# On-farm evaluation of improved Brachiaria grasses in semi-arid eastern Kenya

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## Abstract

The arid and semi-arid areas of Kenya cover slightly over 80% of the land and are important for livestock production, with 60% of livestock found in this region. The main constraint to livestock production in this region is inadequate quantity and quality of livestock feed due to frequent droughts and reduced rainfall attributed to climate change. Participatory on-farm evaluation trials were conducted in agro-ecological zones Upper Midlands 3 (UM3) and Lower Midlands 4 (LM4) of Machakos and Makueni Counties respectively. The objective of the study was to assess agro-ecological adaptability and acceptability of four improved Brachiaria grass cultivars; *Brachiaria brizantha* cvs. Xaraes, Piatã, MG4 and *Brachiaria decumbens* cv. Basilisk. Eight farms were selected in each area and herbage was harvested five times at two monthly intervals. In each harvest, dry matter was measured. Assessment on performance and farmersô preference of the Brachiaria cultivars was carried out after two years using a structured questionnaire that was administered to 49 farmers (18 females and 31 males) in Machakos and 45 farmers (21 females and 24 males) in Makueni.

No differences were found in the mean total dry matter yield between the grass cultivars in Machakos county. However, *Brachiaria brizantha* cvs MG4 gave the highest dry matter yield of 10.4 t $ha^{-1}$. There were differences in the mean total dry matter yield between the cultivars in Makueni county where *Brachiaria brizantha* cv. Piatã gave the highest dry matter yield of 8.4 t $ha^{-1}$. The most preferred cultivar in agro-ecological zone UM3 was *Brachiaria brizantha* cv. Xaraes while *Brachiaria brizantha* cv. Piatã was the most preferred cultivar in agro-ecological zone LM4. Although Cv. Xaraes was not the most productive in agro-ecological zone UM3, it was preferred due to increase in milk production when fed to dairy cattle. Cv. Piatã was preferred due to its fast regrowth after harvesting.

***Keywords:*** *acceptability, adaptability, dry matter, farmers' preferences*

## Introduction

The arid and semi-arid areas of Kenya cover slightly over 80% of the land and are important for livestock production, with 60% of livestock found in this region (Kenya Agricultural Research Institute (KARI 2001). The rainfall in these regions is low (annual rainfall: 250ï 700 mm) and highly variable with a coefficient of variation of 45ï 56% (Njarui et al 2015). The regions are characterized by a long dry season from June to mid-October which leads to cessation in growth of pastures thus resulting to inadequate quantity and quality of livestock feeds. This is compounded by generally high temperatures, which causes high evapo-transpiration in excess of 2500 mm annually (KARI 2001) thus leading to water deficit for plant growth.

Livestock feed production and use is driven by increases in population and income, which increase milk demand and thus the demand for feeds (Kiptot et al 2015). By the year 2010, livestock population in Kenya was estimated at 17.4 million cattle, 17 million sheep and 22 million goats (KNBS 2010). Out of this, 610,930 cattle, 226,120 sheep and 1,363,359 goats were in Machakos and Makueni counties. This is an indicator that demand for livestock feed is high in the country due to the large number of livestock and increased demand for milk and meat due to the high population growth. Farmers are unable to provide sufficient quantity and quality feeds to their livestock especially during the dry season. For example, in the mid-altitude eastern region of Machakos and Makueni counties where the dry season is more pronounced, crop residues mainly from cereals form a large proportion of the animal feeds during the dry season while in the hill masses of the same region, Napier grass (*Pennisetum purpureum* Schum) is the principal feed (Njarui et al 2016). However, Napier grass is threatened by the emergence of stunt and smut diseases (Mureithi and Djikeng 2016).

In order to meet the demand for livestock products, there is need to assist farmers improve feed supply that meet animal requirement to match livestock productivity (Njarui et al 2016). The problem of feed shortage can be addressed through identification and promotion of forage species with nutritive value that are also adapted to drought and low fertility soils (Ghimire et al 2015). Research conducted at the International Centre for Tropical Agriculture (CIAT), Brazilian Agricultural Research Corporation (EMBRAPA), and Australia has identified high performing Brachiaria cultivars and hybrids for different environments. Their adaptation to low fertility and acid soils; tolerance to drought, shade and flooding; high biomass production potential;

ability to accumulate carbon into soils; an efficient use of nitrogen (through biological nitrification inhibition); and an ability to minimize greenhouse gases emissions and ground water pollution makes Brachiaria grass the most extensively cultivated forage monoculture in the world (except in Africa) with an estimated area of 99 million hectares in Brazil alone (Ghimire et al 2015). Due to these desirable agronomic and environmental traits, Brachiaria was identified as potential forage for its native home, east Africa. A study was therefore carried out to test the agro-ecological adaptability and acceptability of four improved Brachiaria grass cultivars, create awareness to the farmers, determine farmersô criteria for adoption and hence incorporate the grass into the farming systems of semi-arid eastern Kenya.

