

## Article

# Uncovering Local Understanding of Cassava Varietal Selection Koudandeng – Obala, Cameroon

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### Abstract

*Data at the individual level were used to assess the diversity of cassava varieties among male and female cassava producers and to document the link between their decision making frameworks and practices in the selection of cassava genetic diversity. The case of male and female cassava farmers of Koudandeng village in the Obala administrative sub division of Cameroon was used in this study. Freelisting and ethnographic data were collected in 2005 from a sample of 39 male and female cassava producers using the stratified sampling method with each respondent selected per household. Freelisting analysis was used to identify the genetic diversity of cassava among male and female farmers. The Smith's index of salience (S) was used to highlight the important cassava varieties and the gender differentiation in the degree of importance of each variety. The pivot table was used to cluster the characteristics of each cassava variety across informants and the reasons for their cassava varietal selection. These showed how local systems of evaluation and classification of the different cassava varieties which constitute male and female farmers' knowledge is translated into their everyday strategies and practices. The research findings question the extent to which government policies, that promote the breeding and dissemination of high yielding cassava varieties for the market and therefore major shifts away from traditional to more intensive production systems, affect cassava genetic diversity in the light of increased commoditisation of cassava. These further highlight that, the introduction of high yielding cassava varieties does not necessarily lead to a loss but to an increase or maintenance of cassava genetic diversity. It is therefore suggested that the link between farmers' (especially women as custodian of cassava genetic diversity) local evaluation and classification frameworks of the different cassava varieties they grow and their varietal selection strategies and actions should be clearly understood. This can be done by looking at intra-species level variation in the characteristics of the different cassava varieties in agricultural policies and research. The results given are a first step towards an in-depth analysis of farmers' knowledge in the management of cassava genetic diversity.*

**Key words:** cassava genetic diversity, local evaluation and classification; cassava varieties; male and female farmers; farmers' needs, interests and priorities; agricultural research and development; HYV cassava, Koudandeng – Obala, Cameroon.

### Introduction

Government and international policies that promote major shifts in the markets and production systems of women's crops, with greater emphasis on the development and diffusion of high yielding varieties (HYV), tend to neglect male and female farmers' individual needs, interests and priorities and therefore miss out on their knowledge in the management of crop genetic diversity. Developing and disseminating high yielding crop varieties is oriented by the principle of broad based adaptability to ecological conditions with little regard for intra species variation that forms the basis of farmers' selection criteria. Male and female farmers' skills and knowledge that are reflected in their practices and reasons for the maintenance or loss of crop genetic diversity is based on their individual needs, interests and priorities. Farmers select cassava varieties according to a combination of traits that meet not only their income, food security, culinary, and agronomic needs, but also the need to gain status (prestige) and maintain their cultural identity while maintaining both the high yielding varieties (HYV) introduced by research and the local varieties if these meet their specific interests. Some local cassava varieties are also high yielding.

The principle of Malthusian demographics that stresses the need for increased food production to feed the world's rapidly growing population on the one hand, and the concern for the African Food Crisis where people are increasingly becoming food insecure on the other hand, have been the driving force for these national and international policies (C.H. Gladwin: 1991; Cohen et al: 1989). Based on this, the Cameroon government, contrary to its Green Revolution Policy of the 70s where high yielding varieties of non-food crops were promoted for export, has since the late 80s embarked on the diversification of its agricultural production with greater emphasis on the production of domestic food crops (mainly women's crops), for regional markets. This policy aims at increased food crop production not only for foreign exchange, but also to meet the challenge of sustainable food self-sufficiency and ensuring food security that act as a hedge against political instability among its urban dwellers (Cameroon Agricultural Policy Document: 1992).

Researching on food crops with high potentials for increased food supply and export identified cassava (*Manihot esculenta*) as one of the priority crops. High yielding cassava varieties that are meant for high potential areas have been bred and distributed by international agricultural research institutes (Nchang Ntumngia, 1997). However, increasingly, the breeding and dissemination of HYV cassava varieties is coming under criticism since it is related to the decline in the variability of cassava (intra species diversity). It has been shown that the variability of plant species in the various ecosystems is not only a function of the physical environment and of numerous natural evolutionary and selection processes, but also of human behaviour. The literature has associated the causes of biological and ecological erosion with the rapid expansion of industrial and green revolution monoculture agriculture, rapid population growth, the growth in international and regional markets for agricultural commodities, the globalisation of the food systems and diets, and the extension of patenting and other intellectual property systems (rights) to living organisms (Zimmerer, 1988; Badri and Badri, 1994; Shiva, 1996; Lang, 1996; Banuri and Jackson, 1996; Moreno-Black, Samnasang and Thamathawan, 1996; Box and Doorman: 1982; CTA/IPGRI: 1992; Eyzaguire and Iwanga: 1996; Tripp: 1996). The marginalisation of small-scale diverse food production systems that conserve farmers' diversity of crops in agricultural development and research is increasingly recognised. It is argued that the high responses of modern varieties that are used in industrial agriculture are dependent on the genetic variation of farmers' varieties. Available evidence points to the fact that cassava genetic diversity erosion is not necessarily a function of the introduction of HYVs, which are diverse in themselves, but is more influenced by the neglect of farmers' knowledge (especially women) in the selection and management of different cassava varieties by formal research and breeding institutions.

Researchers, whose objectives are oriented towards breeding high yielding cassava varieties that are adapted to wide agro-ecological conditions, often consider only the agronomic traits of cassava with little or no attention given to the other intrinsic characteristics of the different cassava varieties and their responses to varied agro-ecologies and how these suit farmers' cultural, social and economic priorities. Understanding the specific characteristics of the different cassava varieties highlights the intrinsic traits which farmers look for in their cassava varietal selection strategies and practices which are not often explicit when evaluated on a general basis.

In Cameroon, women manage local cassava varieties within traditional production and processing systems oriented towards meeting household subsistence needs and generating income by selling processed cassava products and tubers in the local markets. Women as producers, selectors, processors and marketers of cassava are traditionally the custodians of in situ (on-farm) cassava genetic diversity, but their knowledge and competence in cassava genetic diversity management has been relatively undocumented and underutilised in rural development and policy formulation. There is a major concern that researchers' breeding criteria that generally do not address post-harvest handling, marketing, and subsistence needs, and the diversity of agro-ecological conditions confronted by producers, tend to neglect women's needs, interests and priorities in these respects. This has consequences for on-farm genetic diversity management, production, efficiency and food security. This raises questions regarding farmers' selection criteria and how these can be taken more into consideration by breeding and policy formulation and implementation institutions. Having regards for genotype by environment interactions where there is cassava genetic adaptation to physical and socio-economic environments is an important criterion that male and female farmers adopt to ensure the maintenance of cassava genetic diversity, adequate yields, food security and household welfare. Empirical evidence shows that, in Cameroon, male and female cassava farmers in Koudandeng village within the Obala administrative sub division of the Centre Province base their breeding strategies not only on diversity and risk reduction, but also on their motivations to grow cassava, their skills and knowledge in cassava crop management.

