63.3	73.3	52.5
Ease of peeling	43.3	30.0	20.0	26.7	30.0
Planting material availability	36.7	36.7	43.3	53.3	42.5
Stem thickness	6.7	3.3	16.7	13.3	10.0

Multiple responses

Table 5. Percentage of preferred variety per sampled locations

Cassava varieties	Sample location			
	Ebolowa	Bertuoa	Bamenda	Ngaoundere
TMS-92/0057	54.1	41.6	100.0	96.2
TMS-92/0326	88.3	96.4	66.2	72.4
TMS-96/1414	63.2	61.2	86.3	52.1
TMS-96/0023	100.0	89.2	64.3	54.8
M94/0121	32.4	38.4	39.2	56.6

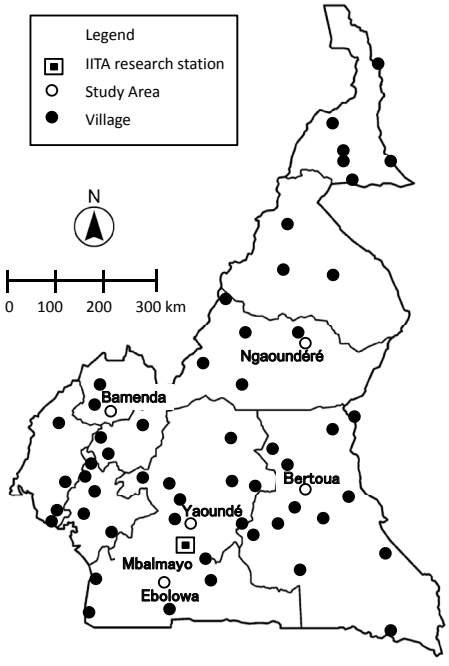

Fig. 3. Distribution of improved cassava varieties in Cameroon by PNDRT

CONCLUSION

In the course of disseminating improved cassava varieties in Cameroon, it was necessary to assess farmers' criteria for preference that lead to adoption of new varieties. The results could serve as feedback information to research, extension, policy makers and other stakeholders. Through PNDRT, cuttings of the improved varieties (TMS-92/0326 and TMS-96/1414) were multiplied and distributed to farmers. Feedback from farmers converge on the usually good performance of improved varieties (high yield, earliness, disease resistance) and it is obvious that the impact of these interventions in enhancing the productivity and income from cassava is promising. Varietal improvement for higher yield and root dry matter content will bring additional cash income to a great number of smallholder farmers.

After large-scale adoption and cultivation of improved cassava varieties, the government of Cameroon on 11th September 2012 released four of these varieties (TMS-92/0326, TMS-96/1414, TMS-96/0023, TMS-92/0057) and one additional variety (TMS-92/0067) due to its suitability to the biological control of cassava green mite, in addition to its resistance to CMD. The released varieties were baptized as Abui-Pkwem for TMS-92/0326, Nko'h Menzui for TMS-96/1414, Abeng-Lengon for TMS-96/0023, Ayeng Ye-Sahti for TMS-92/0057 and Mbong Wa Tobo for TMS-92/0067. The release of the varieties will help improve yield and the fortunes of farmers who depend on cassava for their livelihoods.

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