Comparative analysis of improved and local varieties of Sorghum and Cowpea under farmer conditions in Mali.

By

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Abstract

A participatory farmer trial was planned with an objective to test the performance for grain and fodder yield of local and improved varieties of sorghum and cowpea under farmer conditions using farmer techniques to evaluate its impact on the grain and fodder yield so as to address the issues in dry season feeding in Mali. The treatments (T) were:

T1: Farmer preferred local variety of sorghum;
T2: Improved dual purpose sorghum;
T3: Farmer preferred local variety of cowpea and
T4: Improved variety of cowpea.

Random block design was used. Three farmers were selected for four treatments and for each treatment 3 farmers acted as 3 replication. Non-destructive and destructive observations were collected on crop performance. Apart from that from every farmer field, samples were taken for grains and stovers in case of sorghum, and cowpea. Data was analysed using ANOVA. Results indicated that farmers preferred local variety for sorghum was Gnodjonani and introduced improved dual purpose variety of sorghum was Fadda. In case of cowpea – farmer preferred cowpea variety was Kadochoni, while introduced improved variety was...
Dounanfana. This introduction of improved varieties has helped the farmers by having more options of variety in their village crop germplasm. Fadda had significant results in terms of parameters like days of maturity, flowering days, and panicle weight. Local variety of sorghum had more fodder yield. Dieba village had better panicle length, while number of plants harvested in village Flola were significant. Cowpea crop was mostly grown for haulms. The cowpea forage yields were more in village Dieba for improved variety Dounanfana (139 g/plot) than local-Kadochoni (105 g/plot), similar was the case for village Flola but with lesser yields as compared with village Djeba (improved cowpea-97 g/plot) and local cowpea- 90 g/plot. There were no significant results on performance of destructive and non destructive observations for both cowpea varieties.

**Keywords**: Dual purpose sorghum, cowpea, feed and fodder

**Introduction**

Good genetic variability for grain and fodder yields, crude protein, digestibility of dry matter, nitrogen retention, and contents of lignin and tannin were observed in maize, sorghum, pearl millet, cowpea, groundnut, soybean, cassava, and sweet potato, all major food and feed crops in West Africa. High yielding dual purpose varieties have also been developed in several crops that catalyse the development of improved crop-livestock farming systems (Singh et al., 2001). Cereal and legumes are highly desirable quality livestock feeds but are currently greatly underutilized and often poorly managed. Generally in case of dry arid lands, availability of feeds and fodder is inadequate. Feed variability is an issue and crop-residues are found in plenty and yet mis-managed leads to increase biomass pressure. Livestock feeding face constraints of quality, quantity and seasonality of the feeds. Concurrently small-scale crop-livestock farmers are finding difficulties in providing through enough high-quality forage for their animals. This situation provides an exciting opportunity for greater emphasis on dual purpose crops to meet the future challenges of increasing productivity. There is no doubt that in future food and feed production will have to be met through increased productivity per unit area. For example, dual purpose crops can provide grain for human consumption and residues for livestock nutrition from the same land area with similar amount of inputs including water. As with rapid urbanization and growing population coupled with decreasing farm sizes, mostly farmers give importance to cultivate their farm lands for staple food production than for cultivating livestock feeds and forages, clearly, the croplands must provide the feed resources, therefore for increased population dual purpose crops must deliver to the dual requirement of human and livestock nutrition. As cereal crops and legumes play a substantial role in the nutrition of livestock throughout the Sudano-Sahelien zone of Africa.

Quality of local and improved varieties, yields, disease resistance and mineral content in grain should also be an important consideration of their value and merit; whilst a wide options of cereals and legumes in particular have traditionally provided both grain and fodder, research focus has begun to shift towards improving the productivity,
quality and feeding systems of crop residues. (Lenne et al., 2005). There is also a need to provide information on farmer preferred local germplasm, as it gives base material for breeders for making new varieties with preferred traits.

