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FARMER ACCEPTABILITY CRITERIA IN BREEDING COWPEA

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SUMMARY

Cowpea (*Vigna unguiculata*) farmers from diverse geographical areas in northern Cameroon selected breeding lines from on-station trials for their own fields and explained their reasons (criteria) for making the selections. The average selection intensity employed by farmers varied from 6 to 17% and was similar to that employed by plant breeders. Their selection criteria fell into three broad categories relating to yield, preference and quality, and labour, which were very consistent over years, locations and gender. Selection criteria were strongly influenced by market preferences, reflecting the increasing role of cowpea as a cash crop. Implications of these findings for breeding strategies and genetic resource conservation are discussed.

INTRODUCTION

Cowpea (*Vigna unguiculata*) is an important crop throughout Sub-Saharan Africa. Its grain and leaves are rich sources of high-quality protein (about 20–25% w/w), which provides an excellent supplement to the lower quality cereal or root and tuber protein consumed in much of this region. In addition to its role as food, cowpea hay is an important fodder for livestock. Cowpea is grown almost exclusively by low-resource or smallholder farmers, either intercropped with sorghum or millet, or as a sole crop. It is grown primarily for home consumption and subsistence, but is becoming increasingly important as a cash crop.

Cowpea breeding programmes are conducted by many national agricultural research systems (NARS) in Sub-Saharan Africa. These programmes have been strengthened by the work of various regional and international research organizations including the International Institute of Tropical Agriculture (IITA), the Bean/Cowpea Collaborative Research Support Program (CRSP), and SAFGRAD (Semi-Arid Food Grains Research and Development). Although there have been reports of good adoption rates of improved cowpea varieties in

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several Sub-Saharan African countries (Sanders *et al.*, 1994; Lowenberg-DeBoer, 1994; Sterns and Bernsten, 1994), little has been published regarding the criteria used by farmers in choosing which varieties they adopt. Published reports of participation by farmers in cowpea improvement efforts are few and are restricted primarily to descriptions of on-farm trials in annual reports of some NARS programmes (for example, Russell *et al.*, 1989).

Farmer participation in the breeding of crop varieties for low-resource farmers is regarded by some as necessary to help ensure acceptance and eventual adoption (Maurya *et al.*, 1988; Prain *et al.*, 1992; Franzel *et al.*, 1995; Sperling *et al.*, 1993). Since farmers in fact make the final 'selections' in any breeding programme when they choose whether or not to adopt a new variety, it has been argued that farmers should participate early in the breeding programme, by helping make on-station selections preceding later-stage on-farm testing (Sperling *et al.*, 1993; Franzel *et al.*, 1995).

In a typical breeding programme, selections are made by plant breeders on research stations where care is taken to maintain a uniform and favourable environment. Advanced generations of selected breeding lines are tested in multiple research station sites over two to four years and final selections are generally made on the basis of high average yield over the set of environments tested. Eventually two to four lines are selected by breeders and advanced to on-farm testing, at which time farmers may be asked to participate by selecting among these lines.

Accumulated experience in low-resource agricultural areas indicates that this approach to breeding is suboptimal because 1) the selection criteria used on-station by scientists to eliminate germplasm lines are not necessarily consistent with the selection criteria used by local farmers and 2) the on-station testing environment is typically more favourable than the target environments of low-resource farmers. As a result, materials may be eliminated which might have performed well under farmer conditions, and lines may be disseminated which do well on-station but may be inappropriate for farmer conditions (Haugerud and Collinson, 1990; Prain *et al.*, 1992; Ceccarelli *et al.*, 1994).

To address these deficiencies and to improve the accuracy of selection for diverse and heterogeneous environments, Sperling *et al.* (1993) introduced a programme of farmer participatory selection which involved using farmer experts in the evaluation of advanced breeding lines in variety trials at research stations, and then subsequently testing their selections on their own farms. The aim of these researchers was to better understand farmers' preferences (selection criteria) and to find ways of reducing the discrepancy between on-station and on-farm performance (genotype × environment interactions). Sperling *et al.* (1993) demonstrated that farmer participation in on-station selection could not only provide a list of selection criteria used by farmers, but could also help clarify the relative weighting of the criteria employed by farmers when making selections. They further showed that farmers were able to predict on-farm performance fairly accurately from what they observed on-station (farmer-selected lines outper-

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formed local mixtures 64–89% of the time in the on-farm tests, with average production increases of 38%).

