Farmer- Experimentation On Challenges Of Adopting Agrobiodiversity Conservation Technologies: A Case Of Setaria Grass In A Banana Plantation

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Background

1 am Muhwezi Frank Kashaija, a PLEC demonstration farmer and a teacher at Kikundo primary school. I am also a member of Mwizi PLEC Experimenting Farmers Association (MPEFA) since 1999. A member of Bushwere Zero grazing Crop Integration Association (BUZECIA) which we formed in 2000.

I bought a banana plantation in 1984 and it had a lot of couch grass (orumbugu), wandering jew (eteija) and local irish potatoes (emonde) as weeds. So I removed them for they were competing with crops for moisture and nutrients. I rehabilitated the banana plantation, which had poor performance. By observations I detected some signs of loss of soil by water erosion. This was because this piece of land is sloping from north- east to south -west, and susceptible to soil erosion. Helped by our agricultural officer, Mr. Mpiirwe, I dug technically laid out trenches to check soil erosion and harvest water to increase water penetration into the soil. I copied this idea from Mr. Kakaare who had a worse plantation than mine before he constructed trenches with setaria, but later his bananas improved.

Efforts to control soil erosion in the plantations in Bushwere, Regional Land Management (RELMA) Project had introduced soil and water conservation structures, the trenches planted with setaria grass (*fanya chini*). Being a teacher, I theoretically knew that grasses help to reduce soil erosion by its root binding action and formation of humus after decay. So I planted the *setaria verticillata* (orutaratumbe rwa Tanzania) to stabilize the bands of my trenches which to me as a farmer, found useful in controlling erosion and my banana production had started improving.

Later on came a rumor alleging that setaria grass bands consume much water, thus causing moisture shortage in plantation soil. Most farmers in Bushwere and elsewhere in Mwizi uprooted it out of banana plantations. Having some knowledge

of science, I refused to uproot the setaria without proof because I did not have a better alternative to trap the runoff and stop erosion. So I set up my locally designed experiments.

I widened the spacing of the setaria to about 6 ft, which is 5 ft more than the one foot recommendation by the agricultural officers and left one plot aside without setaria. In due course PLEC arrived in Bushwere. As they were carrying out their research, I narrated the setaria rumour and how I would like to experiment on it. They welcomed my experimenting idea and encouraged me to work with them.

Objectives

The experiment was set up with the following objectives:

1. To evaluate the effectiveness of different spacing of setaria grass within a band on controlling runoff soil loss.
2. To evaluate the allegation by the farmers that the setaria grass absorbs more water causing shortage of soil moisture in the plantation.
3. To compare the profitability of different spacing of setaria on banana and setaria production.

Methodology

We redesigned the experiment and for purpose of replication, I convinced some two other farmers who accepted to set up Farmer participatory field experiments in their fields with the following treatments as shown:

Plot 1 Closed spacing (1 ft apart)- which is the recommended spacing by Extensionists.
Plot 2 Distant spacing (6 ft. apart)- my way of experimenting
Plot 3 without grass (control)

They also advised me to plant the setaria grass on the upper side of trenches (*fanya juu).* PLEC scientists taught me and demonstrated to me how to properly manage the setaria grass band i.e. always trimming it at the right height before flowering, maintaining its width at about 1 ft and keep the grass at a 1 ft distance off the

banana stool (mat). They encouraged me to always throw the soil I clean from the trench on the upper side (*fanya juu*) beyond the grass band.

I had started harvesting it for my goats and also mulching the bananas. During the dry season, my friend Kakaare would take it for his cows and I could see that soon it might have market for zero grazing farmers so that I earn some cash income from it

We agreed to take the following measurement:

a) Soil deposits from soil erosion in the trenches
b) Soil moisture levels in three parts of each treatment
c) Weight of banana bunches harvested from each treatment
d) To record the labour costs of maintaining the grasses and trenches and the amount of grass I harvested each time I trim it to estimate the income that I would get if I am to sale it or feed it to livestock.

