Germplasm selection of small-holder cassava farmers in Delta State, Nigeria

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ABSTRACT
The study evaluated criteria for selection of cassava cultivars grown by small-holder farmers in Delta State of Nigeria. The results showed that in addition to a local variety, "Opotopo", most farmers preferred the two improved cultivars, TMS 30527 and TMS 30555, out of four that were distributed by extension workers in the State. The two improved cultivars were selected by high yield, early maturity, and resistance to pests and diseases. The farmers were unwilling to compromise the use of the local variety because it is less fibrous and, therefore, suitable for the traditional 'fufu' dish, though low yielding and also disease and pest susceptible.

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RÉSUMÉ
IGBOKWE, E. M. : *Sélection de germeplasme par les petits cultivateurs de manioc dans l'Etat de Delta du Nigéria.* L' étude évaluait les critères pour la sélection des variétés de manioc cultivées par les petits cultivateurs de l'Etat de Delta du Nigéria. Les résultats révélaient qu' en plus de la variété locale "Opotopo" la plupart des cultivateurs montraient une préférence pour les deux variétés améliorées, TMS 30527 et TMS 30555 sur les quatre qui étaient distribuées par les vulgarisateurs dans l' état. La sélection des deux variétés améliorées était basée sur le rendement élevé, la maturation tôt et la résistance aux insectes ravageurs et aux maladies. Les petits cultivateurs ne voulaient pas accepter un compromis sur l'utilisation de la variété locale parce qu' elle est moins fibreuse et, pour cette raison, appropriée au plat de 'fufu' traditionnel malgré son rendement bas et sa prédisposition à la maladie et à l' insecte ravageur.

Introduction

Cassava is an important carbohydrate staple, supplying over 70 per cent of the daily calorie intake for over 50 million people in Nigeria (NRCRI, 1986). The fibrous root is processed into several foods and has potential for use in livestock production and industry.

In 1993, output of cassava in Africa increased by 14 per cent primarily in Nigeria (averages: 16.6 million tonnes in 1988-90 to 31.1 million tonnes in 1993) where production reached a record level after a significant expansion in plantings and the continued adoption of pest-resistant high-yielding varieties (FAO, 1994). In Nigeria, this increase in production came from small-holder farms most of which were less than 2 ha per holding.

The major constraints to cassava production are identified as low yield of landraces, disease and pest attack, and inadequate supply of production inputs (IITA, 1992). The first two biological factors were tackled at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, by developing improved varieties.

Specifically, from 1971, efforts were made toward developing high-yielding clones which were also resistant to cassava bacteria blight (CBB), African cassava mosaic virus (ACMV), cassava mealybug (CM), and cassava green mite (CGM). By 1986, ACMV and CBB had been successfully controlled with the breeding of resistant varieties (IITA, 1992). These varieties have been reported to yield well, have good consumer acceptance, and are low in cyanogenic glucosides. The varieties transferred and grown by farmers include the tropical manihot series

(TMS) 30572, 30555, 4092, and 4(2) 1425. They have been estimated to produce a mean yield of up to 14.75 t/ha and a range of 1.25 to 67 t/ha (Nweke, 1996). It is also estimated that 60, 35 and 45 % of the cassava land area in the humid, sub-humid and non-humid areas, respectively, in Nigeria are planted with IITA varieties (Nweke, 1994, 1996).

Traditionally, most farmers obtain planting materials solely from their production fields and neighbours' plots, and sometimes from marketing middlemen (Otim-Nape, Bue & Bagume, 1994; Nweke, 1996; Igbokwe, 1996). This process of obtaining cuttings may seem arbitrary and, therefore, may lead to farmers growing improved varieties and landraces that may not be adapted to their farm conditions and do not meet their food needs. However, there is some evidence that small-holder farmers have knowledge of, and select varieties and landraces by known criteria.

This study, therefore, explored the knowledge of cassava farmers in cultivar selection. The results could provide information which would be useful for classifying germplasm stored in cassava genebanks. Such information can be integrated into breeding programmes and at the same time used to develop new varieties that could meet the desires of the farmers (van Dorp & Rulkens, 1993).

Materials and methods

The study was conducted in Delta State of Nigeria in 1997. Out of the three agricultural zones in the State, namely, southern, central and northern zones, the northern zone was randomly selected. Four local government areas (LGA) randomly selected were Aniocha South, Ika North East, Oshimili North, and Ukwuani. From each LGA, one community was selected and the households listed with the assistance of extension agents. From each community, 15 households were randomly selected, giving a sample size of 60 households. All heads of households and other adult members were interviewed, giving a sample size of 108. A search of literature showed that farmers' decision to adopt or reject particular clones or landraces is influenced by various agronomic and product-quality criteria. Secondly, the ease of obtaining cassava planting materials indicated that acceptability of varieties is the basis of selection. Thus, these criteria (Fig. 1) formed the checklist for collecting data through informal interviews.