## Materials and methods

### Study area

The study was carried out in agro-ecological zones Upper Midlands 3 (UM3) and Lower Midlands 4 (LM4) (Jaetzold et al 2006) of Machakos and Makueni counties in semi-arid eastern Kenya (Figure 1). Both zones receive bimodal rainfall with the first rains occurring from March to May and second rains from October to December. In zone UM3, annual rainfall ranges from 900 to 1050 mm with mean temperatures of 17.9 to 20.5 $^{o}$C. The altitude ranges from 1400 to 1830 m above sea level. In zone LM4, annual rainfall ranges from 700 to 900 mm with mean temperatures of 21.3 to 22.0 $^{o}$C. The altitude ranges from 1160 to 1280 m above sea level. The farming systems are characterized by mixed crop-livestock production (Njarui et al 2016).

Maize is the most important cereal and is commonly grown as intercrop with beans (*Phaseolus vulgaris* L.), cowpea and pigeon pea ( *Cajanus cajan* L.). Major livestock kept include cattle, sheep and goats.

**Figure 1.** Location of the study area

### Farmers' selection of Brachiaria grass cultivars

Participatory evaluation and selection of Brachiaria grass cultivars involving 84 to 89 farmers was carried out from an evaluation trial at Katumani research centre on three separate occasions; (March 2014 (wet season), June 2014 (end of wet season) and October 2014 (peak of dry season) (Gatheru et al 2016). The

trial consisted of seven improved Brachiaria cultivars, *Brachiaria brizantha* cvs. Marandu, Xaraes, Piatã, MG4, *Brachiaria decumbens* cv. Basilisk, *Brachiaria humidicola* cv. Llanero, *Brachiaria hybrid* cv. Mulato II and a control, Rhodes grass (*Chloris gayana*). Participating farmers came from Kangundo subcounty of Machakos County and from Makueni subcounty of Makueni county. The criteria used for evaluation had been developed earlier through focus group discussions held in the two sub-counties during the month of January 2014. Farmers identified drought tolerance, disease tolerance, soil erosion control, pest resistance, height at harvest, suitability for grazing and for cut-and-carry, and green colour of leaves as the key criteria for selecting grasses for forage production.

For each criterion, farmersô opinion on individual grass cultivars were recorded using a Likert scale of 1 to 4 where, 1=poor, 2=fair, 3=good and 4=very good (Plate 1). To determine the best cultivar, a mean score was calculated across all the selection criteria. Based on the farmersô scores, the best cultivars across all the selection criteria were MG4, Basilisk, Xaraes and Piatã.

**Plate 1.** Farmers selecting Brachiaria grasses at Katumani research centre

**On-farm establishment of Brachiaria grasses**

Preparations for on-farm evaluation started during the month of October 2014. Planning meetings with farmers and extension staff were held in the two counties. During these meetings, farmers were requested to set aside at least 0.25 acres (0.10 ha) of their land for on-farm evaluation. Training on land preparation, planting and management of the grass was carried out and the date for seed distribution was set. Seed distribution to individual farmers was carried out late October 2014. Seeds of the four selected Brachiaria grass cultivars;*Brachiaria brizantha* cvs MG4, Xaraes, Piatã and *Brachiaria decumbens* cv. Basilisk were distributed to 82 and 68 farmers in Machakos and Makueni counties respectively. Results from on-station agronomic evaluation for three seasons had shown that, the four cultivars had the highest Dry Matter (DM) yield (Njarui *et al*., 2016). In zone UM3, each farmer received 1 kg seed of cv. Xaraes and 1 kg seed of either cv. MG4 or cv. Basilisk while in zone LM4, each farmer received 1 kg seed of cv. Piatã and 1 kg seed of either cv. MG4 or cv. Basilisk. Results from agronomic evaluation (Njarui et al, 2016) had shown that, Piatã was more drought tolerant and hence the reason for its distribution in agro-ecological zone LM4 which receives less rainfall.

