Grass2Cash beneficiary scoping and on-farm monitoring in Western Kenya - 2020 report of activities

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1. Introduction

Kenya has one of sub-Saharan largest dairy sectors which contributes 12 % to the country's GDP and 40% to the agricultural GDP. The dairy sector is particularly heavily dependent on forage production, however many smallholder have insufficient quantity and quality of forage that limits the productivity of dairy cows. In western Kenya, a medium-high rainfall area where mixed farming is practiced, growing and feeding livestock with Napier grass (*Pennisetum purpureum)* and crop residues of maize, sorghum or finger millet is a common practice. Moreover, practices of grazing in communal land, forests and roadsides are used to compliment cut and carry practices. Although these feeds have been relied on by farmers as a source of nutrition to livestock their nutritive quality and adequacy is highly compromised. Changing weather patterns that lead to prolonged droughts have further worsened ease access and availability of livestock feeds throughout the year.

Although much research has been conducted resulting in improved forage varieties with a potential of providing highly nutritious feed, translating production levels of these forage grasses from research stations to the farm level has often proven to be challenging. Forage production at farm level, unlike at the research stations, takes place under heterogeneous conditions including variability of soils nutrients, climatic factors and management practices among farmers. This heterogeneity has made it difficult to upscale technologies that were developed under homogenous conditions in research stations.

The general objective of this study is therefore to determine the effects of on farm variability on the yield of selected species of *Panicum maximum* and *Brachiaria* spp in western Kenya. The specific objectives are to i) determine the effects of on-farm agronomic management practices on the performance of selected forage varieties, and to compare them to the yields obtained from researcher-managed plots; ii) determine the effects of selected soil properties and climatic factors on yield of selected forage varieties; iii) determine the financial costs and benefits associated with on-farm cultivation of the forage varieties.

2. Beneficiary scoping survey

The Grass2Cash project has seen farmers benefit from planting material in the form of *Panicum* and *Brachiaria* grass seeds. Farmer beneficiaries were distributed in four counties in the larger western Kenya i.e. Kakamega, Bungoma, Busia and Siaya counties. It was established there was need to carry out a scoping survey among beneficiaries that entirely focused on 480 farmers who has received planting material (forage seeds) and training as initial cohort between July-September of 2019 from Send a Cow peer farmers. Additionally, this time frame is considered a period where one year later on, farmers would have well established forage plots, and have had some managing experience including harvesting several times. The scoping survey was a necessary step towards obtaining farmers that will be included in the on-farm agronomic monitoring which will include a data collection period of 6 months evaluating on farm management practices of farmers and the effect this has on forage production and overall forage technology adoption in Western Kenya.

Objectives of the scoping survey

i) Establish rate of forage plots establishment and continuation among 480 beneficiaries that received training and forage seeds as of September 2019.

ii) Establish extent and quality of forage plots and forage utilization among farmer beneficiaries in all the four counties.

The survey ran for a period of eight days excluding a one day training of enumerators. Enumerators were introduced to the survey intended to achieve, and trained on the use of Open Data Kit (ODK) which was utilized for the entire survey in administering and answering of the questionnaire. Objectives the survey enumerator training were:

1) To understand geographical areas that the survey was to be carried out (in this case the four counties)

2) To understand how to use the Open data Kit for data collection

3) To understand the components if the survey questionnaire

4) To carry out a practical test in the field.

The table below shows dates in which the survey took place in each county.