The Cameroon Institute for Agricultural Research and Development (IRAD) in collaboration with Purdue University (USA) conducts a breeding programme funded by the United States Agency for International Development (USAID) under the Bean/Cowpea Collaborative Research Support Program (CRSP). The objective of this programme is to develop germplasm and/or varieties with resistance to the cowpea bruchid (*Callosobruchus maculatus*) that are broadly adapted, and are acceptable to low-resource farmers in northern Cameroon. To understand better farmers' acceptance criteria and preferences, a farmer-participatory breeding approach (patterned after that of Sperling *et al*. (1993)) was developed and on-station farmer evaluations conducted in 1994 and 1995.

This paper describes our experience with on-station farmer evaluation of breeding lines in Cameroon, emphasizing the selection criteria used by farmers. We further explore the possible implications of our findings for other breeding programmes in the Sub-Saharan region.

METHODS

Trials (1994)

In 1994, farmers evaluated three different breeding trials; an advanced trial, a preliminary trial, and a breeding methodology study. All three trials consisted of F6 lines grown in plots of four rows 4 m in length, with 80 cm between rows and 50 cm between plants in the row. Yield data were taken from the two central rows of each plot. All trials were grown under a moderate-input management regime which included two insecticide sprays, no fertilizer application, and two weedings.

The advanced trial was composed of the 18 highest-yielding lines from 1993 along with two control varieties (BR1 and VYA) grown in a randomized complete block (RCB) design with four blocks and two locations. The preliminary trial consisted of 120 entries in a RCB design with two blocks at one location only. One control variety (BR1) was planted in every 10th plot. The breeding methodology study comprised 56 entries (including control lines BR1 and VYA) in a RCB design, four blocks and two locations.

The advanced trial was evaluated by farmers in only one location, Douroum, located approximately 60 km from Maroua, Cameroon. The Douroum site is not a research station of IRAD, but it was considered on-station rather than on-farm because trials were managed by researchers and conducted in the same manner as those carried out on-station. Farmers evaluated the preliminary trial at the IRAD station in Gazawa, approximately 30 km from Maroua, and the breeding methodology study was evaluated at the IRAD research station at Guiring, in Maroua.

Trials (1995)

The 1995 advanced yield trials consisted of the 62 best lines from the 1994 trials

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along with two control cultivars. All 64 entries were grown in a RCB design with four blocks at four locations. All trials consisted of F7 lines grown in plots of four rows 4 m in length, with 80 cm between rows and 50 cm between plants in the row. Yield data were taken from the two central rows of each plot. Trials were grown under a moderate-input management regime which included two insecticide sprays, no fertilizer application, and two weedings.

The trials and farmer evaluations were carried out on four IRAD research stations spanning the North and Far North Provinces of Cameroon. Two research stations were located in the Far North Province (Guiring and Guetalé), in a Northern Sudanian agroecology with a growing season of 100–125 days and average annual rainfall of 500–850 mm, and two stations were located in the Northern Province (Sangueré and Tcholliré), which represents a Southern Sudanian agroecology with a growing season of 125–150 days and an average annual rainfall of 850–1200 mm.

Identification of expert farmers

Expert cowpea producers were identified in the vicinity of each trial location through key informants (such as local extension agents, local NGO agents, IRAD technicians), field observations and interviews. Criteria used in selecting experts included ability to communicate, recognition in the community as an expert, several years cultivating cowpea and innovativeness. Individuals were selected to represent a diversity of age, gender, ethnic background and socio-economic status. 'Expert' status was verified by on-site visits to each participating farmer's cowpea fields where interviews were conducted to better understand their production practices, farming systems, and socio-economic status and situation. Farmers who has previously worked as labourers on any of the IRAD research stations were excluded.

