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# On Farm Evaluation and Demonstration of Rhodes Grass and *Sylosanthus guanensis* in Selected Districts of Sheka and Bench-Maji Zones, Southwest Ethiopia

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**Abstract:** The need to evaluate and identify the adaptability of these improved forage crops on station had been to identify the promising forage species to the particular agro-ecology. On farm evaluation and demonstration of Rhodes grass and *Stylosanthus guanensis* was carried out on 20 farmers' fields in Yeki and Sheko districts of Sheka and Bench-Maji zones during 2016 and 2017 cropping seasons. The study was to evaluate and demonstrate Rhodes grass and stylosanthus gaunensis at farmers' level and to assess farmers' opinion. The forages were planted on 10×10 plot size on each farmer's farm land. Dry matter yield, seed yield data and farmers perceptions were evaluated. The result indicated that there was variability in performance of the improved forage species between the districts and among the farmers within the districts. The dry matter yield and seed yield for Rhodes grass obtained range from 6-10t/ha and 190.3-315.4 kg/ha respectively. For Stylosanthus guanensis, the highest dry matter was obtained in sheko district (5.1t/ha) and the lowest mean dry matter yield recorded in yeki district (3.5t/ha). Similarly, highest seed yield (269.5 kg ha<sup>-1</sup>/year) was obtained in sheko district whereas the lowest seed yield (179.2 kg ha<sup>-1</sup>/year) was obtained in yeki district. Most of the farmers were select Rhodes grass than stylosanthus on majority of selection criteria. Further demonstration of improved forage crops allows farmers to improve their knowledge and understanding on cultivation and utilization of forages crops for their animals.

**Keywords:** Demonstration, Improved Forage, Farmer, Sheko, Yeki

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## 1. Introduction

Although Ethiopia has large livestock population, the productivity of the livestock resources and the benefits obtained from the sector does not proportionate with the high livestock population due to various constraints. Feed shortage both in quantity and quality remains the major constraint to good animal performance in Ethiopia [1]. The major feed resources to livestock in Bench-Maji and Sheka zones are natural pasture, crop residues (mainly green maize Stover, *teff* straw, barley), *enset* and babana, leaves and other homemade non-conventional feeds such as leftover of banana, taro leaf and residues of local drinks like *areke*, *tela*, fruits and vegetables reject [2, 3]. The authors indicated nowadays the contribution and productivity of natural pasture has been declining from time to time due to the expansion of

crop production at the expense of grazing land.

One of the options to improve feed availability and quality is through cultivating of different improved forage species. However, cultivation and utilization of improved forage crops species in the areas are not well known. Teppi agricultural research center has been evaluating different improved cultivated forage crops to Teppi condition. The need to evaluate and identify the adaptability of these improved forage crops on station had been to identify the promising forage species to the particular agro-ecology and to demonstrate and promote to the ultimate users (farmers).

Even though previous efforts made by districts agricultural offices had focused on introduction of different forage species such as Napier grass, Dolicos lablab and Sesbania, at the present time these forages are found rarely in the hands of farmers and utilization as animal feed is non-existent. The

perennials grass type rhodess grass (*Chloris gayana*) and herbaceous legume type *stylosanthus guanensis* are well adapted and promised forage crops, at Teppi agricultural research center, on station. Rhodes grass (*Chloris gayana*) is a perennial tropical grass and can adapt and survive in areas where annual rainfall ranges between 310mm and 4030mm and where temperature extremes are 5°C and 50°C [4]. Among different species of Stylo, (*Sylosanthus guanensis*) is an herbaceous perennial fodder legume and widely grown in many tropical countries [5]. It grows best at low altitudes and need more 7 than 700 mm annual rainfall [6]. However, these forage crops were not demonstrated and promoted to the ultimate users. Therefore, the aim of this study was to demonstrate and promote rhodes grass and *stylosanthus guanensis* legume forage crops at farmers' level and to evaluate farmers' opinion following demonstration of improved forage crops and their managements.

## 2. Materials and Methods

The study was conducted for two years (2016 & 2017) in Yeki and Sheko woredas. Sheko is located at a distance of 20 km west of Mizan-Aman, zonal city of Bench-Maji. Yeki district is located 80km south of Masha, zonal city of sheka. These selected woredas are categorized under mid-land agro-ecology characterized by crop-livestock production system.