Date	County
2nd and 3rd September	Kakamega
4th and 7th September	Bungoma
8th and 9th September	Busia
10th and 11th September	Siaya

Results

Total number of targeted farmer's beneficiaries was 480 which had previously been tracked with an ODK tool.

a) Out of these only 400 could be surveyed (83.3%) due to several factors: some farmers had double entries in the initial beneficiaries list as they received various varieties, while most could not be traced since they moved or died in the past one year, or were unknown to the peer farmer.

b) Out of these 400 farmers, 391 farmers confirmed receiving seeds in 2019 from Send a Sow Peer Farmer which is an equivalent of 97.5%. In Kakamega County for instance 98.4% beneficiaries received seeds, and 99.1 % in Bungoma. Busia recorded a 100% of each interviewed farmer receiving seeds while Siaya recorded 93.2%. The highest number of beneficiaries was recorded in Kakamega at 123 followed by Bungoma at 113, Bungoma had 100 beneficiaries while Siaya recorded the lowest at 69.

c) Out of the total 391 seed beneficiaries 28% received Mombasa,38.5% Tanzania, 0.7% Masaai,11.7% Cayman, 10.2% Mulato II, 0.4%Cobra, Xareas had 8.5%, Piata 0.2%, Basilisk 0.7% while Mg4 recorded 0% which meant none of the surveyed farmers benefited from Mg4 variety. 97.4% of farmers had received some form of training from their peer farmers while only 2.6 had not received training. The average acres owned by farmers in the survey was 2.3 acres.

d) This resulted in a total number of entries in the database of 425 since some farmers had more than one variety of forage which was ultimately considered as a separate entry during data analysis. Among 415 farmers who confirmed receiving seeds in 2019, a total of 360 equivalent to 86.7% planted while 13.3% did not plant the seeds. Reasons highlighted for failure to plant ranged from misplacing of seeds, some are still keeping seeds in the house, social issues, climatic factors such as lack of rain, inadequate land to establish forage plot. Majority of farmers represent those who planted the seeds from July to September 2019. Some farmers waited for short rain in October and November to plant while others planted

as recent as February, March and April of 2020 which most farmers attribute to inadequate rainfall that discourages the establishment of forage plots.

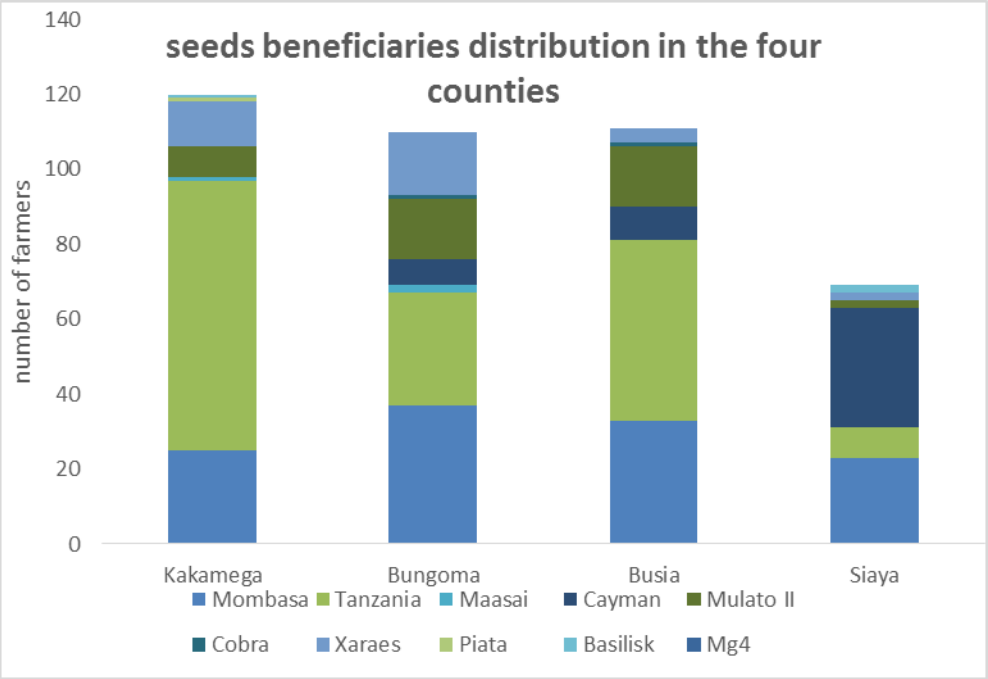


Figure 1 shows distribution of forage varieties surveyed per county.