Since most of the 1995 trial locations were different from the 1994 locations a different set of experts was identified each year. In 1994 the total number of participants was 50, which included 36 men and 14 women. The breakdown of participants by location was as follows: Douroum, 15 men, 4 women; Gazawa, 15 men, 5 women; and Guiring, 6 men, 5 women. In 1995, there was a total of 99 participating experts including 70 men and 29 women. The number of participants by location was as follows: Tcholliré, 9 men, 4 women; Sangueré, 36 men, 13 women; Guiring, 14 men, 6 women; Guetalé, 11 men, 6 women. In 1994 ethnic group data were not collected, but in 1995 a total of 20 different ethnic groups was represented. The predominant ethnic groups represented were Mafa 33%, Moundang 25%, Toupouri 10% and Moufou 6%. According to Boutrais *et al.* (1984), there are approximately 42 different ethnic groups in the North and Far North Provinces of Cameroon and so the sample of expert cowpea producers represented about 50% of the ethnic groups of the region.

On-station farmer evaluation of trials

In 1994 and 1995 evaluation of the field trials took place at or near full maturity

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(from late September to early October). Farmers were asked to evaluate all the lines in a particular trial and select those which they would like to try on their own farms. Each of the trials was evaluated in its entirety (that is, farmers evaluated all plots and were unaware of replications). There was no limit to the number of lines that participants could select. In evaluating the trials, farmers walked through the fields individually until they had made all their selections (typically 1–2 h). Each individual participating farmer was then accompanied back through the trials by a project researcher or technician and asked to indicate his or her selections. Interviews were conducted as open evaluations in which farmers were asked to give detailed reasons for their selections. Following the individual interviews, project researchers, technicians and farmers walked through the trials as a group and farmers were asked to raise their hands when they arrived at plots which they had chosen earlier. The number of hands raised for each plot was then checked against the number of selections for the particular plot given in the individual interviews. This 'show-of-hands' exercise provided a check on the plots or lines selected in the individual interviews.

The percentage of farmers selecting a particular line was used as the measure of its relative desirability or acceptability. However, since each trial was evaluated in its entirety, it was possible for a farmer to select a particular line more than once (that is, once in each block). Therefore, the overall total number of times a particular line was selected was the criterion used to test for significance using chi-squared analysis. For example, if 25 farmers participated in a trial evaluation of 256 entries (64 lines × 4 blocks) and there was a grand total of 100 selections made, each line would be expected to be selected 1.56 times by chance alone (1/64 × 100) and therefore 1.56 was used as the expected value in the chi squared formula (note that each cowpea line was represented four times in a trial of 256 = 1/64). In the preliminary yield trial (1994), where the control variety BR1 was replicated 12 times in each block, the probability of selecting BR1 at random was calculated as 12/132 = 0.09090).

RESULTS

Farmers were very selective during their evaluations. Although there were no limits to the number of lines each farmer could select, the average number of selections per farmer in 1995 was 4.1 (range = 2–10). In 1994, a total of only 12 lines were selected a significant number of times by farmer experts from the three different trials evaluated (Table 1). This represented a selection intensity of 6% of the genotypes tested (196 total genotypes tested). BR1, the currently extended control variety was selected by 16% of the participating farmers in the advanced trial. The percentage of farmers selecting any particular line a significant number of times ranged from 10 to 90%. Grain yields of the selected lines varied considerably, ranging from 270 to 1244 kg ha^{-1} (Table 1). Approximately 67% of the lines (8 of the 12) selected by farmers in 1994 were again selected by a

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Table 1. On-station farmer selection of advanced breeding lines in multi-locational yield trials in 1994 and 1995.

Lines	1994		1995	
	Selection (%)†	Grain yield‡ (kg ha^{-1})	Selection (%)†	Grain yield (kg ha^{-1})
C93W-24-130	21*	761	19***	1067
C93W-24-8	35***	575	31***	968
C93W-2-38	27*	711	18***	910
C93W-24-125	90***	624	18***	870
C93W-7-29	0	881	19***	863
C92S-12-58	55***	400	43***	729
C93W-24-84	10*	856	13*	699
C92S-9-9	20***	1244	17***	697
C92S-9-5	0	544	14**	692
C91S-3-8	27*	405	0	651
C92S-11-10	0	600	15***	614
C93W-7-38	21*	720	18***	605
C91S-1-16	36***	499	—§	—
GLM 93	—	—	10 n.s.	581
C91S-3-6	27*	270	0	544
BR1¶	16**	577	1 n.s.	385
l.s.d.				169

†Percentage of farmers selecting a particular line: $n=50$ in 1994, $n=99$ in 1995; asterisks represent a significant percentage of selections according to chi-squared analysis, ***, $p=0.001$; **, $p=0.01$; *, $p=0.05$, n.s. = non-significant; ‡yields were not analysed statistically in 1994 because lines were from different trials; §em-dash indicates that line was not grown that year and C91S-1-16 was eliminated due to poor fodder yield; ¶ yield of BR1 is from the advanced yield trial in which it was selected by 16% of the participants.

significant number of farmers in 1995 (Table 1) but C91S-1-16 was not advanced to the 1995 trials because of its very poor fodder yields.