**Farmers planted the seed on various dates during the month of November 2014. The first monitoring of the grass establishment was carried out in December 2014.**

In each zone 30 farms with good stand establishment were selected for monitoring forage production. Regular visits to the selected farms were carried out on monthly basis. During these visits, scientists held discussions with individual farmers on performance of the grass and a checklist on establishment and management of the grass was administered to each farmer. The scientists also scored for diseases and pests through visual observation. In each of the selected farms, a standardization cut was carried out sixteen weeks after establishment. Forage yield evaluation took place two times in 2015 and three times in 2016 at two monthly intervals with cutting height of approximately 5 cm above the ground. In 2015, biomass was harvested at the peak of the rainy season (April 2015) and at the beginning of the dry season (June 2015) while in 2016, biomass was harvested at the end of short rains (January 2016), at the beginning of the long rains (March 2016) and at the end of the long rains (May 2016). For each farm and Brachiaria cultivar, three quadrants of 1 $m^2$ were selected through visual observation where growth of the grass was perceived to be best, medium and poor. The grass in each quadrant was cut and weighed using a weighing balance. The three main samples were then mixed and a sub-sample of approximately 500g taken and oven dried at 105 $^oC$ for 48 hours to determine the dry matter (Njarui et al 2016). For each farm and cultivar, the three quadrants were labelled for subsequent sampling and farmers were requested to preserve those plots.

The data on total dry matter yield were subjected to Analysis of Variance (ANOVA) using the statistical software Genstat 15$^{th}$ edition and where significant differences occurred, the means were separated by the Least Significant Difference (LSD) test at $P<0.05$ (VSN Int. 2013). The following model was used for analysis:

$Y_{ij}=\mu + R_i+ C_j+Ů_{ij}$

Where,

$Y_{ij}$=Observed value

$\mu$=Overall mean value

$R_i$=Effect of $i^{th}$ replication (farm)

$C_j$ =Effect of $j^{th}$ cultivar

$\mathring{U}_{ij}$ =Random error.

Due to inconsistency in some farms caused by farmers not preserving the 1 $m^2$ sampling plots, only eight farms were used for analysis in each agro-ecological zone.

### Farmers' assessment on performance of Brachiaria grass cultivars

Farmersô assessment on performance of the cultivars was carried out after two years of on-farm evaluation. Forty nine farmers (18 females and 31 males) in Machakos and 45 farmers (21 females and 24 males) in Makueni were involved. The assessment was carried out using a structured questionnaire. In each agro-ecological zone, participating farmers were invited for a meeting in a central venue on a specific date. The farmers were first briefed on the purpose of the meeting after which the scientists and the local extension staff assisted the farmers in filling the questionnaire. Data collected included cultivars being evaluated, grass establishment, production, feeding, feed conservation, preferred cultivars and reasons for their preference.

The data collected were analysed through descriptive statistics using the Statistical Package for Social Sciences (SPSS) (IBM, 2011).

## Results and discussion

### Farm characteristics and practices of participating farmers

Majority of the participating farmers in both agro-ecological zones were males (Table 1). In both zones, most of the participating farmers used hired labour for land preparation while planting of the grass was mainly by the household head. More farmers in Machakos than Makueni county used organic or inorganic fertilizer and planted Brachiaria grass on flat land. The choice on which part of the farm for growing Brachiaria grass in Machakos was based on the available space (66.7% of farmers) while in Makueni, 63.3% of the farmers had the area reserved for planting grass. The difference in practices can be attributed to differences in land size between the two counties. An earlier study (Njarui et al 2011) reported an average land holding of 2.12 ha and 4.48 ha per household in Machakos and Makueni respectively. Prevention of soil erosion was not a determinant in choosing the part of the farm for planting Brachiaria grass in both counties. However, 23.3% of farmers in Makueni reported that they planted Brachiaria grass where crops perform poorly and in infertile areas. This is in agreement with an earlier study (Njarui et al 2011) which reported that

farmers allocate the most fertile part of their land to food and cash crops and the less fertile land for pasture and forage production. The mean distance from homestead to the grass plot was greater in Makueni than in Machakos.