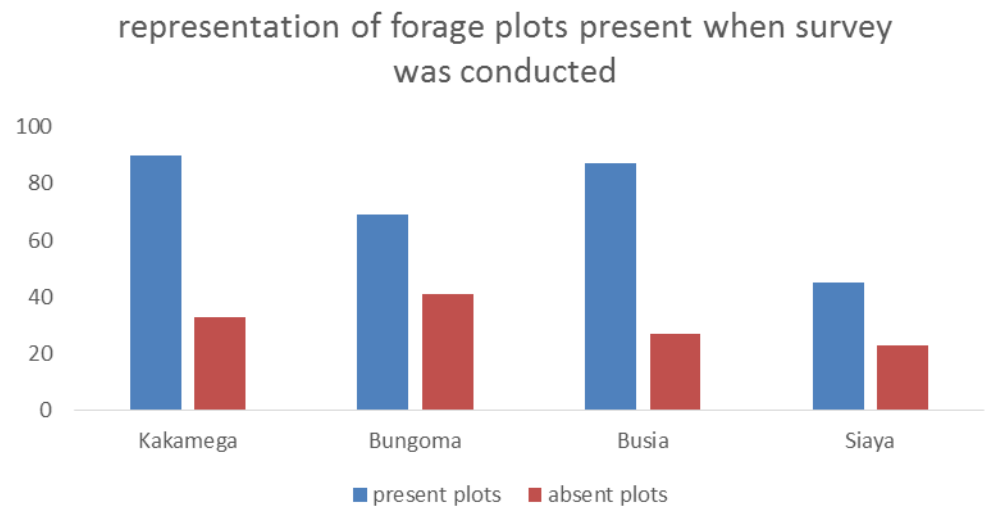
Forage plots present at time of survey

At the time the survey was conducted, a total of 291 which is 70.1% plots were present or existed while 29.8% or 124 plots could not be traced and were absent. Contributing factors to absence of plots included:

- Poor germination of seeds in farms and nurseries
- Flooding which resulted in washed away seedlings
- Drought which contributed to poorly established forage plots
- Uprooting to plant other crops including cereals (maize, beans) and Napier grass
- Social wrangles among household members
- Poor maintenance and management practices such a weeding and manuring
- Overgrazing which was rampant in farms that do not practice cut and carry.

Busia County led with the highest present forage plots during time of survey. Out of a possible 114 plots 87 plots were present making it 76.3% and only 27 absent plots. Kakamega came second with 73.8% of plots being present. Bungoma had 69 present plots which account for 62.7% while Siaya came in last with 66.1% plots being present.

Figure 2: illustrates forage present and absent at time survey was conducted.



Management practices (weeding, harvesting)

91.5% of farmers prefer using hand digging tillage method to prepare land before planting. The other 3.1% used ox plough while another 5.2% combine hand hoes and ox plough to prepare land for planting. Most farmers have weeded their plots 3-times making 39.8% of the population. 22.1% have weeded above 5 times. Farmers who weeded 1-2 times and 4-5 times make 17.3% and 18% respectively. Very few farmers have entirely never weeded their plots at 2.8%. 34.36 farmers have harvested 3-4 times in all four counties. A reported 23% have harvested above 5 times with 20% having harvested 4-5 times. Few farmers have harvested less than two times and make only 17.9% and only 4% reported never harvesting their forage plots.