### 2.1. "Kebele" and Participant Farmers' Selection

Two kebeles from yeki district namely Kubito and Addis Alem, and from sheko district Mehal Sheko and Giz-Meret were selected based on the potential of the livestock population. A total 20 farmers (5 farmers from each kebeles) were selected with districts livestock and fishery resources offices experts and Development Agents (DAs). Participated farmers were selected on the bases of their interest to cultivate the forage on their farm land. The experiment was conducted following participatory methodology where all the three major bodies (researchers, DAs and farmers) have involved in the evaluation process. Researchers played a role in provision of training, planting materials (forage seeds), design of the trial, data collection, where as farmers participated in the whole field management activities and in taking their own observation. On the other hand DAs serves as a bridge between farmers and researchers.

Rhodes grass (*Chloris gayana* acc. no. 7384) and *stylosanthus guanensis* were used for the demonstration purpose. Before cultivating the forage crops on the farmers' farmland training was given to the participated farmers, development agents (DAs) and woreda experts on how to manage and utilize the forage to their livestock's. The participant farmers were agreed to allocate 10m\*10m plot size for cultivation of each forage species.

### 2.2. Training to the Farmers and Development Agents (DAs)

Training was offered for farmers and Development Agents

(DAs) for two days to create awareness how to cultivate forage crops and their utilization system.

### 2.3. Forage Crop Management and Data Collection

The participant farmers' were prepared the land properly for each forage species and the seeds were prepared based on the recommended seeding rate of 8kg/ha for Rhodes grass and 4 kg/ha for *stylosanthus guanensis*. The forages were sowed by drilling in rows with 30cm spacing for Rhodes grass and 40 cm for *stylosanthus guanensis*. Diammonium phosphate (DAP) fertilizer at the rate of 100kg $ha^{-1}$  was applied for rhodes grass at planting and at every cuts. *Stylosanthus guanensis* was planted without application of fertilizer. The participant farmers agreed to apply all field management of the forage materials (hoeing, weeding and animal interference) were continuously monitored during the experimental period.

Agronomic data like plot cover, days to flowering, plant height at 50% of lowering stage, biomass yield and seed yield. Half of the plot was used for biomass determination and the remaining plot size (5\*10m) used for seed yield determination. Additionally farmers' opinion towards the technology was assessed. Descriptive statistic such as mean, frequency and percentage were used.

## 3. Results and Discussion

### 3.1. Establishment Performance

The plot cover percentage of the demonstrated forage species at four weeks of establishment period showed in figure 1. The overall mean percentage of plot covered by the plants at four weeks of establishment period for Rhodes grass in across the two years in Yeki was higher than Sheko district. Moreover, higher plot cover was recorded in the second year than in the first year of establishment. This might be due to higher number of tillers were emerged from the original stands. Similarly, the overall mean percentage of plot cover at four weeks of establishment period for *stylosanthus gaunensis* across the two years in Yeki was higher than Sheko district. [7] Suggested that establishment performance of the same species or variety might be varied across different location due to soil and climatic variations.

### 3.2. Agronomic Performance of Rhodes Grass

Agronomic data (Days to 50% of flowering, plant height, dry matter yield and seed yield) of Rhodes grass was presented in Table 1. The mean days to 50% flowering of Rhodes grass recorded highest (115.6 days) at kubito kebele and lowest (98.6 days) days after sowing at Mehalshoko kebele. Days to 50% flowering is indicated the optimum harvesting date for forage grasses. As described by [8] plant development and yield are severely affected by soil conditions such as moisture and soil fertility. This might be due to the climate at kubito kebele cooler. Plants height is one of the factors that can influence the herbage yield of forage species. The mean height measurements of Rhodes

grass at 50% of flowering stage was in this result ranges from about 139cm at Mehalsheko to 150cm at Gizmeret.

### 3.3. Dry Matter and Seed Yield of Rhodes Grass

The average productivity of Rhodes grass obtained in terms of dry matter ranges from 6.8 to 10.1t/ha/year. The performance of Rhodes grass is very good in all tested farmers' fields of yeki district than sheko district. The dry matter yield (t/ha) harvested in the second year were higher than in the establishment year. The dry matter yield showed variation across the years and locations. The variation of dry matter yield obtained across the kebeles might be due to environment (fertility of the soil) and management practices

of the farmers. This could be due to more number of tillers are emerged from the stand of the grass. [9] observed that Rhodes grass was found to be very persistent and vigorous with high tillering capacity.