The study relied on rural rapid appraisal (RRA) (McCracken, Pretty & Conway, 1988) methods which include informal interviews, focus-group discussions, field observations, and farmer-led collection and identification of grown cassava varieties. Some cassava traders and processors were also interviewed within the study area. There is documented evidence that in humid mid-western Nigeria, the LGAs selected were among the major producers of cassava products, and the farmers were knowledgeable about cassava varieties and their qualities (IITA, 1992).

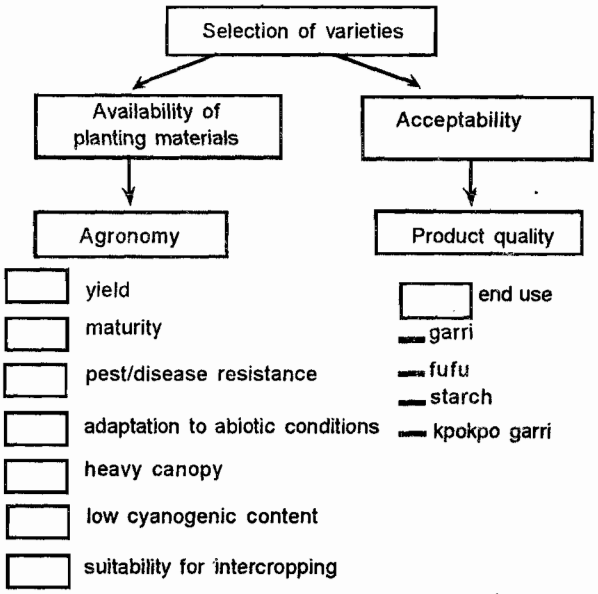

Fig. 1. Framework for data collection on criteria for cassava variety selection by rural farmers.
Source: Adapted from van Dorp & Rulkens (1993).

Results and discussion

A total of six cassava varieties comprising four improved clones and two landraces was grown in the study area. The six varieties were of the bitter type, a predominance found in humid ecologies in Nigeria (Nweke *et al.*, 1994). These varieties had different local names among the communities, with morphological and/or agronomic characteristics or sources of imtroduction being used as mode of classification. Through group discussions, identification, and field observations, it was established by consensus that the TMS clones, commonly referred to as "akpu agric" and distributed by extension agents, consisted of TMS 30572, 30555, 4092, and 4(2) 1425 besides two landraces, namely "Opotopo" and "Odeyeye".

Most of the farmers grew more than two varieties on the same plot. However, it was more common to find an improved variety grown solely on plots up to 0.5 ha, with intrusions of other improved varieties or landraces. This arises from the mode of obtaining planting material from other farms which predisposes the farmer to selection error. Another major cause of intrusion comes from seasonal demands which cause scarcity during the main planting period (March - June), thereby compelling farmers to obtain stakes randomly to attain a desired plant population. This varietal mixture in farm plots could be responsible for the recombination of genotypes and the emergence of volunteer seedlings (Boster, 1985), some of which could not be classified by the farmers and extensionists.

The most widely grown clones were TMS 30572 (81.6 %), 30555 (66.6 %) and "Opotopo" (45.0 %) (Table 1). Farmers isolated four significant agronomic attributes out of seven presented to them. These were high yield, early maturity, pest and disease resistance, and suitability for intercropping (Fig. 2), which were the bases for selecting the three varieties (clones).

Over 70.0 per cent (Fig. 2) of the farmers selected TMS 30527 because it is high yielding (82.0 %), early maturing (78.0 %), and resistant to pests and diseases (78.0 %). However, only 10.0 per cent of the farmers found it suitable for intercropping. This has to do with the heavy canopy and the tendency to shade off other crops in mixtures, and thus could explain the reason for growing it as a sole crop. Less than 70.0 per cent of the farmers recommended TMS 30555 for high yield (60.0 %), early maturity (23.3 %), resistance to pests and diseases (60.0 %), and suitability for intercropping (13.3 %). When compared to the two improved varieties, "Opotopo" performed poorly in tuber yield (37.0 %), resistance to pests and diseases (5.0 %), and suitability for intercropping (7.0 %), but was, however, rated higher than TMS 30555 for early maturity (35.0 %).

When the agronomic attributes were taken

TABLE 1

Distribution of Farmers Growing Six Cassava Cultivars in Delta State, Nigeria

Cultivar	*Percent**
TMS 30527	81.6
TMS 30555	66.6
"Opotopo"	45.0
TMS 4092	33.3
TMS 4(2) 1425	18.3
"Odeyeye"	11.6

*Multiple response.