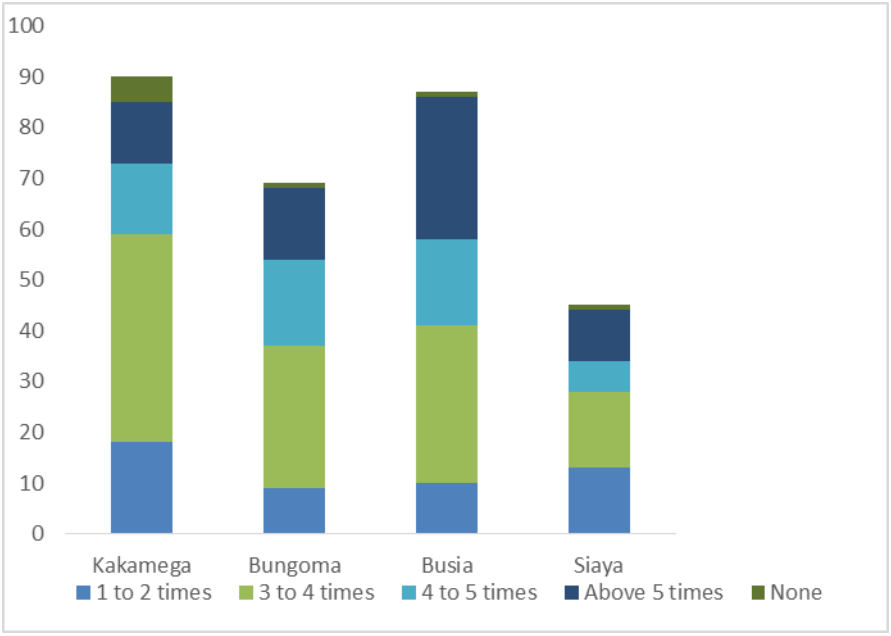


Figure 3 shows weeding patterns among farmers in the various counties.

In Kakamega County, the highest farmer population at 38.9% have harvested 3-4 their forage plots which is a similar case in Bungoma at 36.2%, In contrast the most of the farmers which is 29% reported having harvested above 5 times in Busia. In Siaya farmers harvested 1-2 times or 3-4 times which both represent 33% of farmer beneficiaries with plots.

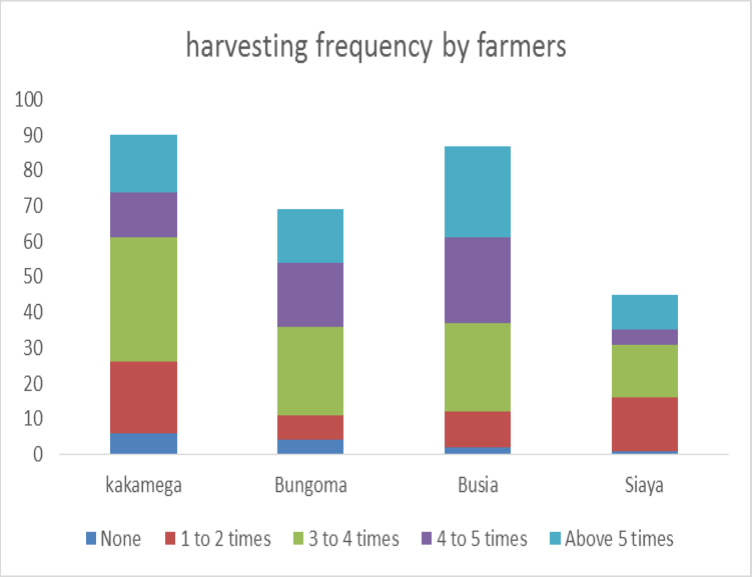


Figure 4 illustrates harvesting frequencies among forage beneficiaries in the four counties.

Forage appreciation and reasons

On a scale of 1-5 highest percentage of farmers appreciate the forage varieties at an average of 4 which is followed by farmers who rate the forage at a 5 which makes 29.55%. An average 16% think the grass should be scored at 3. Some of farmers have low appreciation level and scored the grass at 1 which is 1.3% of the farmers while 1.7% scored the forage at 2. As an observation most farmers who scored the forage low at either 1 or 2 have never either harvested and utilized the grass or were demoralized after poor germination.