The mean seed yield of Rhodes grass obtained highest in yeki district (315.4kg/ha at Kubito kebele) and lowest in sheko district (190.3kg/ha at Mehalsheko kebele). Though there was variation observed on across the evaluated districts, seed yield performance of Rhodes grass is very good in all tested farmers' fields of the districts. The seed yield obtained in this result lie between 60-650kg ha<sup>-1</sup> which obtained at farmers level [10].

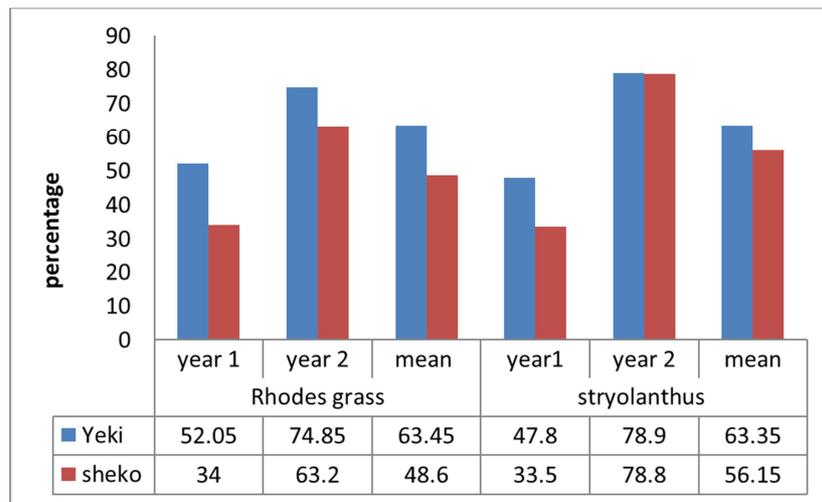


Figure 1. Percentage of plot covered by the plants of demonstrated forage species (Rhodes grass and stylosanthus gaunensis).

Table 1. Agronomic data of demonstrated forage species Rhodes grass in the districts.

| Parameters              | Forage Species |        |       |           |        |       |                |        |       |            |        |       |
|-------------------------|----------------|--------|-------|-----------|--------|-------|----------------|--------|-------|------------|--------|-------|
|                         | Rhodes grass   |        |       |           |        |       |                |        |       |            |        |       |
|                         | Yeki district  |        |       |           |        |       | Sheko district |        |       |            |        |       |
|                         | Kubito         |        |       | Addisalem |        |       | Gizmeret       |        |       | Mehalsheko |        |       |
|                         | Year 1         | Year 2 | Mean  | Year 1    | Year 2 | Mean  | Year 1         | Year 2 | mean  | Year 1     | Year 2 | Mean  |
| Days to 50% flowering   | 117.85         | 113.4  | 115.6 | 115.8     | 106.7  | 111.2 | 104.1          | 95.8   | 99.9  | 107.55     | 89.75  | 98.6  |
| Plant height (cm)       | 154.2          | 139.3  | 146.7 | 145.6     | 148.7  | 147.2 | 143.9          | 156.9  | 150.4 | 138.5      | 141.1  | 139.8 |
| Dry matter yield (t/ha) | 9.3            | 10.8   | 10.1  | 8.8       | 7.8    | 8.3   | 7.9            | 8.1    | 8     | 6.3        | 7.4    | 6.8   |
| Seed yield (kg/ha)      | 298.2          | 332.6  | 315.4 | 333.2     | 327.3  | 330.2 | 307.7          | 318.7  | 313.2 | 151.2      | 229.3  | 190.3 |

### 3.4. Agronomic Performance of Stylosanthus gaunensis

Agronomic data (Days to 50% of flowering, plant height, dry matter yield and seed yield) of *Stylosanthus gaunensis* was presented in Table 2. The mean days to 50% flowering of *Stylosanthus gaunensis* recorded highest (123.2 days) in yeki district at Addis alem kebele and lowest (114.9 days) in sheko district at Mehalsheko kebele. This might be due to the climate at kubito kebele cooler. The mean height of *Stylosanthus gaunensis* at 50% of lowering stage recorded in this result ranges from about 104.2cm to 107.7cm. As described by [8], plant development and yield are severely affected by soil conditions such as moisture and soil fertility.