In 1995, 11 lines were selected a significant number of times by farmer experts (Table 1), representing a selection intensity of roughly 17% of the genotypes tested (64 entries). This selection intensity was very consistent over all four locations (data not shown). Neither of the two control varieties, BR1 or GLM 93, were selected a significant number of times by farmer experts. The percentage of farmers selecting any particular line a significant number of times ranged from 12 to 43%. The grain yield of farmer selections ranged from 605 to 1067 kg ha^{-1}, but all selected lines yielded as good or better than the two control varieties GLM 93 and BR1 (Table 1). All four lines with the highest grain yields in 1995 (24-130, 24-8, 2-38 and 24-125) had been selected by a significant number of farmers in 1994.

Farmers consistently used about 26 different criteria when selecting lines (Table 2). It was found that these could be grouped into three broad categories: criteria relating to (1) yield, (2) preferences and quality and (3) labour savings. The

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Table 2. Criteria used by farmers in selecting among breeding lines in multi-locational yield trials in 1994 and 1995.

	Percentage of total responses†	
Criteria	1994	1995
Yield-related criteria		
grain yield	27.1	22.1
fodder yield	11.4	10.6
leaf retention	0.4	1.9
continuous flowering	0.4	1.0
early maturity	1.6	1.5
insect resistance	0.8	3.2*
disease resistance	1.2	5.8**
non-dehiscent pods	0.4	0.0*
Total for group	43.3	46.1
Preferences and quality-related		
large seeds	11.0	11.3
white seeds	16.0	10.3**
seed taste	4.0	4.6
rough seed coats	0.0	0.4
smooth seed coats	0.0	0.2
floury seeds	0.0	0.2
hard seeds	0.4	0.0*
pod colour preference	1.6	2.2
fodder quality	0.8	0.6
leaves for eating	2.0	5.6*
Total for group	35.8	35.4
Labour-related criteria		
long pods	3.5	7.3*
large pods	9.4	3.8***
erect growth habit (ease of harvest)	1.6	3.2
semi-erect habit (ease of harvest)	0.4	0.8
spreading habit (weed suppression)	2.8	2.1
pods easy to harvest	3.2	1.0*
easy to thresh	0.0	0.1
many seeds per pod	0.0	0.2
Total for group	20.9	18.5

† In 1994 there were 50 participating farmers in three locations, giving a total of 254 responses when asked to list and explain their selection criteria; in 1995 there were 99 participating farmers at four locations and a total of 1441 total responses; asterisks represent a significant percentage of total responses according to chi-squared analysis, ***, $p = 0.001$; **, $p = 0.01$; *, $p = 0.05$.

assignment of criteria to each of these categories was based upon farmer interviews (for example, long pods and many seeds per pod were considered labour saving attributes, rather than indicators of yield, because much less effort goes into threshing per given quantity of grain). Although there were some significant year-to-year differences in specific selection criteria (for example, disease resistance, insect resistance, large pods, white seeds), there were no significant differences in the percentage of responses falling into each of the general categories of criteria,

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that is, yield, preferences and quality-related, and labour-related, between 1994 and 1995 (Table 2).

Yield-related criteria (both grain and fodder yield) accounted for only 43.3% (1994) and 46.1% (1995) of the responses given by farmers to explain their selections. This indicated that varietal selection is based on much more than yield alone. Preference and quality-related criteria were the second most important to farmers, accounting for 35.8% (1994) and 35.4% (1995) of the total responses. Plant characteristics associated with savings in labour were an important category of criteria given by farmers and accounted for 20.9% of the responses in 1994 and 18.5% in 1995. Specific criteria which collectively accounted for more than 65% of the total responses in both years were grain and fodder yield, large, white seeds and long, large pods.