The growing concern about increased commercialisation of women's crops has also raised important questions about the variability of cassava genetic diversity and the erosion of the knowledge entailed in the management of genetic diversity with increased promotion of HYVs among farmers. The marketability of the different cassava varieties is an important criterion that responds to farmers' income needs. Other important considerations are: food security and culinary qualities, yield qualities, pest and disease tolerance, phenotypic or morphological characteristics, traditional use values and cultural values of cassava, and the need to gain status and maintain cultural identity in cassava alongside marketing qualities that male and female farmers of Koudandeng village employ. Farmers combine these qualities in various ways to suit their individual needs, interests and priorities while selecting the different cassava varieties. These selection criteria, which are based on a combination of desired traits, lead to the maintenance of a diversity of cassava varieties since each variety possesses specific characteristics.

Efficient policy review to improve agricultural development, farmers' income and food security requires an understanding and utilisation of: i) the different knowledge domains entailed in cassava; ii) farmers' local classification' and evaluation (perceptions) of the different cassava varieties that reflects the place of cassava in farmers' socio-economic and food systems.. These consist of farmers' reasons for their diverse agronomic practices and selection criteria and motivations for maintaining or losing cassava genetic diversity.

There is also the need to produce a reference document for rural development institutions. Farmers' practices have been mistakenly considered to be equivalent to their knowledge, and so no studies have actually documented farmers' reasons for conserving diversity. Research institutions therefore, do not actually have a reference on which to base their breeding criteria and objectives. Documenting farmers' reasons for their selection practices in cassava (especially women's as main custodians of cassava genetic diversity) is a prerequisite for understanding and documenting their knowledge in cassava genetic diversity management. Further, literature highlights the fact that relating the connection between local plant classification and conservation of plant genetic resources is an important dimension of focus that has been missed out in ethnoecology (Nazarea, 1999). Cognitive anthropologists have made substantial progress in the analysis of cultural image and image domains (colour, kinship relations, folk biology taxonomies and folk anatomy). An understanding of how these domains of image are effectively integrated with domains of local action plans, that enable different categories to be linked to strategies and action plans is virtually lacking in anthropological studies. Understanding the interface between decision making frameworks and behavioural outcomes and the lenses that shape and structure these interconnections in cassava genetic diversity management is necessary.

Based upon reconnaissance study, cassava producing household survey, freelisting and follow up ethnographic interviewing, this article highlights the different reasons for which male and female cassava farmers select and manage a diversity of cassava varieties in the light of increasing commercialisation and changing government policy on cassava. To determine the cassava diversity that exists in this urban periphery, a free listing analysis was performed. Twenty seven different cassava varieties (see table 1) were identified, two of which were introduced by research institutions and twenty five of which are local varieties. While each farmer grew on average seven varieties, men maintained twelve varieties and women maintained all. The Smith's index of saliency (Smith's S) was used to measure the salience of each cassava variety freelisted by farmers. The pivot table was used to cluster the different characteristics of each variety across informants. This article introduces detailed consideration for a rethinking in debates on the impact of commoditisation and government policies on crop genetic diversity erosion. It is believed that the introduction of HYVs for the market leads to the loss of biological diversity. In more traditional communities like Koudandeng, where traditional food and cultural values are of great significance, introducing HYV varieties may not necessarily lead to the erosion but instead to an increase in species genetic diversity since local varieties have specific traits that are highly valued by farmers and consumers. Farmers' production orientation and objectives, greatly determine their decision to increase, maintain or lose plant genetic diversity. This article not only attempts to provide a reference for cassava plant breeders, but equally emphasises the need to evaluate different plant species at varietal level (intra species level evaluation). This permits an understanding of farmers' motivations and local crop evaluation and classification systems. This should facilitate the development and diffusion of varieties that respond to male and female farmers' needs, interests and priorities if agricultural development has to be fostered while conserving plant genetic diversity.

### **Study Site, Sample Design and Data**

Koudandeng village, which is the study area, is situated in the Obala sub division of the Lekie administrative division, which are all part of the Centre Province, a tropical rainforest region with bimodal rainfall where cassava is highly produced and commercialized. The Obala administrative sub

division is an urban periphery where commercial cassava production is greatly influenced by the urban markets of Yaounde. Obala, which falls under the IITA's Forest Bench Mark research areas of the Congo Basin, is a high cassava producing area and has had greater intervention of research and extension activities and institutions as compared to most other regions of the same province. Obala is characterized by high population pressure, good market access, and the diversification and commercialization of its agriculture. The Etone and Beti cultures are present in Obala with relatively homogenous sub-groupings that maintain their traditional socio-cultural attitudes and gender roles, and commercialises more fresh cassava tubers, baton (a fermented paste wrapped in leaves and tied with raffia fibre) and couscous (fermented cassava flour). Obala therefore has factors that give insights into the impact of the dynamic processes of the commoditization of cassava and government policy on cassava biodiversity management.

The closeness and ease of access of Koudandeng to Obala and Nkometou urban-peripheries and Yaounde, has led to the disappearance of the main village market. Koudandeng is situated at 26km away from Yaounde the capital of Cameroon, 12km away from Nkometou (an urban periphery town) and about 20km away from Obala. The livelihood activities and strategies in the study area are: agriculture, petty trading, wage labour, craftwork, wild game hunting, out migration to other villages and towns, and salaried jobs. Traditional men's activities require high energy expenditure and include: craftwork, wild game hunting, agriculture, salaried jobs, running beer parlours and household provision stores, and out migration. Women, traditionally, are food crop producers and marketers (cassava inclusive), and petty traders as well. Plantain and yam fields constituted men's traditional food crop fields, but shifts in livelihood strategies in response to changing economic situations have led to men producing what ever food crop that yields income, such as cassava, maize, plantains/bananas, and market garden crops. Even though cassava yields income, it is still a traditional women's crop because it is the main staple, and only 5.2% of the total population of cassava farmers are men. Women are still the main custodians of cassava genetic diversity in this village. Women who travel more to the different markets to sell their farm produce (especially cassava), have greater mobility as compared to men whose cocoa and coffee markets are located in the village. Men food crop producers employ women's labour in the sale of their produce. Cassava, being the main staple, is grown and processed in almost every household with an average field size of 150m x 150m. While men may manage only one cassava field, women on the average manage 3 fields per year. Cassava roots, cassava flour and baton (fermented cassava paste wrapped in wild plant leaves and tied with raffia strings) are the main cassava forms sold frequently and on a large scale. The presence of improved processing technology in Koudandeng has facilitated local level cassava processing into couscous and baton.

The history of the commercialisation of cassava in this village, dates as far back as the 1980s when trade liberalisation was the major orientation in the Cameroon government's policy. Three historic periods that have marked the impact of trade liberalisation on the commercialisation of food crops are: i) the pre 1988/89 period during which there was a boom in the price of cocoa vis-à-vis the world market. Cocoa is the main export crop in this village; ii) the period between 1989 and 1993 during which cocoa farmers' income dropped drastically and the government promoted domestic food crop production including cassava, as a major strategy to overcome the bust in the country's economy due to lower prices for trade exports. This period also experienced the rapid devaluation of the country's currency (francs cfa) and a rapid turn about in the crop production activities for men. In order to diversify their income sources, men took up cassava, maize and plantain production for the market; iii) the post 1994 period during which prices of cocoa vis-à-vis the world market gradually increased with men taking up cocoa production once more.