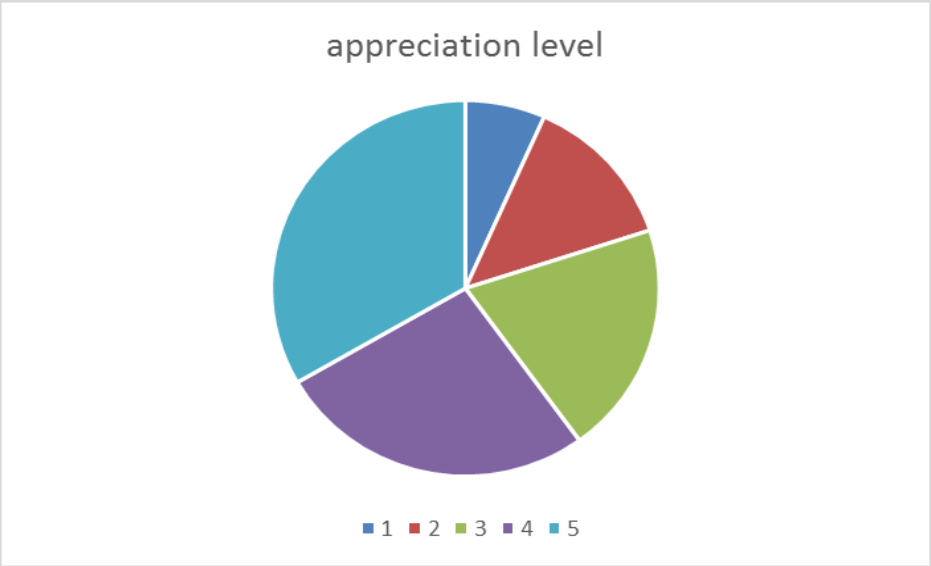


Figure 5 shows level of forage appreciation among farmer beneficiaries.

Farmer's often gave more than reason as to why they prefer the forage. Combination of high yield, palatability by cows, and fast regrowth after cutting being rampant. Other farmers attributed their preference of the forage to generating income for the household. Selling grass has enabled one farmer for example to purchase a calf.

Palatability by cows was most appreciated at 74.9%. Increased milk production was reported by 64.4% of the farmers. 54.3% said they appreciate the grass due to its fast regrowth after cutting. Aspects of the grass being soft and easy to cut was reported by48% of the farmers. Only 41.9% reported high yields while resistance to pest and drought was reported by 28.86% and 18.2% of the farmers respectively.

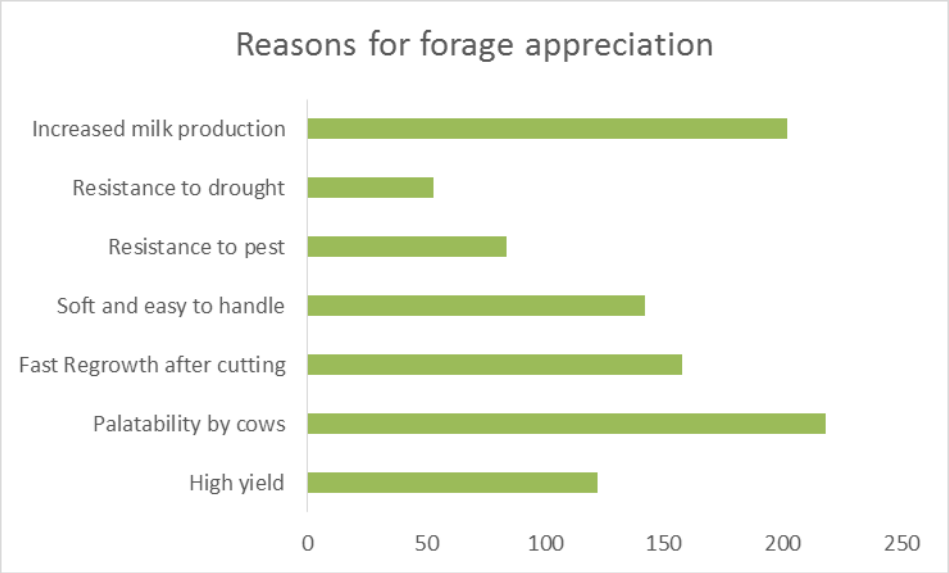


Figure 6 illustrates various reasons given by farmers for their forage appreciation.