**Table 1.** Characteristics and management practices of Brachiaria grass evaluation farmers in Machakos and Makueni

| Characteristic/management practice | Machakos (UM3) | | Makueni (LM4) | | $\chi^2$ | Prob. |
|---|---|---|---|---|---|---|
| | Freq. | Percent | Freq. | Percent | | |
| Gender of household head | | | | | 0.465 | 0.495$^{ns}$ |
| Female | 2 | 8.0 | 7 | 23.3 | | |
| Male | 28 | 92.0 | 23 | 76.6 | | |
| Person preparing the land for planting | | | | | 8.561 | 0.381$^{ns}$ |
| Husband | 6 | 20.0 | 6 | 21.7 | | |
| Wife | 2 | 6.7 | 4 | 13.0 | | |
| Children | 0 | 0 | 0 | 0 | | |
| Labourer | 17 | 56.6 | 8 | 26.1 | | |
| Husband & wife | 2 | 6.7 | 4 | 13.0 | | |
| Husband & children | 0 | 0 | 3 | 8.7 | | |
| Husband & labourer | 2 | 6.7 | 3 | 8.7 | | |
| Wife & children | 1 | 3.3 | 0 | 0 | | |
| Wife & labourer | 0 | 0 | 1 | 4.3 | | |
| Wife,children & labourer | 0 | 0 | 1 | 4.3 | | |
| Person planting the Brachiaria grass | | | | | 7.371 | 0.497$^{ns}$ |
| Husband | 11 | 36.0 | 8 | 26.1 | | |
| Wife | 1 | 4.0 | 4 | 13.0 | | |
| Children | 0 | 0 | 0 | 0 | | |
| Labourer | 8 | 28.0 | 3 | 8.7 | | |
| Husband & wife | 5 | 16.0 | 4 | 13.0 | | |
| Husband & labourer | 4 | 12.0 | 5 | 17.4 | | |
| Wife & children | 1 | 4.0 | 1 | 4.3 | | |
| Wife & labourer | 0 | 0 | 1 | 4.3 | | |
| Wife,children & labourer | 0 | 0 | 1 | 4.3 | | |
| Type of fertilizer used during planting | | | | | 10.379 | .016$^{**}$ |
| Organic fertilizer (manure) | 6 | 20.0 | 1 | 3.3 | | |
| Inorganic fertilizer | 6 | 20.0 | 0 | 0 | | |
| Both organic & inorganic | 1 | 3.0 | 0 | 0 | | |
| None | 17 | 57.0 | 29 | 96.7 | | |
| Part of farm planted with Brachiaria | | | | | 5.298 | .021$^{**}$ |
| Flat area | 23 | 76.7 | 13 | 43.3 | | |
| Sloppy area | 7 | 23.3 | 17 | 56.7 | | |
| Reasons for choosing that part of farm | | | | | 15.762 | .001$^{***}$ |
| Crops perform poorly | 0 | 0 | 4 | 13.3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Infertile area | 0 | 0 | 3 | 10.0 | | |
| Reserved for planting grass | 10 | 33.3 | 19 | 63.3 | | |
| To prevent soil erosion | 0 | 0 | 0 | 0 | | |
| Available space | 20 | 66.7 | 4 | 13.3 | | |
| | Mean | Std. Dev. | Mean | Std. Dev. | t | Prob. |
| Distance from homestead to grass plot | 0.21 | 0.59 | 0.35 | 0.42 | 0.66 | $0.515^{ns}$ |

***=Significant at p<0.05, ***=Significant at p<0.01, NS=Non significant*

**Dry matter yield of Brachiaria grasses**

The mean total dry matter yield of the Brachiaria grass cultivars in the study area is shown in Table 2. Analysis of variance (ANOVA) showed no significant differences in mean total dry matter yield between the grass cultivars in Machakos county. However, there were significant differences ($p<0.05$) in mean total dry matter yield between the three cultivars in Makueni county. Cv. MG4 gave the highest dry matter yield (10.4 t $ha^{-1}$) in Machakos while Cv. Piatã gave the highest dry matter yield (8.4 t $ha^{-1}$) in Makueni. The dry matter yields in both counties were higher than those achieved from on-station three seasonsô evaluation at Katumani where, cvs. Piatã, MG4, Xaraes and Basilisk gave mean total dry matter yields of 4.1, 4.1, 3.9, and 3.8 t $ha^{-1}$ respectively (Njarui et al 2016). This can be attributed to the difference in rainfall between the evaluation sites and Katumani. Agro-ecological zone UM3 generally receives more rainfall (900 ï 1050 mm) while agro-ecological zone LM4 receives 700 to 900 mm which is more than the average (710 mm) for Katumani research centre which is within agro-ecological zone UM4 (Jaetzold et al 2006).