In 2002, a reconnaissance survey (with 54 informants) of three main food markets of Yaounde, identified Obala as the main source of supply of cassava fresh roots and baton. Further, interviews with 29 cassava retailers and consumers in the Obala semi-urban market specified Koudandeng village as one of the main sources of supply of cassava fresh roots and baton. In November 2002, a reconnaissance survey using focus group discussions with 23 informants, gathered the necessary socio-economic, agricultural and cultural data that provided the framework for further in-depth investigation. Using the stratification parameters identified from this study, a household census was carried out to identify those households producing cassava. Basic demographic data and information on the importance of cassava in the livelihoods of men and women was obtained. Nearness to urban markets for cassava, degree of cassava production, level of research and extension intervention, ease of accessibility, ethnic diversity, and level of cassava commercialization were the guiding criteria for the choice of the study site.

One hundred and sixteen cassava producing households were visited with interviews carried out with any available adult member of the household. At least one member of each household was identified to produce cassava during this census. Of the 116 persons interviewed, 110 women (94.8%) and 6 men (5.2%) produced cassava. It is estimated that 11 households (8.6% of total) were not included in the census because members of these households were absent at the time of the interviews. Data collected on household demographic structure, farm size, cassava germplasm management, and commercialisation/consumption highlighted two ways in which producers could be classified. On the basis of cassava commercialisation and consumption, three categories of producers were identified: those who did not sell cassava at all (20.7% of farmers); those who sold less than 40% of their cassava produce (19.8% of farmers) and those who sold over 40% of their cassava produce (59.5% of farmers). On the basis of cassava genetic diversity, three categories of farmers were identified: those who grew at most four cassava varieties (16.4%); those who grew between five and eight cassava varieties (68.9%) and those who grew over nine cassava varieties (15.5%). The data for this article was collected using the latter.

A qualitative knowledge questionnaire based on the census data was designed, pre-tested and after revision, the final questionnaire was administered to 39 farmers (2 men, 37 women). The selection criteria was based on the number of cassava varieties grown, farmers' production orientation, sex, age, and farmers' willingness to participate in the research. Each questionnaire took on average less than one hour to administer and there was no significant problem in its field administration.

### **Characteristics of the Sample Population and Cassava Genetic Diversity**

Of the 39 respondents, 94.9% were women and 5.1% were men. 27.8% of the producers interviewed were young, while 38.9% was of middle age and 33.3% was old. Households were large and the average family size was 9 persons per household. Each producer managed on average 3 cassava fields per year (2 in first season and 1 in the second season) with an average field size of 1.008ha. Cassava is grown either in mono crop or in association. Groundnut fields (av. Size: 1.81ha) are the main cassava fields while sweet potato and yam fields (av. Size: 0.93ha) are minor cassava fields. 75.7% of producers grew cassava in groundnut fields, while 13.5% grew cassava either in sweet potato or yam fields. Cassava is grown in both the 1<sup>st</sup> and 2<sup>nd</sup> cropping seasons each year. 35.6% of the cassava produced is sold. As mentioned earlier, three categories of producers who grew cassava in 2005 were identified: those who grew few varieties ( $\leq 4$ ), those who grew an average number of

varieties (5-8) and those who grew many varieties (>8). 28.2% of the respondents grew few cassava varieties, 46.2% grew an average number of varieties and 25.6% grew many cassava varieties. Close to 50% of the respondents grew on average 5-8 cassava varieties. The average number of cassava varieties grown was seven. There is no significant difference in the number of cassava varieties grown by all categories of farmers. All those who grew many (> 8) cassava varieties were women. The two men who grew cassava were either in the group of those who grew few or an average number of varieties.

Those who grew few cassava varieties were either young or old while a greater proportion of those who grew over four cassava varieties were of middle age. There was no significant difference in the ages of those who grew an average number of cassava varieties in Koudandeng.

**Table 1: Number of Cassava Varieties by Age of Farmer**

| Age (years)      | ≤ 4 Cassava Varieties | 5- 8 Cassava Varieties | > 8 Cassava Varieties | X <sup>2</sup> |
|------------------|-----------------------|------------------------|-----------------------|----------------|
| ≤ 40 (N = 10)    | 50%                   | 40%                    | 10%                   | 0.158          |
| 41 – 55 (N = 15) | 6.7%                  | 53.3%                  | 40%                   |                |
| 56 – 75 (N = 14) | 35.7%                 | 42.9%                  | 21.4%                 |                |

Source: Fieldwork, May 2005

The index of saliency was used to measure the salience level of the different cassava varieties freelisted by farmers, because it takes into consideration the frequency and position (order) of mention of each variety. It is assumed that the cassava varieties mentioned first and most often are more salient and therefore more important to the individual farmers, as compared to the varieties mentioned last and least often. The proportion of farmers growing or not growing each cassava variety further confirmed this assumption (table 2). The formula used to calculate the index of saliency is that proposed by Jerry Smith (1993) and adopted by Stephen P. Borgatti (1996) as such:

$$S_j = I r_i/n_i; S_j = nr_j/n_i$$

Where:  $r_j$  = position of item  $j$  in the list and

$n$  = number of items in the list.

The overall saliency index is the average of the saliency index for each item across informants.

Analysis of male and female cassava farmers' individual freelists of the different cassava varieties shows that twenty-seven different cassava varieties exist in Koudandeng (see table 2). Women grew all the twenty seven varieties, while men grew only twelve suggesting that women are the main custodians of cassava genetic diversity in this village. On average, each farmer can name nine or ten varieties. The correlation in responses between individual informants ranged from – 0.11 to 0.50 (not shown) and reflects the extent to which each term (varietal name) correlates with some cultural truth.

**Table 2: Freelist of Cassava Varieties Known in Koudandeng**

## Smith's S

| Varieties                           | General | Men   | Women |
|-------------------------------------|---------|-------|-------|
| 1 FONCTIONNAIRE                     | 0.732   | 0.667 | 0.736 |
| 2 MBOKANI                           | 0.648   | 0.333 | 0.665 |
| 3 6MOIS (MEVINA) AMERE              | 0.399   | 0.220 | 0.409 |
| 4 IKWEMI                            | 0.486   | 0.871 | 0.465 |
| 5 MINTOLE MINKO                     | 0.532   | 0.409 | 0.538 |
| 6 MENYO MBANDJOCK                   | 0.489   | 0.727 | 0.476 |
| 7 MUANE MOU                         | 0.503   | 0.364 | 0.511 |
| 8 6MOIS (MEVINA) DOUX               | 0.230   | 0.523 | 0.214 |
| 9 MENYO LOCAL                       | 0.233   |       | 0.245 |
| 10 NTANGNE                          | 0.235   | 0.182 | 0.188 |
| 11 MEKOUGHE                         | 0.135   |       | 0.142 |
| 12 SANEGAI                          | 0.135   | 0.318 | 0.125 |
| 13 MANIOC PATATE (JAUNE OR MEBOURA) | 0.042   | 0.045 | 0.042 |
| 14 GABON (FONCTIONNAIRE II)         | 0.055   |       | 0.058 |
| 15 IRAD                             | 0.022   | 0.091 | 0.018 |
| 16 MEKOUGHE CONGO                   | 0.024   |       | 0.029 |
| 17 ZAYABO AYI MADJE                 | 0.023   |       | 0.024 |
| 18 APOBA MOU                        | 0.017   |       | 0.018 |

|    |                      |       |       |
|----|----------------------|-------|-------|
| 19 | ATANGHAI             | 0.019 | 0.020 |
| 20 | NKODUMA              | 0.002 | 0.002 |
| 21 | NDONGSOME            | 0.006 | 0.007 |
| 22 | OBALA                | 0.003 | 0.003 |
| 23 | ZAMA                 | 0.026 | 0.027 |
| 24 | MOUNG ELIGEDJA MANGA | 0.013 | 0.014 |
| 25 | BATOURI              | 0.019 | 0.020 |
| 26 | IRAD LOCAL           | 0.009 | 0.009 |
| 27 | MEBOURA MINYEMBO     | 0.008 | 0.009 |