PLEC Scientists helped me to do the technical measurements and analysis of soil loss and soil moisture, which I could not manage to do. The soil deposited in the trenches from the runoff was determined using methods described by Stocking and Murnigham (2001). Soil loss from the plots between the trenches for each treatment in ton/ha was calculated from the soil deposits according to Stocking and Murnigham (2001). The data was statistically analyzed in order to determine the effect of different spacing setaria grass bands on controlling the run off.

The soil moisture levels in the plots of each treatment were monitored by collecting samples during the dry season at two depths:

- Top soil, between 10 - 15 cm (rooting zone for setaria grass, and
- Sub soil, between 30 - 35 cm (rooting zone for banana).

For each treatment, three sampling locations were used:

- Banana sampling location - at least 30 cm away from a banana stools and between neighbouring trenches.
- Setaria sampling position - 30 cm above the setaria band.
- Trench sampling position - 30 cm below the trench.

The data collected was analysed by the Scientists using a split-split plot experimental design.

Results

The data for percentage available soil moisture is presented in Figure 1.

Figure 1. Variation of percentage soil available moisture with sampling position and treatment

The results show that percentage available soil moisture in the banana sampling position is significantly higher for the closed setaria treatment than the spaced setaria. A similarly significant situation was noted in the above sampling position, which shows that closed setaria treatment conserved more soil moisture than open spaced one. The differences between closed setaria treatments and control were physically observed to be higher on closed but statistics do not seem to be significant.

It should be noted that closed setaria treatment had other benefits as shown in Figure 2 and Table 1 below.

The Figure 2 below shows the result of effect of different spacing setaria grass bands on controlling the run off soil loss.

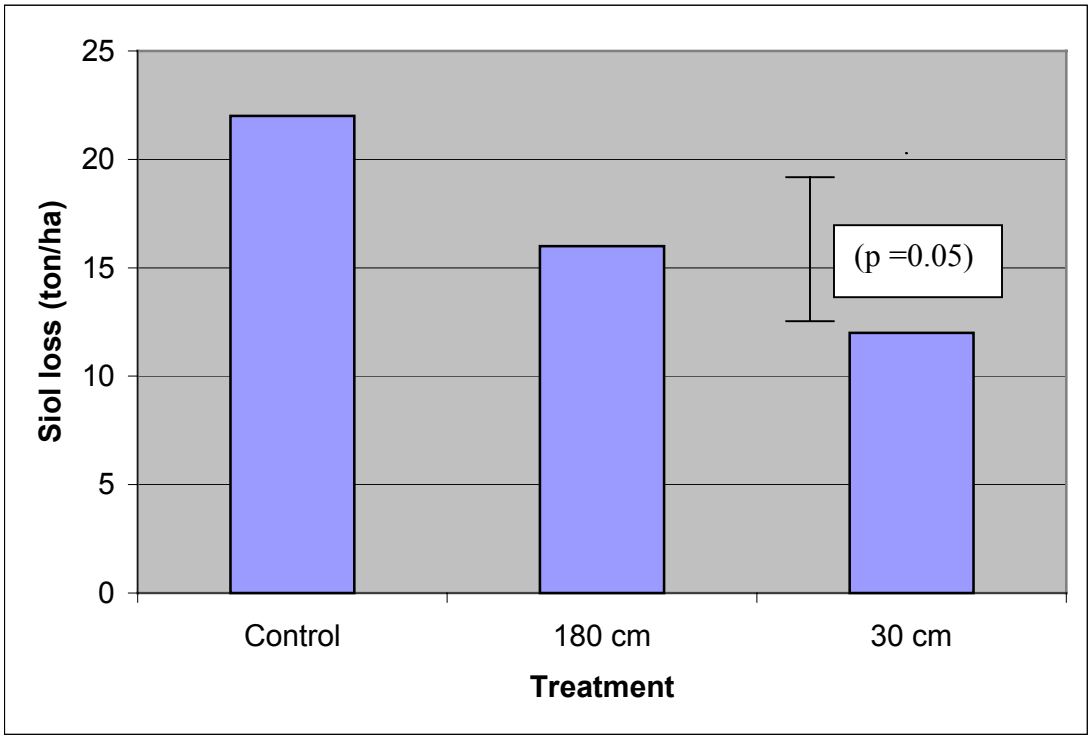

Figure 2. Effects of spacing setaria grass (within a SWC band) on runoff soil loss in banana field.