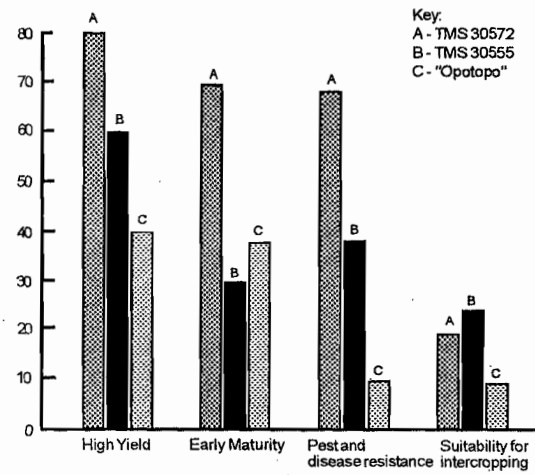

Fig. 2. Farmer selection of three cassava cultivars based on four agronomic characteristics.

together for each cultivar, it was observed that the improved cultivars, TMS 30572 and 30555, were more acceptable to farmers than the landrace "Opotopo" as shown in the distribution of farmers growing them (Fig. 3). However, many farmers insisted that the local cultivar was preferred because it has less fibre, resulting in the higher dough yield after fermentation and sieving. Secondly, unlike the improved varieties, it was more adaptable to the area and had an appreciable yield without fertilizer application.

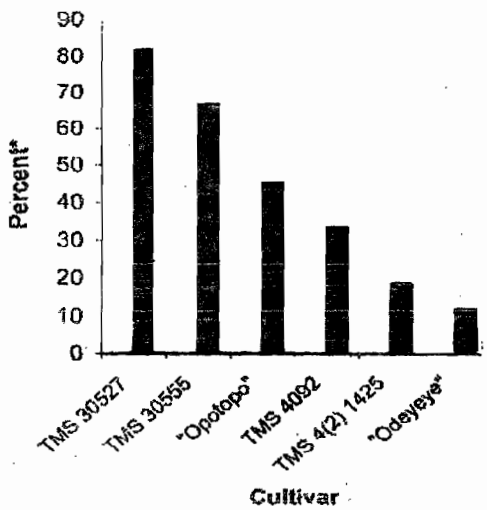

Fig. 3. Distribution of farmers growing six cassava cultivars in Delta State, Nigeria.

* Multiple response

With specific reference to end use, most farmers preferred the local cultivar for fufu processing. It is better for fufu and produces dough without pigmentation. On the other hand, most of the improved cultivars were selected for "garri" production because product yield was higher. This could result from the higher fibre content as against the aforementioned local variety. This assertion was confirmed by middlemen traders and cassava processors who preferred improved varieties to the local cultivar for "garri" processing. The two products – "garri" and "fufu" – traditionally, are the two major forms in which cassava is consumed in the area. However, " garri" is produced as a product of commerce, and this could explain the selection of cultivars with higher bulk yield.

It was also observed that while improved cultivars were often grown early in the season as sole crops or intercropped with maize, the local cultivar was often interplanted with yams or planted on old yam plots. It was planted in yam-based mixtures after the yam vines had been trailed on stakes and during weeding by women. Similarly, women planted as a follow-up crop activity, to ensure produce supply for fufu preparation – a woman's responsibility. Men and women grew improved varieties mainly for commercial purposes and to a limited extent, for home consumption. Women, however, interplanted more improved cultivars than men. This has to do more with planting material early in the season and preoccupation with farm maintenance, especially in yam-based mixtures.

It was established that farmers' criteria for selection of cassava cultivars involved an interaction of agronomic, consumer preference, and socio-economic factors. Most farmers selected cultivars by three agronomic characteristics, namely, high yield, early maturity, and resistance to pests and diseases. For the purpose of processing "fufu" for home consumption, most of the farmers cultivated the less fibrous local variety, "Opotopo", while at the same time growing two improved varieties on a large scale ostensibly for the market. The improved varieties were also popular among middlemen traders and processors. The choice of the local variety as a source of food is the responsibility of women in the households. This does not mean that women do not grow improved varieties for the market; rather, commercial production is the responsibility of men and women. Women are responsible, however, for market sales.

It was also established that farmers were very receptive to the introduction of improved varieties

of cassava. Although most farmers did not know the performance parameters of varieties distributed by extension, they, on their own initiative, evaluated the cultivars and made their selection. This explains the apparent rejection of two out of four improved cultivars introduced into area.

It follows, therefore, that a methodical accumulation of farmers' indigenous knowledge of cassava crops in genebanks is necessary in identifying certain characteristics which may be difficult to evaluate, such as adaptability to traditional food products as shown by women's choice of non-pigmented cultivars for fufu preparation. In addition, farmers' knowledge can serve as an initial index for characterizing cassava germplasm collection. This becomes of paramount importance in Nigeria, where genetic diversity in cassava is known to be very wide.

When new cultivars are distributed by extension with minimal evaluation in regional trials, meeting farmers' requirements in specific localities becomes a difficult task. Innovations transferred to farmers may be rejected because they do not satisfy farmers' needs. Such waste of scarce resources can be avoided by first determining farmers' criteria for selection, and using these to develop new cultivars.

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