The difference in the order of salience of the same cassava varieties between men and women reveals the gender differentiation in the degree of importance of the different cassava varieties grown in this locality. The gender differentiation of saliency varies according to the variety. For example, in table 2, while the fonctionnaire variety is the most salient among women, it ranks third to ikwemi and menyo mbandjock in the case of male producers. Women, who are the main marketers of cassava, place greater emphasis not only on yield and food security qualities, but also on the marketing qualities of the different cassava varieties in their evaluation and classification processes. Male producers' evaluation criteria are based more on yield qualities and palatability (taste, colour) qualities to a lesser extent.

Some cassava varieties may appear lower down the saliency index table not because they were mentioned last, but because they were grown by one or two producers in 2005 and thus were not common in the locality. This is the case of those varieties that appeared between the 18<sup>th</sup> and 27<sup>th</sup> position in table 2.

Analysis of table 3 shows that, the most salient cassava varieties were also the most commonly grown by male and female farmers, while the least salient ones were the less commonly grown. The relative importance attached to each cassava variety by men and women corresponds to their varied socio-cultural, economic, subsistence and agro-ecological needs, interests and priorities. These varied needs are translated into their varietal selection practices, which determine the decision on whether to grow or abandon the variety.

**Table 3: Saliency of cassava varieties by proportion of farmers who grew or did not grow in 2005**

| Cassava varieties freelisted | Smith's S | % grown 2005 | % not grown 2005 |
|------------------------------|-----------|--------------|------------------|
|------------------------------|-----------|--------------|------------------|

|                               |       |     |      |
|-------------------------------|-------|-----|------|
| fonctionnaire                 | 0.732 | 97% | 3%   |
| mbokani                       | 0.648 | 90% | 10%  |
| mintole minko                 | 0.532 | 51% | 41%  |
| muane mou                     | 0.503 | 64% | 36%  |
| menyo mbandjock               | 0.489 | 59% | 41%  |
| ikwemi                        | 0.486 | 72% | 18%  |
| six mois amère (mevina amère) | 0.399 | 41% | 59%  |
| ntanghe (bela mpeughe)        | 0.235 | 31% | 69%  |
| menyo locale                  | 0.233 | 21% | 79%  |
| six mois doux (mevina doux)   | 0.230 | 21% | 79%  |
| sanegais (senegalais)         | 0.135 | 13% | 87%  |
| mekoughe                      | 0.135 | 13% | 87%  |
| gabon                         | 0.055 | 8%  | 92%  |
| manioc patate (jaune)         | 0.042 | 8%  | 98%  |
| zama                          | 0.026 | 3%  | 97%  |
| mekoughe congo                | 0.024 | 5%  | 95%  |
| zayabon ayi ma dje            | 0.023 | 5%  | 95%  |
| IRAD                          | 0.022 | 3%  | 97%  |
| atanghai                      | 0.019 | 3%  | 97%  |
| batouri                       | 0.019 | 3%  | 97%  |
| apoba mou                     | 0.017 | 0%  | 100% |
| moung eligedja manga          | 0.013 | 3%  | 97%  |
| IRAD local                    | 0.009 | 3%  | 97%  |
| Meboura minyembo              | 0.008 | 3%  | 97%  |
| ndongsome                     | 0.006 | 3%  | 97%  |
| obala                         | 0.003 | 3%  | 97%  |
| nkoduma                       | 0.002 | 3%  | 97%  |

Source: Fieldwork, 2005.

### **Cassava Varietal Selection Criteria: Reasons for Maintaining Cassava Genetic Diversity**

Male and female farmers have reasons why they either decide to grow or abandon specific cassava varieties. As explained earlier, these reasons which reflect the degree of importance attached to the different varieties are varied according to farmers' multiple needs, interests and priorities which they combine and translated into their everyday practices. Cassava varietal selection is one of such practices where male and female farmers combine a series of desired traits or characteristics, to constitute their selection criteria for their choice of which variety to either grow or abandon. These traits are intertwined in a web of fabric that is peculiar for each male and female farmer. In the case of Koudandeng, male and female farmers' cassava varietal selection criteria could be grouped into five

main categories as perceived by them: i) agronomic characteristics; ii) food security and culinary qualities; iii) use value; iv) marketability qualities of the different cassava varieties; and v) status and cultural identity. There is no clear cut division in these categories. These reasons are most often not considered by formal plant breeders, whose breeding criteria are often based only on yield quality and broad based adaptability to ecological conditions. It is hypothesized that the social processes giving way to biodiversity loss or maintenance is seen to originate in research institutions and policies. Literature highlights the fact that, small-scale diverse food production systems that conserve farmers' diversity of crops are marginalised in agricultural development and research processes, even though the high response of modern varieties used in industrial agriculture are dependent on the genetic variation of farmers' varieties ((Zimmerer, 1988; Badri and Badri, 1994; Shiva 1996; Lang, 1996; Banuri and Jackson, 1996; Moreno-Black, Somnasang & Thamathawan, 1996; Box and Doorman: 1982; CTA/IPGRI: 1992; Eyzaguirre and Iwanga: 1996; Tripp: 1996 ).

### i) Desired Agronomic Characteristics of Different Cassava Varieties

Agronomic characteristics are defined in terms of the cassava crop physiology, production and phenotypic (morphological) traits. Yield qualities, long underground storability and pest and disease tolerance of cassava roots constitute male and female farmers' perception of crop physiology and production traits that are desired for each variety. Cassava being the main staple, which is fast becoming an economic crop of this people, yield quality is an important trait for male and female farmers who eat and sell cassava daily. Farmers with large family sizes who experience low yields hardly will sell cassava. ***“Why should I sell cassava when I have a large family and I send food to my children who are studying in schools in Yaounde? I hardly have enough cassava produce to feed my family”*** replied a female farmer when asked whether she sells cassava. Yield is measured locally by the number and size of tubers produced and the level of root rot. High yields imply that the cassava variety produces many and big tubers per stalk and the tubers do not rot or rot less. The reverse is true for low yields. Farmers therefore perceive yield in terms of the phenotypic characteristics of cassava. Weight is not really used as a measure of yield in the local system of evaluation and classification of cassava. Phenotypic or morphological traits refer to the visible characteristics of the different cassava plant parts, which are perceived in terms of bulking capacity of roots, size of stem and leaf and number of roots per stalk, colour (root, stem, leaf) and structure of the stem. The structure of the cassava plant is important because of the leaves that are harvested and either eaten or sold. Tall less branching varieties do not produce thick leaf canopies and are not very much desired. Cassava is a crop whose tubers can store long underground and this is an important trait since the harvest of some varieties is spread out over a long period as needed. Farmers prefer cassava varieties that do not rot as they stay long underground since this evenly spreads out year round availability of their main staple - cassava. Food habits, ensuring food security within households and market needs are therefore major determinants for the desired agronomic traits during selection of the different cassava varieties to grow.