Selection criteria used by men and women farmers in making selections were similar (Table 3). When asked about their selection criteria 47.7 and 43.9% of the responses given by men and women farmers respectively were yield related. This difference was not statistically significant. The specific yield-related criteria of continuous flowering and insect resistance were mentioned more frequently by men farmers than women farmers. The percentage of total responses in the labour-related category was not significantly different between men and women farmers (15.7% of women's responses and 19.6% of men's responses, Table 3). The percentage of the total responses given by men farmers which were preference and quality-related criteria (32.7%) was significantly lower than the percentage of total responses given by women farmers in this category (40.4%, Table 3). Most of this difference was accounted for by the selection of lines for the eating quality of their leaves for human consumption, a criterion used much more frequently by women farmers. Additionally, spreading growth habit was more important to men than women farmers (3% of men's responses compared with 0.2% of women's responses).

DISCUSSION

Farmers as an aid to selection

The study indicates that utilizing local farmer expertise as an additional screening tool in the selection process can be both efficient and effective. By utilizing a chi squared calculation it was possible to discern easily those lines which were being selected more frequently than by chance alone. The selection intensities employed by farmers (6% in 1994 and 17% in 1995) were consistent over locations (data not shown) and were similar to what would typically be employed by a plant breeder. This level of selectivity indicates that conscious choices were being made. Additionally, the fact that 67% of the lines selected by farmers in 1994 were again selected by a significant number of farmers in 1995 (Table 1) indicates that farmers were quite effective at identifying lines in one set of environments that were highly appreciated and selected by other farmers in a different set of environments. This 'predictive' ability was also reported by

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Table 3. Differences in criteria used by men and women farmers in selecting among breeding lines in multi-locational yield trials in 1995.

Criteria	Percentage of total responses†	
	Women	Men
Yield-related criteria		
grain yield	21.6	22.4
fodder yield	9.3	11.2
leaf retention	2.5	1.6
continuous flowering	0.0	1.6*
early maturity	1.5	1.6
insect resistance	1.9	3.9*
disease resistance	7.1	5.4
Total for group	43.9	47.7
Preferences and quality-related		
large seeds	13.1	10.4
white seeds	10.1	10.2
seed taste	4.8	4.5
rough seed coats	0.6	0.3
smooth seed coats	0.2	0.2
pod colour preference	2.9	1.8
fodder quality	0.0	0.9*
floury seed	0.0	0.3
leaves for eating	8.7	4.1***
Total for group	40.4	32.7*
Labour-related criteria		
long pods	7.9	7.0
large pods	3.9	3.4
erect growth habit (ease of harvest)	2.3	3.6
semi-erect habit (ease of harvest)	0.2	1.1
spreading habit (weed suppression)	0.2	3.0***
pods easy to harvest	0.6	1.3
easy to thresh	0.0	0.2
many seeds per pod	0.6	0.0*
Total for group	15.7	19.6

† Four trials in four different locations were evaluated by a total of 29 women farmers and 70 men farmers giving a total of 1441 responses when asked to list and explain their selection criteria; percentages followed by asterisks *, ** in the same row indicate significant differences in responses between men and women farmers at $p = 0.05$ and $p = 0.01$ respectively from chi-squared analysis.

Sperling *et al.*, 1993, who found that farmers were able to extrapolate on-farm performance from on-station performance with good accuracy.

Selection criteria

Yield-related criteria accounted for the largest percentage of responses by both men and women farmers in both years (43.3 and 46.1% in 1994 and 1995 respectively). However, preference and quality-related criteria together with

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labour-related criteria accounted for over 50% of the farmer responses, indicating that yield is only one criterion among many that are important in farmer selections. Other evidence suggesting that criteria other than yield play an important role in determining a line's acceptability include the large range of grain yields for lines that farmers selected (605–1067 kg ha^{-1} in 1995), and the non-significant correlation (1995 data) between realized grain yields and farmer selections ($r = 0.406$ ($p = 0.166$), $r^2 = 0.165$) and fodder yields and farmer selections ($r = 0.067$ ($p = 1.00$), $r^2 = 0.004$). Sperling (1992), Sperling *et al.*, (1993) and Dorp and Rulkens (1993) also reported that yield is only one criterion embedded in a complex of many interacting criteria relating to agronomic performance, consumer preference and socio-economic (market) conditions. The selection criteria, other than yield, of primary importance in farmer selections included large seeds, white seeds, long pods, and large pods. (For reasons unknown to the authors, farmers considered pod length different from, rather than an integral part of large pods; it was therefore decided to leave these two responses separate, in keeping with the farmers' responses.) In fact, seed size and colour, taken together, accounted for 21.6 and 27% in 1995 and 1994 respectively of all responses when farmers were asked to list the criteria they used in selecting among lines. This was the same percentage of responses as for grain yield. Thus farmers placed about equal value on seed size and colour as selection criteria as they did on grain yield. Pod characteristics (length and overall size) were likewise important, accounting for 11–12% of all the criteria responses in both years.