The recommended spacing of setaria grass(30 cm) was significantly ($p = 0.05$) more effective in controlling soil runoff in banana field than the farmers spacing (180 cm) and control.

Table1: Average soil loss and relative soil moisture content per season

Treatment	**Soil lost (ton/ha)**	**Moisture content**	**Labor to clean trenches**	**Water in trenches after heavy shower**
Closed grass (1 ft)	12	Higher	Lowest	Clean water
Distant grass (6 ft)	16	Moderate	Moderate	Dirty water
No grass (control)	22	Less (little)	Highest	Lot of mud

Discussion

Currently there are other seven farmers in Bushwere who got interested and in fact started experimenting the setaria grass management in banana plantations. From my experience, I found setaria grass to be useful to a farmer in the following ways:

- It reduces soil erosion and helps in conserving soil moisture.
- It can be used as mulch to conserve soil moisture and suppress weeds
- Used as animal feeds for goats, sheep and cattle, as Mr. Kaakare and Lt. Fred.
- From animals, manure is brought to plantations to replace the lost plant nutrients (recycling of nutrients) and increase banana yields.
- Scientists explained to me that there is high protein content in setria grass tissues (about 2.5 % N), this means that livestock fed on the setaria grass gives increased milk yields. Another farmer, Mr. Gita, whom I visited, confirmed this.
- The growing of the grass in the plantations increases the biodiversity in the fields (ie another way of conserving biodiversity).

All the above lead to increased income and family welfare.

Conclusion

In conclusion, I am convinced that setaria grass is good for controlling soil and water losses. It does not take all the water if well managed. Since it has many other uses, I recommend that other farmers should keep it in their plantations but must learn to manage it well i.e. plant it on the upper side, keep it well trimmed and not too close to the banana stool. I also advise my fellow farmers to replace the useless and stubborn weeds in gardens with useful biodiversity, as I did replace couch grass and other weeds with setaria grass bands. Now that I have learnt the many good things of setaria grass and how to manage it well, I am planning to start a zero grazing cattle unit. This will also encourage me to conserve more useful biodiversity like *Calliandra, Desmodium*, guatamala grass, on my limited agricultural land and around my homested.

I would like to thank PLEC project staff who have tirelessly helped us farmers of Bushwere to test some of the agrobiodiversity technologies. It is helping us to understand our farming in a more scientific way. We can now know why we should carry out certain farming practices if we are to have high yields. Also i thank PLEC to have facilitated me to come and attend this workshop to share our research results with you. We invite you to Bushwere parish, Uganda so that we demonstrate to you good practices of conserving biodiversity in crop fields. Remember PLEC has developed Bushwere into a demonstration site, so come and use it for training other farmers and doing more research.

Finally, I thank you for listening.

Thank you: All this, for God and My country, Uganda.

Table 2: Expenditure and income from each plot

Plot	**Time taken (min.)**		**COST (Ushs)**		**Total cost/ plot**	**Income from setaria**	**Income from banana**	**Incom from beans**	
	Trimming	Cleaning	Trimming	Cleaning					
A (closed)	60	40	500	200	700	500	3200	5200	
B (spaced)	45	60	300	300	600	300	1950	5000	
C (control)	_	90	_	500	500	_	1350	4600	
TOTAL/ ACTIVITY	**105**	**190**	**800**	**1,000**	**1,800**	**800**	**6,500**	**14,800**	

Note:

1. In wet season trimming and cleaning are done about 4 times in 3-4 months depending on climatic conditions
2. In dry season trimming is 2 times in 3 months, and cleaning of trenches is done once when rains are expected

Price of bean is shs. 200/= per kilo