### ii) Food Security Characteristics of the Different Cassava Varieties

Food security and culinary qualities are those characteristics of the different cassava varieties that male and female farmers perceive in terms of sustaining the family from hunger, palatability when eaten either fresh or processed, and time saving. Maturity age, dry matter content of cassava roots, leaf tolerance to the effect of the dry season (less water availability), and bulking capacity of roots, are the major desired food security traits that are looked for during selection by male and female farmers.

While maturity age is scientifically regarded as an agronomic characteristic of any crop, male and female farmers perceive it as a food security need. They plant both late and early maturing varieties in the same fields, and start harvesting those that mature early first before proceeding to the late maturing ones. This practice does not only avoid risk of crop failure and ensure year round availability of cassava, but saves the household from hunger. Early maturing cassava varieties that have high yields such as “fonctionnaire”, are said to suppress hunger or save the household from starvation. Harvesting these varieties which mature within six to nine months after planting, starts during the lean season when the food stored by households is almost exhausted.

*“I like fonctionnaire because it kills hunger”. “Fonctionnaire is the first variety to be harvested in a crop season, it is good”. “I plant both early and late maturing varieties in the same field, to avoid risk of crop failure and spread out availability of cassava year round”. “I like planting both the late and early maturing cassava varieties because I need money at all times. I harvest and sell the early maturing varieties like fonctionnaire, six mois doux (sweet), six mois amère (bitter), and menyò mbandjock, while waiting for the late maturing varieties to mature in a years’ time”* comment most male and female farmers when questioned why they plant many varieties.

*“Early maturing varieties like fonctionnaire, menyò mbandjock and mevina (six mois) doux and amère kill hunger and I like them”* retorted another woman who plants eleven cassava varieties.

While early maturity might be viewed as an important trait for some cassava varieties, it is used as a reason to abandon others especially those that mature early but rot early and rapidly. This is the case of mevina amère also called six mois amère (six months bitter) and mevina doux also called six mois doux (six months sweet). These varieties that rot quickly and highly are seen as an important cause of cassava theft, which is so rampant in the fields of farmers who plant different cassava varieties on specific portions of the field.

*“I plant cassava varieties on different portions of my fields and so do not like planting early maturing cassava varieties because, I will harvest them early and portions of my fields will be left empty and this will invite theft in my fields. Moreover, the early maturing varieties bring hunger because, they rot quickly and one has to harvest them early and fast”* replied farmer X when asked why she plants few cassava varieties.

Avoidance of theft in fields by not planting specific early maturing varieties with high root rot that require early and rapid harvest, is an enabling factor for the loss of cassava genetic diversity among some categories of farmers. There is a greater tendency for the maintenance of cassava genetic diversity among male and female farmers, who grow both early and late maturing varieties as compared to those who grow only late maturing varieties.

Female farmers in particular, have high regards for high dry matter content of different cassava varieties because processing does not shrink the paste of these varieties. Varieties with low dry matter content and thus have much water (watery), shrink the cassava paste as a result of squeezing or pressing out excess water during processing. ***“It rises couscous, it rises the paste, it hardens the paste, it rises baton, it is good for baton and couscous processing”*** are some of the typical expressions of women farmers. Cassava processing is mainly done by women in this village. Men who grow cassava employ the labour of women to process.

*“Ikwemi, muane mou, mevina amère, mintole minko, and mekoughe congo are very good for baton and couscous. They rise in the paste and give much baton or couscous. They have less (low) water”. “The leaves of Muane mou, menyò mbandjock, and ikwemi taste good in kwem”. “The leaves of fonctionnaire give much kwem” continued more women in their explanation to the reasons why they grew specific cassava varieties*

*“I do not process or sell cassava. My wife does it for me”. “Even if I grow cassava, I cannot process nor go to the market to sell. It is a job meant for women”* replied some men who were questioned on their gender divisions of labour in cassava.

Previous studies (Nchang Ntumngia, 1997) of male and female cassava farmers' knowledge systems in Malende, Cameroon, highlighted the importance of dry matter content of the roots of different cassava varieties in gari (aka tapioca) processing. All the varieties rated for high dry matter content and good for processing into couscous, baton or gari are local varieties in both the Malende and Koudandeng studies. Varieties introduced by research such as IRAD, meboura also called manioc jaune or manioc patate (yellow, potato cassava) were rated lowly for this characteristic. This explains why they were among the least salient and least cultivated varieties (table 3).

Taste, colour of boiled roots and processed products, fiber content of roots, root mealiness (cooking ability), and texture of processed products constitute palatable characteristics also called culinary qualities, that are desired by both men and women. Apart from yield qualities that have a high salience among men and women farmers, taste is the most salient selection criteria for women and the second most salient to yield quality for men (see table 2). Taste is expressed in terms of good and sweet aroma, and varieties are abandoned because of their poor taste, as it is the case with the variety called meboura also called manioc patate or manioc jaune (sweet potato or yellow cassava).

***“Mbokani has a sweet salty taste and can be eaten raw”. “Menyo mbandjock has a very good taste and it is called manioc de table (cassava for the table)”. “It tastes good in kwem. Its leaves produce good quality kwem”.*** Sweet varieties have a high preference among farmers as compared to bitter ones, because they can be boiled and eaten fresh as well as processed. It is good to boil and eat is the common expression among men and women farmers. Also, varieties that are very bitter even after processing, are neglected such as mevina amère also called six mois mere (six months bitter), mekoughe, mekoughe congo, mintole minko, and senegalais commonly called sanegai. These varieties rated lowly not only at the level of salience among farmers but also at the level of the proportion of male and female farmers growing them (tables 2 & 3). Preliminary survey of cassava producing households in 2002 highlighted the fact that, out of the sixteen different cassava varieties grown in Koudandeng, eleven were sweet and five were bitter. The same comparative analysis in Malende revealed that out of the ten varieties that were grown, eight were bitter and two were sweet. Malende farmers process more of gari (aka tapioca) which requires a soar taste to be qualified as being of good quality. Bitter cassava varieties, according to the local evaluation and classification of Malende farmers, produce a soar taste and thus good quality gari as compared to sweet varieties. Twenty two out of the twenty seven cassava varieties identified in this study, were sweet while five were bitter varieties. Palatability (which depends on the food habits and income needs of a community) is an important determinant of the loss or maintenance of cassava genetic diversity. While some characteristics are of higher value to some farmers and communities, they may be of a lower value to others.

Male and female farmers' food habits and their production objectives are major determinants of their choices of which cassava variety to grow. Cassava as the main staple in Koudandeng, is either boiled

and eaten fresh or processed and prepared into a meal. It is most often eaten with a vegetable soup as the accompanying relish. Pounded cassava leaves constitute the main vegetable source. Cassava is grown mainly for household consumption with surpluses sold and 35.6% of cassava produced was sold as can be seen in table 4.