Mean dry matter yield of *Stylosanthus gaunensis* ranged from 3.5 to 5.1ton ha<sup>-1</sup> per year. The dry matter yield showed variation across the years and locations. The dry matter yield (t/ha) harvested in the second year were higher than in the establishment year. This could be due to more number of tillers are emerged from the stand of the grass. The variation of dry matter yield obtained across the kebeles might be due to environment (fertility of the soil) and management practices of the farmers. [11] supported that edaphic and climatic factors and management practices could vary the productivity of forage species. The mean seed yield of *Stylosanthus gaunensis* obtained highest in sheko district (269.5 kg ha<sup>-1</sup>/year at Mehalsheko) and lowest in Yeki district (179.2 kg ha<sup>-1</sup>/year at Addis alem kebele).

Table 2. Agronomic data of demonstrated *stylosanthus gaunensis* in the districts.

| Parameters              | Forage Species                |        |           |        |          |       |                |        |       |        |        |       |
|-------------------------|-------------------------------|--------|-----------|--------|----------|-------|----------------|--------|-------|--------|--------|-------|
|                         | <i>stylosanthus gaunensis</i> |        |           |        |          |       |                |        |       |        |        |       |
|                         | Yeki district                 |        |           |        |          |       | Sheko district |        |       |        |        |       |
|                         | Kubito                        |        | Addisalem |        | Gizmeret |       | Mehalsheko     |        |       |        |        |       |
|                         | Year 1                        | Year 2 | Mean      | Year 1 | Year 2   | Mean  | Year 1         | Year 2 | mean  | Year 1 | Year 2 | Mean  |
| Days to 50% flowering   | 124.2                         | 112.7  | 118.4     | 127.6  | 118.8    | 123.2 | 117.4          | 120.3  | 118.9 | 120.1  | 109.65 | 114.9 |
| Plant height (cm)       | 111.2                         | 104.3  | 107.7     | 115.8  | 102.2    | 109   | 106.3          | 107.3  | 106.8 | 102.8  | 105.6  | 104.2 |
| Dry matter yield (t/ha) | 4.6                           | 4.8    | 3.7       | 4.7    | 3.4      | 3.5   | 4.5            | 5.6    | 5.05  | 4.9    | 5.3    | 5.1   |
| Seed yield (kg/ha)      | 133.4                         | 194.3  | 163.8     | 150.25 | 208.3    | 179.2 | 225.4          | 313.6  | 269.5 | 225    | 310.4  | 267.7 |

### 3.5. Farmers' Evaluation Criteria and Preferences of the Forages

Evaluation of demonstrated forage varieties by farmers is very important to know their perception and opinion either they perceive them positively to cultivate or not. In this regard, all 20 farmers' were interviewed on different aspects of evaluation criteria such as ease of establishment, earliness to harvest, easiness to harvest, leafy nature and palatability by the animals and the result was presented in (Table 3). The result of farmers' evaluation criteria, most of the farmers were select Rhodes grass than *stylosanthus* on majority of selection criteria.

Table 3. Perception of farmers towards demonstrated improved forages.

| Evaluation / selection Criteria | Forage species |     |             |    |
|---------------------------------|----------------|-----|-------------|----|
|                                 | Rhodes grass   |     | Sylosanthus |    |
|                                 | No             | %   | No          | %  |
| Ease of establishment (easy)    | 18             | 90  | 13          | 65 |
| (Difficult)                     | 2              | 10  | 7           | 35 |
| Earliness to harvest (Early)    | 19             | 95  | 3           | 15 |
| (late)                          | 1              | 5   | 17          | 85 |
| Easiness to harvest (Easy)      | 20             | 100 | 13          | 65 |
| (Less easy)                     | 0              | 0   | 7           | 35 |
| Leafy nature (Very good)        | 15             | 75  | 11          | 55 |
| (Good)                          | 4              | 20  | 7           | 35 |
| (Fair)                          | 1              | 5   | 2           | 10 |
| Palatable by animals (high)     | 20             | 100 | 3           | 15 |
| (Medium)                        | 0              | 0   | 13          | 65 |
| (low)                           | 0              | 0   | 4           | 20 |

## 4. Conclusion

In animal production and husbandry practice, feed shortage is one of the major technical constraints that has to be solved through demonstration and adoption of improved cultivated forage crops at the farmers level. Participation of farmers in technology evaluation allowed farmers to have an interest in technology adoption and perception. Therefore, farmers should be assisted by the extension services. In the same way, it will be necessary to improve the participation of farmers on cultivation and utilization practices of improved forage crops through sustainable manner. Extension service in the cultivation and utilization of improved forage at districts levels of livestock and fishery development need to be encouraged.

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