**Table 2.** Mean total dry matter yield (t $ha^{-1}$) of Brachiaria grasses in Machakos and Makueni

| Cultivar | Machakos (UM3) | Makueni (LM4) |
|---|---|---|
| *Brachiaria brizantha* cv. Xaraes | 9.9 | - |
| *Brachiaria brizantha* cv. Piatã | - | 8.4 |
| *Brachiaria brizantha* cv. MG4 | 10.4 | 6.0 |
| *Brachiaria decumbens* cv. Basilisk | 9.5 | 7.3 |
| LSD (P<0.05) | 3.7 | 2.1 |

*- cultivar not planted in that site*

**Farmers' assessment of Brachiaria grasses**

Table 3 shows farmersô rating of the characteristics that were used to assess the performance of Brachiaria grasses in Machakos and Makueni counties. There were no significant differences (P>0.05) in the success of grass establishment between the two counties, though more farmers (62.5%) in Machakos county reported successful grass establishment than in Makueni county (57.8%). There were significant differences (P<0.05) in growth and yield rating between the

counties with more farmers in Machakos county rating growth and yield of the grass as very good. Satisfaction on milk production after feeding dairy cattle on Brachiaria grass was significantly different P<0.1 between the counties. More farmers (95.7%) in Machakos were very satisfied or satisfied than in Makueni county (78.1%). No significant differences (P>0.05) were found between the two counties on the ease of harvesting/cutting Brachiaria compared to Napier grass. However, 77.6% and 75.6% of farmers in Machakos and Makueni respectively reported that Brachiaria grass was easier to harvest/cut than Napier grass. The ease of chopping Brachiaria grass compared to Napier grass was very highly significant (P<0.01) between the counties with 83.7% of farmers in Machakos reporting that Brachiaria grass was easier to chop than Napier grass. There were no significant differences (P>0.05) between the counties on the ease of making hay from Brachiaria compared to other grasses. Despite the positive attributes associated with Brachiaria grass, farmers reported some negative attributes. In agro-ecological zone UM3, majority of farmers (75.0%) reported that the grass was not drought tolerant, 12.5% of farmers reported that it did not produce seed and was not pest tolerant especially cv. Basilisk (12.5% of farmers). In agro-ecological zone LM4, forty percent of farmers reported that the grass was not pest tolerant, was difficult to establish (40% of farmers) and the grass (cv. Basilisk) was hairy (20% of farmers).

**Table 3.** Farmersô assessment on performance of Brachiaria grasses in Machakos and Makueni

| Characteristic | Response | Machakos (UM3) | | Makueni (LM4) | | $\chi^2$ | p |
|---|---|---|---|---|---|---|---|
| | | N | % | N | % | | |
| Success on grass establishment | Good | 30 | 62.5 | 26 | 57.8 | 0.22 | 0.642$^{ns}$ |
| | Moderate | 18 | 37.5 | 19 | 42.2 | | |
| | Poor | 0 | 0.0 | 0 | 0.0 | | |
| Rating on growth of grass | Very good | 34 | 69.4 | 21 | 46.7 | 7.373 | 0.025$^{**}$ |
| | Good | 12 | 24.5 | 23 | 51.1 | | |
| | Moderate | 3 | 6.1 | 1 | 2.2 | | |
| | Poor | 0 | 0.0 | 0 | 0.0 | | |
| Rating on yield of grass | Very good | 34 | 70.8 | 17 | 40.5 | 8.417 | 0.015$^{**}$ |
| | Good | 11 | 22.9 | 20 | 47.6 | | |
| | Moderate | 3 | 6.3 | 5 | 11.9 | | |
| | Poor | 0 | 0.0 | 0 | 0.0 | | |
| Satisfaction on milk production | Very satisfied | 24 | 51.0 | 17 | 41.5 | 6.416 | 0.093$^{*}$ |
| | Satisfied | 21 | 44.7 | 15 | 36.6 | | |
| | Fairly satisfied | 2 | 4.3 | 8 | 19.5 | | |
| | Not satisfied | 0 | 0.0 | 1 | 2.4 | | |
| Ease of cutting/harvesting Brachiaria compared with Napier grass | Easier to cut than Napier | 38 | 77.6 | 34 | 75.6 | 1.747 | 0.417$^{ns}$ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | The same as Napier | 5 | 10.2 | 8 | 17.8 | | |
| | More difficult than Napier | 6 | 12.2 | 3 | 6.7 | | |
| | Easier to chop than Napier | 41 | 83.7 | 22 | 50.0 | 17.760 | $p<0.001^{***}$ |
| Ease of chopping Brachiaria compared with Napier grass | The same as Napier | 3 | 6.1 | 8 | 18.2 | | |
| | More difficult than Napier | 4 | 8.2 | 2 | 4.5 | | |
| | Never chopped Brachiaria | 1 | 2.0 | 12 | 27.3 | | |
| | Easy to conserve | 24 | 49.0 | 21 | 46.7 | 2.225 | $0.329^{ns}$ |
| Ease of making hay from Brachiaria compared with other grasses | Difficult to conserve | 0 | 0.0 | 2 | 4.4 | | |
| | Never conserved Brachiaria | 25 | 51.0 | 22 | 48.9 | | |
| Negative aspects associated with Brachiaria grass | Does not produce seed | 2 | 12.5 | 0 | 0.0 | 18.113 | $0.053^{*}$ |
| | Not drought tolerant | 12 | 75.0 | 0 | 0.0 | | |
| | Pest infestation | 2 | 12.5 | 4 | 40.0 | | |
| | Difficult to establish | 0 | 0.0 | 4 | 40.0 | | |
| | Hairiness | 0 | 0.0 | 2 | 20.0 | | |

