Introduction

Sustainable livestock production is highly dependent on the availability of quality feed and forage resources. Napier grass, also known as elephant or Uganda grass, is one of the most important tropical forage crops. It is widely used in cut and carries feeding systems [1] and is of growing importance in other agricultural systems. Napier grass possesses many desirable characteristics, including high yield per unit area, tolerance to intermittent drought and high water use efficiency making it forage of choice. It has the ability to withstand repeated cutting and will rapidly regenerate, producing palatable leafy shoots [2]. Agriculture is back bone of Ethiopian economy and accounts for 46% of Gross Domestic product and, livestock sector contributes 30% to 35% and more than 85% of cash income. The subsector also accounts for 19% export earnings [3].

Despite this fact feed shortage and poor quality of available feeds are the major constraints to increase livestock productivity in Sub Saharan Africa particularly Ethiopia [4]. Sowing a new pasture or improving an existing natural pasture requires a reliable source of seed or vegetative material or species recommended and adopted for the area [5]. Inadequate nutrition and feeding are major constraints to livestock production in sub-Saharan Africa (SSA). Feeds (usually based on fodder and grass) are either unavailable in sufficient quantities due to fluctuating weather conditions or are available but in a poor quality that they do not provide adequate nutrition [6]. These constraints result in low milk and meat yields, high
mortality of young stock, longer inter calving intervals and low animal weights [7].

Use of improved forages would reduce pressure on natural pasture, improve soil fertility and erosion of marginal lands, improve carbon sequestration to mitigate climate change, support system substantially and enhance natural assets and system reliance [7,8], for instances some of improved forage species can be used for these above services are desho grass, elephant grasses, sesebania sesban, Rhodes, oats, cow pea and others [3]. Therefore, to overcome this livestock production loss using alternative feed resources like Napier/Elephant grass is indispensable. Having this in consideration this research activity was developed to improve feed security of livestock in Dire Dawa and Harar rural areas through Napier/ Elephant grass demonstration on farmers land/degraded land and Farmers Training Center with the following objectives.

Objectives

- To evaluate the productivity of Elephant grass on degraded land and under farmers’ condition practice.
- To build farmers’ knowledge and skill on elephant/ Napier grass production importance for animal feed and management practice.
- To strengthen stakeholders linkages and collaboration among stakeholders in line with animal feed and livestock production.

Materials and methods

This research activity was undertaken in selected districts of Dire Dawa and Harar region.

Site and farmers selection

The Kebeles as research sites were selected purposively based on the potentiality, appropriateness of the area by considering lodging, slop’s land escape, access to road, suit for repeatable monitoring and evaluation in progress of sowing to harvesting, accordingly, Kile and Dodota from Harari and Wahil, and Bishan Bahe from Dire Dawa were selected. And also, farmers were selected based on their interest, innovation he/she has, land provision for this demonstration, interest in cost-sharing, willingness to share experiences for other farmers, and studying their profile Table 1.

Research design and implementation

Elephant/Napier grass cuttings (two varieties IRLI14983 and local check were selected for this demonstration purpose, because IRLI14983 variety was being adaptable in these environment when its adaptation trial on research station was conducted. Then, cuttings of Elephant grass were prepared in form of at least 5cm–8cm (in number 300–400 cuttings per kebeles in total of 12000–16000 cuttings) were planted on the contour in respect to 80cm between cuttings and 100cm between rows according to availability of contour structure or watershed areas in addition on Farmers Training Centers.

Data collection

Both quantitative data sheet were collected by data sheet and qualitative through personal field observation, individual interview, Focus Group Discussion by using checklist.

Data analysis

Quantitative data was analysed using simple descriptive statistics (Mean, Frequency and Percentage) while the qualitative analysed by was analyzed using narrative explanation.

Results and discussion

Training of farmers and other stalk holders

Multidisciplinary research teams: crop, extension and socio-economic researchers and other stakeholders (Offices of Agriculture and Natural Resource) actively participated by sharing their experience and knowledge, journalists for the sake of publicity of the work done, Development Agents, Experts and farmers were participated on the training entitled Elephant/Napier grass production and management Table 2.