Table 4: Cassava Sales versus Consumption

| Mean proportion of cassava sold in Koudandeng |       |            |         |                |
|---|-------|------------|---------|----------------|
| Koudandeng                                    |       |            |         |                |
| Men   | Women | Mean total | F- test | R <sup>2</sup> |
|   |       |            |         | Sig. 0.05      |
| 56.7%   | 34.4% | 35.6%      | 0.019   | - 0.019        |

Source: Fieldwork: Household census, 2002

Sweet cassava varieties included: muane mou, menyo mbandjock, menyo locale, fonctionnaire, gabon (also called fonctionnaire locale), mbokani, meboura (manioc jaune or manioc patae), ntanghe (bela mpeughe), mevina doux (six mois doux), ikwemi, sanegais (senegalais), IRAD locale, batouri, moug eligedja manga, zama, ndongsome, nkoduma, obala, atangai, zayabo ayi mad dje, meboura minyembo, and apoba mou. Mekoughe, mekouge congo, mintole minko, mevina (six mois amère) and IRAD were bitter varieties.

There is a close relation between good (sweet) taste and boil and eat qualities of the roots of different cassava varieties. ***“I do not have time to process baton or couscous. The sweet varieties are good because my children can just boil and eat, even without any sauce”*** retorted Mrs. X when questioned why she grows mostly sweet varieties. ***It is good to boil and eat. It tastes good. It has a very good taste”*** are some rhetoric responses given by male and female farmers. Female farmers' busy time schedule and workload make them prefer planting the sweet varieties, whose roots are easily boiled and eaten, to the bitter varieties that must be processed before eating. Cassava root mealiness, is therefore an important quality and farmers measure it in terms of cooking time and low fiber content. Varieties that are good to boil and eat or to eat raw, should cook quickly and well and be soft to chew. ***“It cooks quickly, it cooks well, it is very soft to chew”*** are dominant expressions of both male and female farmers with respect to specific cassava varieties such as: fonctionnaire, mbokani, muane mou, menyo mbandjock, ntanghe (bela mpeughe), meboura (manioc patate, manioc jaune), meboura minyembo, menyo locale, moug eligedja manga, sanegai (senegalais), and mevina doux (six mois doux). The first three varieties indicated in tables 2 and 3, were rated highly in order of importance with respect to saliency level and the proportion of male and female farmers who grew them in 2005. Thirty minutes is the average cooking time required for each variety especially for women, who have to prepare a rapid meal for their households early in the morning and after returning late from the fields. While women, who are mainly involved with food preparation evaluate the root mealiness of the different cassava varieties in terms of cooking time and fiber content, men evaluate it more in terms of fiber content.

The texture of meals made out of processed cassava products (baton and couscous meals) is another important determining factor, alongside root dry matter content, for the classification of the different

cassava varieties as being good for processing into couscous or baton. Good quality couscous or baton should have an elastic texture when cooked. The mintole minko cassava variety which ranks 3<sup>rd</sup> in order of salience and 5<sup>th</sup> in order of percent of male and female farmers who grew it in 2005, is highly reputed for this quality (tables 3).

Cassava leaves are not only eaten locally, but are also sold in the neighbouring town markets of Obala, Nkometou and Yaounde. In cassava leaf eating regions (Centre, South, East provinces of Cameroon), the pounded cassava leaves that are prepared into a soup constitute the main vegetable source called “kwem”. Farmers therefore evaluate their cassava varieties in terms of the quality of their leaves when processed into kwem. Also, cassava varieties whose leaves are tolerant to the effects of the dry season during which there is low water availability and green leafy vegetables are scarce, are maintained even when they have low yields. The varieties called mbokani and ikwemi were identified as having leaf tolerance to the effects of the dry season, and this is an important criterion that makes mbokani rank 2<sup>nd</sup> to the fonctionnaire variety both in terms of salience (Smiths’S: 0.648) among male and female farmers and the percent (90%) of farmers who grew it in 2005 (table 3). In order of salience, the ikwemi variety ranks 1<sup>st</sup> among male producers and 5<sup>th</sup> among female farmers, as well as ranks 3<sup>rd</sup> (72%) in order of those who grew it in 2005.

### iii) Use Value of Different Cassava Varieties

Cassava, as a staple crop, has many functions as influenced by the food habits and belief system of the Koudandeng community. All the plant parts (leaves, stem, and tubers) have specific use values that respond to the needs, interests and priorities of individual male and female farmers. The general belief that witches and wizards use spiritual means to pull out yields from their neighbours fields, makes the stem of specific varieties such as apoba mou highly desired by female farmers for their anti wizard/witch actions in cassava fields. This variety which is grown in Sa’a (a neighbouring village) is being newly introduced into the village. The cassava stem is therefore not only useful for vegetative propagation, but also for spiritual protection of farmers’ fields.

Gift giving, is an important system of seed exchange in this region. Women grow specific cassava varieties to maintain their status and social relations, by giving as gifts or sharing among kin and friends. Koudandeng cassava farmers form fabrics and webs of social relations through which knowledge, information and cassava varieties are exchanged. Marriage between men and women of the Esselle Clan to which the people of Koudandeng belong, is a taboo and so the movement of seed and plant material is highly developed among kin (especially those into which women are married) and friends especially for married women, who originate from different clans. Mothers-in-law, sisters-in-law, co-wives and maiden kin are the most important cassava plant exchange networks for these women who are considered strangers (“beloa” in the Etone language) and do not have seeds of their own. Jane Guyer (1977) stated that women in the Beti tradition were used as a source of exchange of goods, services and money in the pre-colonial trade era. Different varieties and types of crops were exchanged through marriage, which was an important means of building alliances between clans along the trade route from the Beti ethnic group (which covers the south and centre provinces) to Douala (in the Littoral province), the main seaport. While women bring along specific cassava varieties into marriage, they also give good quality varieties that do not exist in their village of origin as gifts to their parents and kin. ***I grow the ikwemi cassava variety more specifically, to give as gifts to my parents and kin who are not residents of this village***” explained Mrs. X in response to why she

grows the different cassava varieties. Mothers-in-law, in their desire to ensure and maintain a certain standard and quality of the staple meal served to their sons and grand children, offer specific cassava varieties as gifts to their daughters-in-law. The existing cassava exchange networks identified in this study include: i) between co-wives (either married to: same husband, husbands' brothers, cousins) who get cassava from their different sources, ii) between daughters-in-law and mothers-in-law (husbands' mothers, wives of husbands' uncles), iii) between sisters-in-law and wives, iv) between parents/mothers and daughters, v) between sisters, vi) husband and wife's sister, vii) between son and step mother, and viii) between researchers/extensionists and farmers.

The two male farmers, who grew cassava in 2005, identified more the research extension exchange network as an important link, through which they obtain the cassava varieties that were disseminated by research. ***“I introduced into this village the manioc jaune (yellow cassava) also called manioc patate (potato cassava) or ‘meboura’ in the Etone language. “I got the cuttings from the IRAD/ ICRAF staff, who works with the ICRAF project at Nkolfepe”. “I got a few stems of the IRAD cassava variety from the IRAD station at Nkolbisson when I attended a seminar on cassava production”*** explains Mr. A. when questioned on the source of his cassava varieties. While men go out in search of the cassava varieties that meet their needs through the formal institutions, women expect the government to come to their aid at home while being more active within their local and informal networks. ***“I learnt of the IRAD cassava variety through the village extension worker who worked in this village some three years ago because, I am the president of the Ayili farming group”. “Madame, what is the end result of your work here? Are you going to give us new plant material? Let the government do something about our lack of plant material”*** exclaimed women respondents. This sit-and-wait attitude of most women who are the main cassava producers, limits their access to cassava varieties that have been developed by research and therefore their knowledge of these varieties. This may explain why only few of the HYV cassava varieties introduced by research are grown in this village.