The importance of seed size and colour as selection criteria appears to reflect the increasingly important role of cowpea as a cash crop. Wolfson *et al.* (1989) interviewed 38 farmers in 25 villages in northern Cameroon and reported that 89% of the farmers sell some of their cowpea crop if the harvest is sufficient. Personal observations by the authors and preliminary evidence from market price studies (J. Lowenberg-DeBoer, personal communication, 1996) indicate that large white-seeded cowpeas are more readily marketed and are typically sold at a premium. The idea that farmer selection criteria and preferences are strongly influenced by market forces would help explain the unusual consistency in the selection criteria used by farmers over years (Table 2), gender (Table 3), and locations (data not shown). This consistency was unexpected because the farmer participants in 1994 were different from the participants in 1995 and were drawn from widely different geographic areas. Additionally, the participants in 1995 represented 20 different ethnic groups that have evolved in specific cultural and agro-ecological niches and are known to cultivate a wide array of landraces varying in seed type and colour.

Implications for Cameroon and other breeding programmes

Results of the on-station farmer evaluations suggest that above a certain minimum acceptable yield, the acceptability of a line is determined by factors other than yield, and additional gains in yield do not significantly affect farmer acceptability. Grain yields ranging from 605 to 1067 kg ha^{-1} (1995 data) were

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considered acceptable if other preference or labour-related traits were present. This provides a flexibility in yield targets which, when coupled with the relative homogeneity of preference for large white seed types, enhances the likelihood that lines can be developed that will produce well and be acceptable over a broad geographic area. The finding of a wide range of acceptable grain yields is consistent with results reported by Sperling *et al*., (1993) and suggests that, in general, research expenditures for additional yield trial locations should be balanced by expenditures to monitor and improve understanding of farmer preferences and selection criteria, for ultimately the latter determine which lines are acceptable to farmers. Excessive resource outlays to pinpoint the very highest-yielding lines without a corresponding effort to understand farmer-clientele preferences and criteria will not be cost-effective. Several lines selected by Cameroonian farmers in the 1994 yield trials would probably have been discarded by project breeders if they had been evaluated on the basis of grain and fodder yield alone.

Our data suggest that farmers are seeking varieties that will give them a marketing edge. This is reflected by the fact that large and white seeds accounted for 20–23% of all responses given when farmers were asked to list their selection criteria, and it is known that large, white seed types are readily marketed and are typically sold at a premium. Local seed-type preferences for home consumption appear to be met by local varieties and therefore are not regarded as important in selection of new varieties. These findings suggest that when marketing opportunities exist, market preferences may facilitate breeding for wide adaptability by exerting a unifying influence over agro-ecological and ethnic niche differences. This hypothesis could not be adequately assessed in the present study because locations and ethnic groups were not sufficiently well-characterized to be classified as distinct ethnic and agro-ecological niches. Future studies should be designed with well-defined niches to specifically assess the influence of markets on niche breeding *vs*. wide adaptability.

Several studies conducted in northern Cameroon (Lowenberg-DeBoer, 1994; Sterns and Bernsten, 1994; Wolfson *et al*., 1989) have revealed that the majority of farmers plant improved varieties as a pure crop or monocrop separate from their own local landrace varieties which are typically grown intercropped with sorghum or millet. As improved varieties and local landraces are also used for different purposes (the improved variety BR1 is grown and used most frequently as a cash crop whereas local landraces are used primarily for home consumption), it is hypothesized that, if breeders focus on developing lines which exploit regional market preferences, then local preferences and home consumption needs such as vegetable uses, forage and distinct culinary qualities would continue to be met by local landrace varieties. This breeding strategy would tend to encourage the continuing use of local landraces rather than their displacement by improved varieties, thereby positively affecting genetic resource conservation.

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