Keeping this reason, a participatory farmer trial was planned in west African country Mali, with an objective to test the performance for grain and fodder yield of local and improved varieties of sorghum and cowpea under farmer conditions using farmer techniques to evaluate its impact on the grain and fodder yields.

**MATERIALS & METHODS**

The treatments were as follows:

T1: farmer preferred local variety of sorghum; T2: Improved dual purpose sorghum; T3: Farmer preferred local variety of cowpea and T4: Improved variety of cowpea. Random block design was used. Three farmers were selected for four treatments and for each treatment 3 farmers acted as 3 replication.

**Farmer selection criteria:**

1. Those farmers will be selected who are willing to participate in the trial. This a total of 12 farmers from two villages of Flola and Djeba of Bougouni district of Mali volunteered and participated in the trial.
2. Living the villages of action sites
3. Preference was given for inclusion of women farmers

Conditions and protocols followed by the selected farmers

1. Variety was same in all replications for improved seed of sorghum in all treatments and same variety of local sorghum in all treatments. Similar was the case for cowpea improved and local varieties.
2. Sowing time in all the plots were the same
3. Seed rate, manure application, intercultural operation were the same
4. Harvest time were the same.
5. The farmer kept the fodder/crop-residue for animal feeding trial next year from the crop trial

**Results and Discussion**

Planning workshops were held by the participating farmers in the village of Fiola, Sibirila and Djeba of district Bougouni to know farmer needs on crop preference, number of participating farmers and inputs requirement like seeds, manure, fertilizer requirement etc. Thus, a total of 12 farmers volunteered for the trial. The details are as follows:

- **Location:** Village of Fiola and Djeba, of district Bougouni, Mali
- **Period of the trial:** July to December (rainy and dry season) 2015
- **Trial conditions:** Farmer’s conditions
- **Total Number of the farmers:** 6 farmers in Dieba and 6 farmers in Flola
One local and one improved variety of sorghum and one local and improved variety of cowpea was selected by the participating farmers.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Local</th>
<th>Improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorghum</td>
<td>Gnodjonani</td>
<td>Fadda</td>
</tr>
<tr>
<td>Cowpea</td>
<td>Kadochoni</td>
<td>Dounanfana</td>
</tr>
</tbody>
</table>

In the trial, in 2 locations Djeba and Flola there were four farmers for cowpea crop and 6 farmers for sorghum crop.

**Sorghum and cowpea intercropped**

The plowing was carried in 07/24/2015 and 07/28/2015 at Flola and between 07/18/2015 and 07/31/2015 at Djeba for both sorghum and cowpea. Time of sowing at Flola varied between 08/02/2015 and 08/11/2015, while at Djeba between 07/26/2015 and 08/04/2015. The first weeding was completed in a day's work on trial plots between 08/11/2015 and 2nd weeding 08/19/2015 at Flola while 08/08/2015 as first and 08/13/2015 as second weeding at Djeba. Third weeding was carried on 08/26/2015 and final on 09/04/2015 at Flola, while third weeding done was on 08/19/2015 and final on 08/28/2015 at Djeba. The crops were harvested at Flola 150 days after sowing (DAS) and at Djeba at 180 DAS. As reported by the farmers on an average 24.16 kg and 25.42 kg of grain was kept for home consumption at Flola and Djeba respectively. The quantity reserved for seed were: 2 kg at Flola and 1.57 kg at Djeba. Only a few farmers sold sorghum grain or seeds in the market. According to survey, in Djeba, 100% of sorghum production is oriented for self-consumption and or used as seed for the next crop year. But at Flola, 50 % of the producers sell (12.15%) to market of the total sorghum production at the price of 90 per kg. The cowpea crop was sown on the same dates, as that of Sorghum. Major pest and diseases were found and due to late sowing, there was no grain yield but only haulms in case of cowpea.