Table 1: Summary of selected site and farmers with area coverage of the experiment.

| District | PAs | No. of trial farmers | FTCs | Area covered |
|----------|-----|----------------------|------|--------------|
| Dire Dawa | Wahil | 10 | 1 | - |
| Harari | Bishan Bahe Dodota Kile | 10 | 10 | 20mx 20m for each plots |
| Total | - | 40 | 1 | - |

Table 2: Participants on the elephant/Napier grass training at Research Sites.

| NNo. | Participants | Male | Female | Total |
|------|--------------|------|--------|-------|
| 1 | Farmers | 39 | 10 | 49 |
| 2 | DAs | 4 | 1 | 5 |
| 3 | District experts | 4 | 2 | 6 |
| 4 | Journalists | 3 | 0 | 3 |
| Total | - | 50 | 13 | 63 |

Among the participant stakeholders, 77.7% were farmers whereas 22.4% were female farmers’ participant. Different extension materials were utilized and distributed for the participants these were 35 leaflets and 20 manuals on the technology that are organized in Afaan Oromoo (local language) and English were distributed.

Agronomic and yield performance

The following table describes the yield performances of the demonstrated Elephant/Napier grass varieties across the study site. The yield performance of the improved varieties (IRLI14983 and local) were 10.62, 8.20, 8.87, 9.61 and 7.27, 5.60, 6.13, 6.19 ton/ha at Dodota, Sofi,Bishan Bahe Wahil respectively Tables 3,4.
Yield advantage

The result indicated that IRLI14983 variety has better yield (58.12 ton/ha) when compared with local check (55.07ton/ha). Accordingly, the yield advantage of the IRLI14983 variety over the local check was 48.17% under farmer condition Table 5.

Yield advantage of the demonstrated varieties was calculated using the following formula.

Yield advantage % = \frac{\text{Yield advantage of new variety} \times 100}{\text{Yield advantage of st; check}}

Yield advantage of standard check

Farmers’ Opinion/perception

Farmers set criteria after having know–how about the variety and by using those criteria they gave ranks for the varieties with reasonable remarks during variety demonstration that were: biomass, survival, adaptability, palatability by livestock, and drought tolerant. As a result, most of the farmers selected IRLI14983 variety to reuse on their farm for the future as depicted in following Table 6.

Discussion

The highest average yield of the IRLI14983 Elephant/ Napier grass were recorded at Dodota 10.62 ton/ha and Wahil 9.61 ton/ha as compare to local varieties across the sites. This indicates that this variety is very adaptable and suit with the existing environmental conditions in these sites. And there was yield difference of the varieties across the research sites due to rainfall, soil type and other climatic conditions. In addition there was yield advantage of IRLI14983 variety over local check that is 48.17% as depicted in Table 5 since there was yield of 3.03 ton/ha in comparison and statistically significant difference at p<0.01.

Moreover, farmers evaluated these two varieties (IRLI14983 and local) at different stages based at farm level based on their own criteria: good biomass, good survival, adaptable, good palatability and drought tolerant, accordingly, ranked IRLI14983 variety on first rank as compare to local as shown on Table 6, and even evaluated these criteria by pair–wise ranking, as result, ranked biomass first with the rest as on Table 7. Based on these above result and discussion the following conclusion recommendations were derived.

Conclusion and recommendation

The yield performances of the demonstrated elephant grass varieties across the study sites were 9.32ton/ha for (IRLI14983) and 6.29 ton/ha for local variety with 3.03ton/ha yield difference in which IRLI14983 has more yield advantage 48.17% over local variety. As a result, farmers selected IRLI14983 variety on first rank due to its good biomass, good survival, and adaptable, good palatability and drought tolerant because in these areas there is an opportunity of underground water availability, suitable soil, and other suit climate conditions they can produce this Elephant/Napier grass IRLI14983 variety in these agro–ecology.

Therefore, from this research finding it is recommended to promote further IRLI14983 Elephant/Napier grass variety in similar agro–ecology is very important by government, Nongovernment and other stakeholders through their program to small holder farmers for enhancement of food security for human and feed forages for livestock.
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Contributions of authors

Abdulaziz Teha—collected data, analyzed data, wrote final report.

Ibsa Aliyi—collected data, entered and analyses partially and edited the final report.

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