As food, cassava leaves and roots are eaten within households and during ceremonies and rituals such as religious feasts (baptism, confirmation, 1<sup>st</sup> Holy Communion, marriages), deaths, traditional marriages, births, and political party and other feasts. Female farmers evaluate and select the different cassava varieties in terms of their taste, colour and dry matter content which are good qualities for the kwem, baton and couscous that are processed. Good quality kwem (pounded cassava leaves) should have a good taste and white colour when prepared into a vegetable soup. The Fonctionnaire, muane mou, ikwemi, menyo mbandjock, ntanghe, and mevina amère (six mois amère) and gabon are classified as varieties that not only produce good quality kwem, but also produce much kwem when processed. Apart from the variety called gabon, all these varieties rate highly in terms of salience and percent farmers producing them (table 3). Canopy formation is therefore an important selection criterion for these varieties, which are planted horizontally while placing two or three cuttings on one spot to favour the sprouting of many shoots and therefore, a thick canopy a few months after planting. This horizontal planting and staking method also called planting on flat method, is typical for most forest regions in Cameroon especially those that eat cassava leaves. A comparative analysis of previous studies carried out in Koudandeng and Malende (R. Nchang Ntumngia: 1997; 2002), reveals a difference in the farmers' cassava staking methods that account for high or low canopy formation. While many cuttings are planted on flat and on one spot in Koudandeng, Malende farmers plant one cutting per spot and slantingly at an angle of 45°, which reduces the number of shoots and roots formed and therefore a smaller leaf canopy in this case. There seem to be a close association between the level of shade provided by the leaf canopy, the cassava root rot disease and the low or

high yield qualities of the different varieties. While Malende farmers prefer tall branching and single stem cassava varieties that produce smaller canopies to check against the root rot disease, single stem varieties are almost absent in Koudandeng where the branching varieties are predominant. Leaf harvesting, reduces the amount of available leaf surface for photosynthesis to occur and therefore reduces cassava root bulking capacity (Interview with IITA Agronomist at Nkolbisson, Yaounde). Further more, thick leaf canopy provides greater shade under the cassava plant and this creates a micro-environment with favourable conditions for the microbes responsible for root rot disease. Malende farmers also prefer the tall branching and uni-stem cassava varieties to check against the cassava root rot disease (Nchang Ntumngia 1997). Cassava root rot disease is a common problem faced by cassava farmers in the forest regions of Cameroon, especially in the leaf eating centre, south and east provinces.

Cassava tubers are either eaten raw, boiled and eaten or processed. As compared to some regions where only bitter cassava varieties are processed, both sweet and bitter varieties are processed in Koudandeng, which is influenced by their food habits and local evaluation and classification systems. The most common processed products are baton and couscous. Baton is a fermented cassava paste that is wrapped in the leaves of a wild plant and tied with fiber made out of raffia palms. It is eaten boiled. Couscous is a dried fermented cassava paste that is ground into flour before cooking. Cassava varieties are selected for their good quality in couscous and baton. The tubers of cassava varieties selected for processing, should produce baton and couscous that are white in colour, have an elastic and sticky texture when cooked, and have a good taste and sweet aroma. They should also have low fibre and high dry matter content, which do not shrink the cassava paste when processed. In all, nineteen out of the twenty seven cassava varieties existing in the village are maintained for their quality in baton and couscous processing. These include: Fonctionnaire, gabon, batouri, atangai, ikwemi, IRAD, IRAD locale, mbokani, mekouge, mekouge congo, menyo locale, menyo, mbandjock, mintole minko, muane mou, nkoduma, ntanghe (bela mpeughe), mevina amère (six mois amère), mevina doux (six mois doux) and sanegais (senegalais).

Beigner (a mixture of cassava and banana paste that are fried as round balls) is another form in which cassava is eaten even though it is not common in this region.

#### iv). Cassava and its Marketability Characteristics

Cassava is not only important as a staple crop and in alliance building through marriage and other social networks, but also as a source of income for women who are the main marketers of cassava in all its forms. Cassava stems are not sold but its fresh roots, leaves and processed products are sold in this region. Women farmers select specific cassava varieties to meet their market needs, which are measured in terms of ease of marketability (root shape and size, skin colour of roots and processed products), market incentives (price, market demand), suitability for processing into different products (dry matter content, texture of boiled products), and taste and mealiness of fresh roots and processed products. Cassava varieties that are selected for the market, should therefore meet most of these qualities if the women producers have to stay competitive in the market and increase their income in cassava. Root size, shape and skin colour and the colour of processed products, which are measures of the ease of marketability, determine the demand and price for the different cassava varieties in the market. Big long or round roots attract customers, and this also explains why the fonctionnaire variety ranks first in order of salience and proportion of those growing it in Koudandeng. The red skin of fresh cassava roots is an indication of good taste, sweet aroma and less water content of specific cassava

varieties, which is also an indication that they are good to boil and eat fresh. Menyo mbandjock, menyo locale, ntanghe (bela mpeughe), meboura minyembo and obala varieties are recommended by farmers and consumers for their red skin colour. *“Menyo mbandjock, fonctionnaire and mbokani have good market prices. They sell easily, have big (long, roundish roots), have a good taste, and attract customers”* *“Menyo Mbandjock and fonctionnaire rot much but I like them”*. *“The red skin colour of menyo mbandjock attracts customers and it is called manioc de table (cassava for the table)”*. *“Mbokani resembles mekougue in shape and skin colour, so customers mistake it for mekougue and do not buy much of it, but I like it because my children eat it”*. *“Fonctionnaire rots very fast and when you do not harvest all its roots at once, the remaining roots become bitter, but it is good, it sells well, it attracts customers and commands a high market price”* explained women when questioned why they grow specific cassava varieties.

Of all the marketability measures, colour is a very important trait in farmers' marketing strategies because it not only attracts customers because it is appetizing, but also because it is an index for the length of underground storage of cassava roots. Fresh roots of some cassava varieties that store longer than two years underground, produce darkish, brownish or cream white colour baton and couscous. Some varieties such as mevina (six mois amère) and mevina doux (six mois doux) that mature at six months after planting are greater victims of this criterion. Long underground storability measures the level of toxicity and palatability of fresh roots and processed products. The level of toxicity caused by high cyanide content of roots increases with length of storage underground. The roots of some varieties (fonctionnaire) become bitter when all are not harvested at once. Fresh root woodiness and crispy texture of baton, couscous and fresh roots also increase with underground storability.

The market incentives for women farmers who sell cassava are determined not only by the visible qualities that facilitate sales, but also by the dry matter content and the yield qualities of some varieties. As explained earlier, dry matter content of fresh roots signifies low water content, which does not shrink the cassava paste when processed, thus giving much baton and couscous that is sold. High yielding cassava varieties that have the marketability characteristics also constitute good market incentives for women farmers.