**Crop performance At Flola and Djeba**

**Sorghum**

The ANOVA on performance of each variety is as follows:

<table>
<thead>
<tr>
<th>Crops</th>
<th>Parameters</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Mean</th>
<th>Village</th>
<th>Variety and Village</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant height (m)/plot</td>
<td>2.110</td>
<td>2.018</td>
<td>2.09</td>
<td>2.033</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Panicle length (cm)/plot</td>
<td>25.32</td>
<td>24.58</td>
<td>23.60</td>
<td>26.45</td>
<td>.005</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Days of Maturity (days)/plot</td>
<td>115.08</td>
<td>138.83</td>
<td>&lt;.001</td>
<td>128.06</td>
<td>124.77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>50%</td>
<td>80.77</td>
<td>93.92</td>
<td>&lt;.001</td>
<td>86.93</td>
<td>87.24</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Comparison of improved Sorghum with local in two villages
The table above indicates (p<0.05) Fadda has significant results in terms of parameters like days of maturity, flowering days, and panicle weight. There was significant variation (p<0.05) in, fodder yield and panicle weight for local variety of sorghum had more fodder yield. There was a significant variation (p<0.05) in village for the number of hills per plot. There was a significant variation between variety and village for panicle length, number of plants, number of panicle harvested and panicle weight. Dieba village had better panicle length, while number of plants harvested in Flola were significant.

Cowpea

At FLOLA, 50% flowering was observed in the case of the variety Dounanfana from the 79th day while in the case of the variety Kadochoni, this observation was effective from 78th day. However in Djeba for those varieties Dounanfana and Kadochoni 50% Flowering was observed respectively from the 85th and 78th day. Maturity is reached on the 44th day after 50% flowering at Flola for the case of Dounanfana variety corresponding to 123 DAS while in the case of the Kadochoni variety, maturity was reached at the 118th DAS.

Table 2: Comparison of improved cowpea with local in two villages

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Dounanfana</th>
<th>Kadochoni</th>
<th>Djeba-Village</th>
<th>Dounanfana</th>
<th>Kadochoni</th>
<th>Flola</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Plant/Plot</td>
<td>809.5</td>
<td>787.75</td>
<td>798.625</td>
<td>836</td>
<td>778.25</td>
<td>807.125</td>
</tr>
<tr>
<td>Number of hills/plot</td>
<td>512.75</td>
<td>525.25</td>
<td>519</td>
<td>556.25</td>
<td>519</td>
<td>537.62</td>
</tr>
<tr>
<td>Days of Maturity (days)/plot</td>
<td>84.25</td>
<td>77.5</td>
<td>80.875</td>
<td>78.75</td>
<td>77.25</td>
<td>78</td>
</tr>
<tr>
<td>50% flowering (days)/plot</td>
<td>119</td>
<td>107</td>
<td>113</td>
<td>123</td>
<td>117.25</td>
<td>120.125</td>
</tr>
</tbody>
</table>
The most important forage yields are observed at Djeba for cases of both cowpea varieties. These yields are for the two varieties Dounanfana and Kadochoni respectively according to the locality 97 and 90 kg at FLOLA and at Djeba 139 and 105 kg. There were no significant differences observed within varieties, between villages and between variety and villages. The performance of both cowpea varieties looked the same. Cowpea crop was mostly grown for haulms. The cowpea forage yields were more in village Dieba for improved variety Dounanfana(139 g/plot) than local- Kadochoni(105 g/plot), similar was the case for village Flola but with lesser yields as compared with village Djeba (improved cowpea-97 g/plot) and local cowpea- 90 g/plot There were no significant results on performance of destructive and non-destructive observations for both cowpea varieties.

**Conclusion**

This introduction of improved varieties has helped the farmers by having more options of variety in their village crop germplasm. Fadda had significant results in terms of parameters like days of maturity, flowering days, and panicle weight. Local variety of sorghum had more fodder yield. Dieba village had better panicle length, while number of plants harvested in village Flola were significant. Cowpea crop was mostly grown for haulms.

**References**