Planting methods

On average, the plot area of each farmer is approximately 197.2m^2

272 farmers (93.4%) have planted forage plots in one area/plot. 80.4% of farmers have established the forage plots as mono crops, and 15.8% have mixed cropped the forage and included various other crop species in the plot. Another 3.4% have intercropped the forage plot with beans, sweet potatoes, cassava and bananas.

Forage utilization

86% of farmers used harvested forage to feed their own cows while 6% use it to feed other cows that do not belong to them. 14% reported selling forage to gain income. Moreover, most farmers who sold the grass had surplus after feeding and that is what is disposed by selling. Very few farmers entirely sell the whole harvest for financial gain. The percentage that sell their entire harvest attributed that to lack of cows to feed the grass.

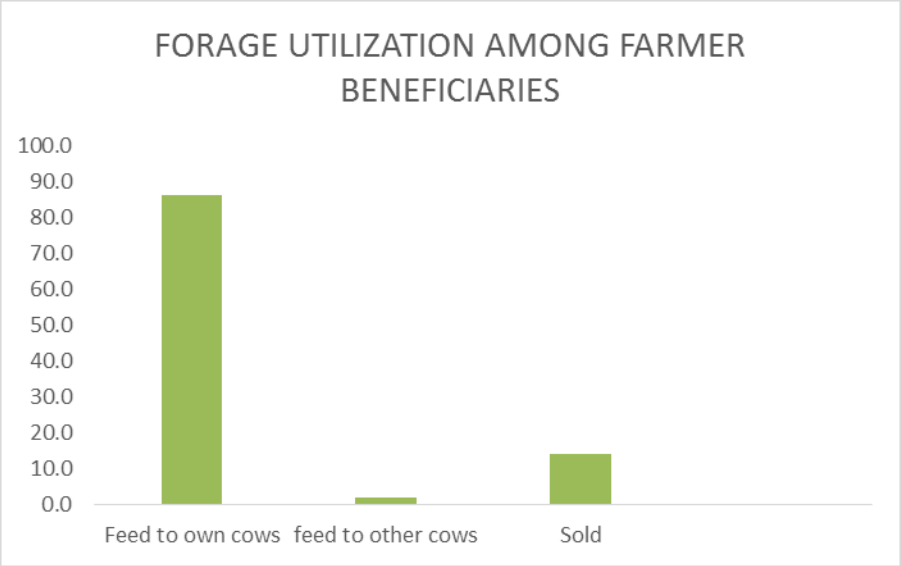


Figure 7: shows forage utilization by farmer beneficiaries

Forage performance

Among the four counties Busia lead with the best performing forage plots. The total percentage of very good performing plots were few at only 13%. The opposite extreme plots performing poorly represented 14% of the total plots. Average plots were 30.2% with majority of plots performing good (60-80%) and represented 41.6% of the population.