Cassava varieties that command high market demand and prices are those that meet the characteristics mentioned above. They should produce white colour couscous and baton and fresh roots when boiled; should have roots that are red in skin colour and big long or round in size; should have good taste and sweet aroma, and should have high dry matter and low fiber content of fresh roots.

Agronomic characteristics (crop physiology and morphology), food security and culinary qualities and use values all contribute to attaining the marketability values of specific cassava varieties, and thus the market incentives for women farmers to earn high income in cassava.

#### v). Status and Cultural Identity

In as much as farmers select cassava varieties that meet their agronomic, food security, use value and income needs, they also strive to maintain their status and cultural identity with specific cassava varieties. Cassava varieties that command high market demand and price are very much preserved

because they permit women farmers to obtain high status from being rich. The variety called fonctionnaire, which is the most salient (Smith's S: 0.732) and commonly grown (97% of farmers), is viewed by women as a source of earning high income which equates them to the government civil servants (fonctionnaire in the French language) who earn a monthly salary and are rich.

Female farmers' need to identify themselves with their cultural heritage is seen in their desire to maintain cassava varieties that were grown by their fore parents. The need to maintain continuity of specific varieties through generations is important if only the variety has other desired traits. While one of the reasons for growing apoba mou (newly introduced into the village) and muane mou (ranks 4<sup>th</sup> in terms of salience and percent of farmers growing) is because they were grown by their fore parents, grandparents and parents, female farmers often evaluate these varieties as having high yields, less root rot and long underground storability and therefore maintain them. On the other hand, mekouge, mekouge congo and menyo locale varieties that are classified as bitter, having low yields and high root rot stand the risk of being abandoned even though they were grown in the olden days. In 2005, 5% of female farmers grew mekouge congo, 13% grew mekouge and 21% grew menyo local (table 3).

Mothers-in-law, in their desire to ensure and maintain a certain standard and quality of the staple meal served to their sons and grand children, offer specific cassava varieties as gifts to their daughters-in-law. This enables the maintenance of the status of individual families that are seen as custodians of good quality cassava and cassava products.

Baton is called "ndeng" in the local language. ***"Koudandeng means big long baton. In the early times, the people of Koudandeng produced very good quality, big and long baton that was likened to the python which is also called "ndeng" – the totem spirit of the Esselle clan of the Eton tribe to which the people of Koudandeng belong. This village then gained its name from the quality of the baton that it produced"*** explained an elderly woman in response to why Koudandeng produces so many batons. Baton is the French appellation for 'ndeng' which means a cane, a stick or a whip. Koudandeng is still highly reputed for the quality and quantity of its baton in the town markets of Obala, Nkometou and Yaounde. Its baton is exported to Congo – a neighbouring country to Cameroon in the Central African sub region. It is believed that the ancestors of the Eton tribe to which the people of Koudandeng belong migrated from the Sanaga region in the Mbam Division of the Centre Province, while crossing the river Sanaga on the back of their Totem (tutelary spirit) snake- the python called "Nganmedja". The quality of baton is likened to their deity. In order to maintain this reputation and using the comparative advantage of their produce in the markets to stay competitive, and increase their chances of earning higher income in the outlet markets for baton, female farmers select and grow specific cassava varieties for their quality in baton production.

## Conclusion

Freelisting and ethnographic data at the individual level were used to assess the diversity of cassava varieties among male and female cassava producers and to document the link between their decision making frameworks and practices in the selection of cassava genetic diversity. The case of male and female cassava farmers of Koudandeng village in the Obala administrative sub division of Cameroon was used in this study. This approach questions the extent to which government policies that promote major shifts in traditional production systems to more intensive production systems for the market,

where high yielding cassava varieties are bred and disseminated, affect cassava genetic diversity in the light of increased commoditisation of cassava. In an attempt to understand this paradigm shift, further questions raised were: why do farmers choose to maintain or abandon specific cassava varieties; and does the introduction of high yielding cassava varieties (HYV) and increased cassava commercialisation necessarily lead to the loss of cassava genetic diversity. From these analyses several conclusions can be drawn.

Male and female farmers' choices to maintain or lose cassava genetic diversity are oriented by their socio-cultural, economic, subsistence and agroecological needs, interests and priorities. These enable them to translate a combination of desired traits in different cassava varieties into their everyday cassava varietal selection practices. This interwoven web of fabric into which these farmers weave in their decision making frameworks, cannot be clearly understood without a critical intra-species level evaluation of the characteristics of the different cassava varieties that farmers grow or neglect, a point which has been missed out in agricultural research and development policies. These combinations of desired traits that meet their income, food security, culinary, and agronomic needs and their interests to gain status and maintain their cultural identity in cassava, is based on male and female farmers' local evaluation and classifications systems. Farmers' local evaluation and classification of the different cassava varieties that they grow is their knowledge of these varieties which is translated into their everyday varietal selection strategies and practices. Such local knowledge and practices that vary across informants must be clearly understood, documented and utilised in the light of increasing cassava production and commercialisation and farmers' income in cassava. Agricultural development in cassava, which is the government's objective, can only be fostered if the link between male and female farmers' local evaluation and classification of the different cassava varieties and their varietal selection strategies and action plans is understood and utilised.

In strife to meet their individual needs, interests and priorities, male and female cassava farmers either maintain or abandon specific cassava varieties and this most often lead either to a loss, maintenance or increase in cassava genetic diversity. Available evidence from the analysis of the freelisting data of the different cassava varieties shows that, the introduction of HYVs developed by research into farmers' milieu and increased commercialisation of cassava does not necessarily lead to a loss but to an increase or maintenance of cassava genetic diversity as the literature specifies. Male and female farmers maintain both local and research introduced HYV cassava if these meet their priorities. Twenty seven different cassava varieties were identified in this study. However, while cassava genetic diversity may depend on farmers' needs, interests and priorities, gender divisions of labour of the producer greatly determines the level of genetic diversity maintenance or loss. Women as main growers, processors and marketers of cassava maintain all the twenty seven cassava varieties, while the few men involved who are mainly growers maintain only twelve varieties. The knowledge of women, who therefore are the custodians of a wider genetic diversity of cassava as compared to men, should be documented and utilised in cassava development strategies and action plans.

Prioritising farmers' reasons for maintaining or abandoning specific cassava varieties and therefore their local evaluation and classification of the different cassava varieties in agricultural research and development, will most often lead to a loss of cassava genetic diversity instead of an increase or maintenance. The issue is not that of the introduction and promotion of research HYV cassava among male and female farmers, but that of a neglect of their knowledge in selection and management of the cassava varieties that they grow in agricultural research and development. Limiting cassava research objectives to broad based agroecological adaptability and high yields, misses out on all or most of the

important factors that lead to an increase, maintenance or loss of genetic diversity and therefore increased cassava production. Farmers tend to neglect the research HYV cassava if these do not meet their local classification and evaluation systems. Moreover, yield quality is not only a function of cassava root bulking capacity, but also a function of each cassava variety's tolerance to the cassava root rot disease, root long underground storability, maturity age, and root water or dry matter content of the different cassava varieties.

Farmers' reasons for growing the different cassava varieties are region specific. The specificity of each region (agro-ecologies, food habits, economic needs, use values, status and cultural identity) should be considered so as to develop and disseminate cassava varieties that respond to regional needs and niches.

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