**=significant at P<0.1, **=significant at P<0.05, ***=significant at P<0.01, ns=not significant*

**Farmers' preference of Brachiaria grasses**

Farmersôpreference of Brachiaria grass cultivars varied with county (agro-ecological zone) (Figure 2). Xaraes was the most preferred cultivar in Machakos county (56% of farmers) while Piatã was the most preferred cultivar in Makueni county (49% of farmers). Basilisk was the second most preferred cultivar in both counties with 38% and 40% of farmers preferring the cultivar in Machakos and Makueni respectively. Although cv. Xaraes was not the best on dry matter yield in Machakos, it was preferred over the other cultivars due to increase in milk production when fed to dairy cattle (48% of farmers) and its fast regrowth after harvesting (34% of farmers) (Figure 3). Fast regrowth after harvesting ensures feed availability throughout the year. These results are similar to those obtained in Rwanda by Mutimura and Everson (2012) where although *Brachiaria* hybrid cv. Mulato II was not the most productive grass, it was preferred by farmers because of its adaptability to low rainfall and acidic soil stress, and its production of green forage year round without any input of

fertilizer. Cv. Piatã was preferred for its fast regrowth after harvesting (35% of farmers), height (30% farmers) and drought tolerance (25% farmers) (Figure 3). Similar results were found by Roothaert and Franzel (2001) where improved milk production and drought resistance were some of the key criteria that farmers used to evaluate local fodder trees and shrubs in central Kenya.

**Figure 2.** Farmersô preference of Brachiaria cultivars (a) Machakos (b) Makueni

**Figure 3.** Reasons why farmers preferred (a) Cv. Xaraes (b) Cv. Piata

## Conclusions

- In the current study four Brachiaria grass cultivars were evaluated for adaptability and acceptability in agro-ecological zones UM3 and LM4 of Machakos and Makueni counties respectively. Accordingly, cv. MG4 produced the highest dry matter yield in Machakos while cv. Piatã produced the highest dry matter yield in Makueni. However, based on the farmersô assessment, the most preferred cultivar in agro-ecological zone Machakos was Xaraes while Piatã was the most preferred cultivar in Makueni. Dry matter yield from two yearsô evaluation indicate that *Brachiaria brizantha* cvs. MG4 and Xaraes are suitable for agro-ecological zone UM4 while *Brachiaria brizantha* cv. Piatã and *Brachiaria decumbens* cv. Basilisk are suitable for agro-ecological zone LM4.

- The four cultivars can be recommended for adoption and up-scaling in similar agro-ecological zones of Machakos and Makueni counties.

- The results of this study further indicated that, yield was not the only criteria that farmers used to evaluate new grass cultivars for forage production.

- Increase in milk production, fast regrowth after harvest, plant height and drought tolerance were the key criteria that farmers used in selecting Brachiaria cultivars in the study area.

- Participatory variety selection was instrumental in identifying Brachiaria grasses preferred by farmers according to their desired attributes and this approach is therefore suitable in disseminating and promoting new technologies.

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