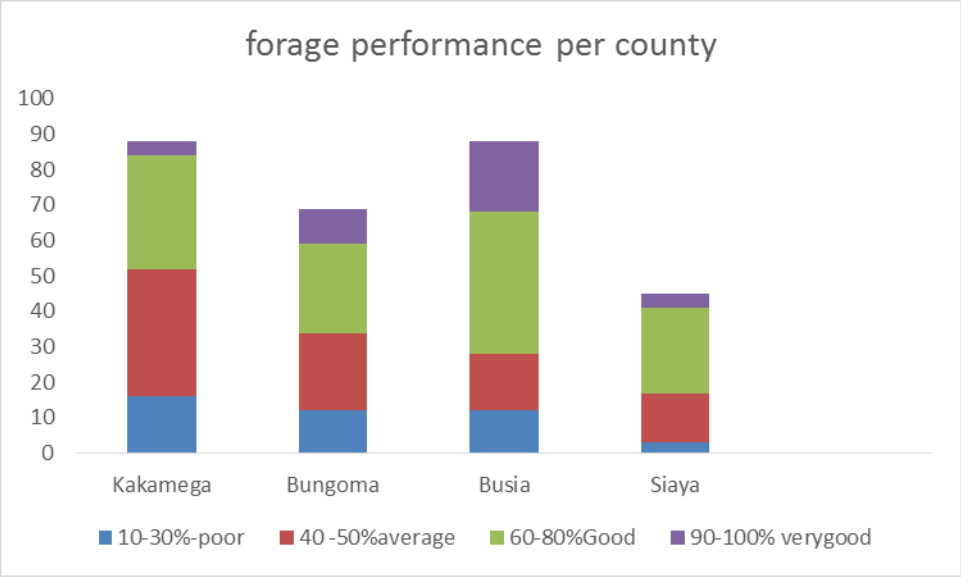


Figure 8 shows forage plot performance among farmers in all four counties.

Figure 9 is a well maintained Mulato II plot performing very well.

Figure 10 shows a poorly performing, weedy Cayman plot.

Recommendations for on-farm monitoring

The scoping survey was an important step in sampling from the population as to who is fit to be included for the on-farm monitoring. Based on the results and analysis of the survey the criteria for selecting on-farm monitoring farmers included:

1) There is a present forage plot at the time the survey was conducted
2) The forage plot should be a plot (thus not contour or boundary)
3) The forage plot should be mono cropped (thus not intercropped)
4) The forage plot performance score should be >40% (average to very good) during the survey evaluation, thus excluding poor to very poor performance.

As a result, from the criteria above out of the 400 surveyed population the final sample that will be used for on-farm monitoring is 170farmers. Plots which were either planted in strips, had been intercropped, and were performing poorly were eliminated. It is important to understand that the criteria, which is purposive sampling makes it possible to collect and compare data to plots that are seemingly similar, have enough replicates per county and reduce bias. In general, it can be observed that the adoption rate of forage technology is at an estimated 70%, since farmer beneficiaries who received planting material 70% of them have almost fully adapted forage integration into their farming systems. Farmers have a positive view towards the new varieties that were provided to them due to provision of livestock feed in both high quality and quantity as compared to their traditional livestock feeds they have previously used. Additionally, there lies huge potential in economic returns in the grass business and some farmers are embracing the practice of cultivating grass entirely meant for selling making it an income generating activity which in return provides a source of livelihood for them.

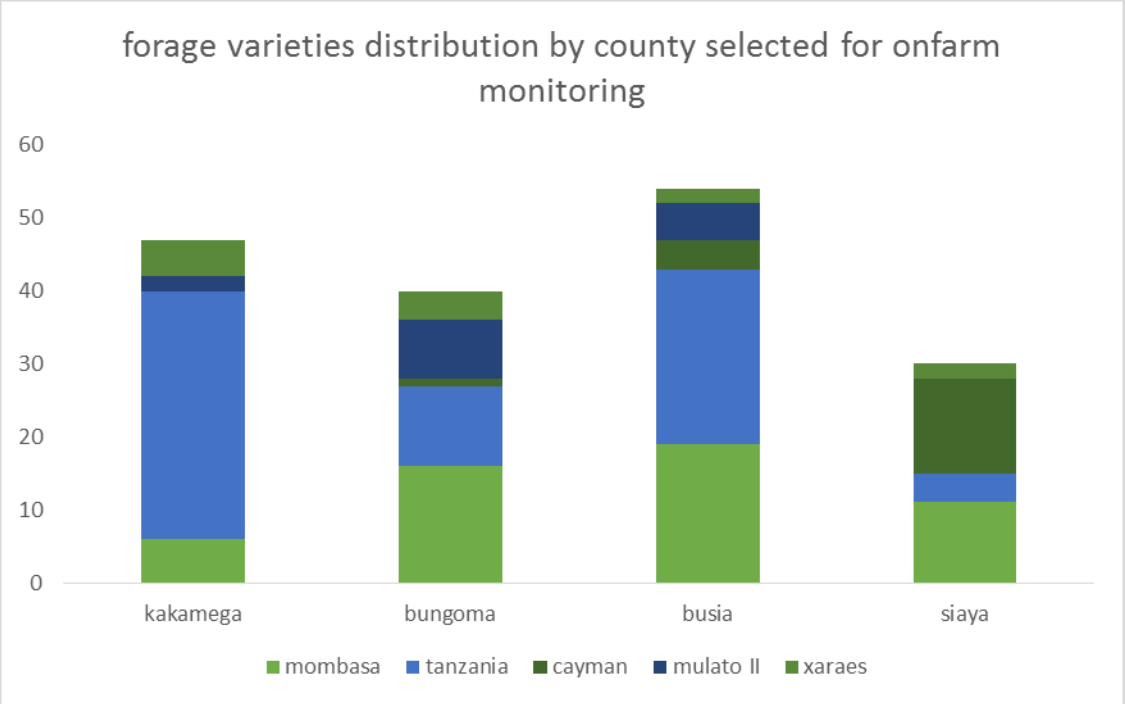


Figure 11 shows varieties replicates available for on farm monitoring.

3. On-farm monitoring

Materials and methods

As a next step after selecting 170 farmers for on-farm monitoring through the beneficiary scoping survey, on-farm data collection commenced immediately with the purpose to understand forage production under typical farmer environment. A facilitation system consisting of peer farmers was set in place, and peer farmers were charged with the responsibility of following up and collecting data on the assigned farmers. It was important to train these facilitators on the data collection methods further training them on the data collection tools to be used. During facilitator training, survey results were shared further explaining criteria used to select participating farmers. It was also important for them to understand purpose of on-farm data collection. A guiding data collection protocol to be used for on-farm monitoring was used. The training also incorporated an on-farm practical to better understand the data collection procedure. Each facilitator was issued with data collection sheets clearly indicating name of participating farmers, their household id as issued during survey and forage variety planted.

Data collection protocol

Two (1m x 1m) quadrants was installed randomly in a farmers' forage plot and clearly marked by pegs and manila ropes. Farmers were instructed that these quadrants should be given the same management as the rest of forage management including weeding and application of manure, fertilizer by the farmer. Both quadrants will be harvested after every six weeks by facilitators in each of the monitored farmer's farms. Fresh weight of the harvested quadrants is determined with digital weigh balance, and recorded in the data sheet separately. Plant height is measured randomly on five plants within one quadrant and recorded in the data sheet. A handful of harvested forage is sub-sampled from each quadrant, and stems separated from leaves and placed in separate, labeled khaki bags for dry matter determination. Fresh weight of stems and leaves is determined with top load balances and recorded. Pest and disease score is recorded for each quadrant.

Figure 2: Set-up of 1x1m quadrants for forage biomass harvesting

Insights from first two harvesting periods

1) Verification of varieties on the ground by facilitators is important. In 8 out of 163 cases, the variety was different from what was indicated in the scoping study.
2) Evaluation of pest and disease and translation into consistent scoring needed to be repeated to ensure good quality data.
3) Although there is an established working system made up of facilitators who do the data collection, it is very important to regularly backstop these activities to clarify emerging questions.
4) Immediate data entry into ODK allows for real-time data checking and analysis which enables to inform each individual facilitator of any noticed mistake in data sheets to avoid repetition of similar mistakes in the next round of facilitation.

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