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RESEARCH HIGHLIGHTS 2017/18

Introduction

The Sugarcane Research Technical Committee Meeting held at Sugarcane Research Institute (SRI), Kibaha on 16th June 2017, was attended by representatives from Out-growers' organizations, estate agronomists, SUSTAIN Project-AWF, Mkulazi Project, SBT, SIDTF, LAOs, DAICOs, KSC Operation Manager and Assistant Director Crop. The Committee reviewed preliminary results of research work conducted in 2016/17 season and approved proposed activities for 2017/18 season.

The following recommendations were made so as to improve the program's activities and ultimately sugarcane productivity. Sugarcane Research Institute (SRI) and Tanzania Official Seed Certification Institute (TOSCI) develop parameters for seedcane quality inspections, the estates should establish system which would allow distribution of seedcane to farmers, there should be controlled movement of planting materials and sensitizations to farmers in order to ensure good quality seedcane are produced, service levy from District council should come back to farmers in terms of extension services. There should be frequent monitoring of YSA, technology transfer to farmers with great impact should be emphasized, awareness creation on how sucrose and other parameters are controlled should emphasize, research to out-growers should be done based on business sustainability; SRI, SUSTAIN and Local Government should prepare a strong joint strategy in establishment of good agronomic practices for quality sugarcane production to out-growers; Research on species specific entomo-pathogenic nematodes (EPN) for control of sugarcane nematode specie specifically *Pratylenchus* and *Meloidogyne spp.*.

During last meeting, a total of twenty nine research activities were approved for the year 2017/18 (**Appendix 1**).

Weather

The rainfall amount (mm) at Kibaha – SRI Weather Station reflecting weather in sugarcane farming areas from June 2017 to May 2018 is indicated in Table 1.1. The annual rainfall amount from June 2017 to May 2018 was recorded at 1373mm, while the annual rainfall amount in June 2016 to May 2017 was recorded as 812 mm, and 910mm in 2015-16. The highest amount was recorded in March 348mm and the lowest amount was recorded in July which was 0.3mm.

Compared to two last seasons, the rainfall distribution in this season was very well evenly distributed and conform to the biannual rainfall modal (Figure 1.1). The rainfall appeared in a total of 124 days compared to 97 days in 2016-17 seasons.

Table 1.1: Rainfall amount at SRI Weather Station, Kibaha

DECADES	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
1	1.4	0.0	0.3	3.2	5.9	55.0	37.8	45.8	0.0	82.6	81.2	105.2
2	0.0	0.0	8.2	15.0	0.0	6.6	10.9	29.0	10.0	129.8	173.0	62.5
3	7.2	0.3	0.0	0.1	270.5	42.0	6.2	0.0	0.0	135.6	39.5	8.0
Total Rainfall (mm)	**8.6**	**0.3**	**8.5**	**18.3**	**276.4**	**103.6**	**54.9**	**74.8**	**10.0**	**348.0**	**293.7**	**175.7**
Number of Rain Days	**4**	**1**	**8**	**5**	**7**	**14**	**10**	**8**	**2**	**21**	**23**	**21**

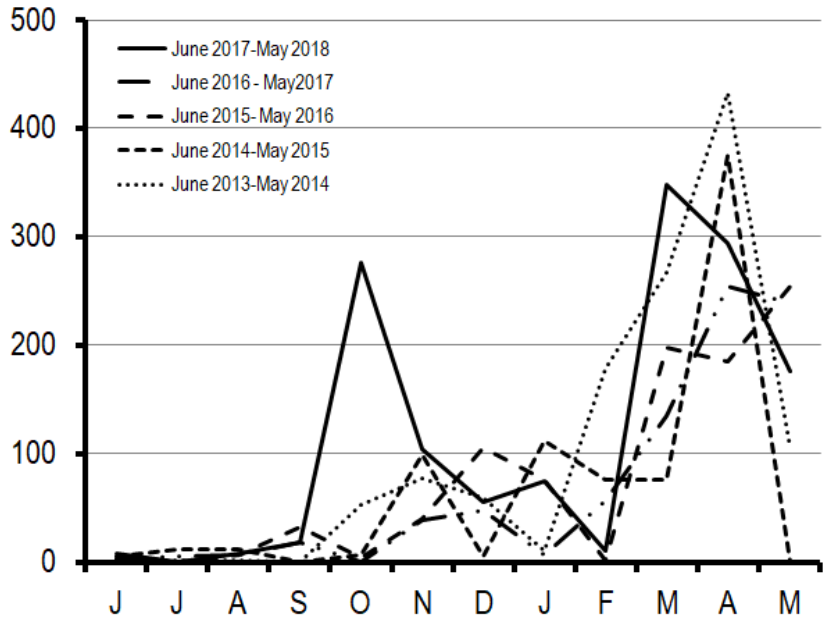

Figure 1.1: Rainfall distribution for the past five years

Staff

Table 1.2 indicates that the program has a total of 24 staff, six (6) are field officers and eighteen (18) are scientists. Among eighteen scientists, 17 are fulltime and one contracted scientist. Two scientists are on study leave, two laboratory technicians. Also program has four field officers, among them one is on study leave (Table 1.2). The program still lacks specific scientists for entomology and pathology, but mentoring and training to capacitate the assigned staff is in progress to fill the gaps.

Table 1.2: List of Staff, Qualification and Assignment

	Name	Qualification	Assignment
		SCIENTISTS	
1	Dr. K. J. Mtunda	PhD in Plant Breeding	Programme Leader/ Centre Director
2	Dr. H. B. Msita	PhD in Bioscience Engineering	Program coordinator/Lead Scientist
3	Dr. S. Ngailo	PhD in Plant Breeding	Breeder
4	H. Kalimba	MSc in Crop Science	Agronomist
5	M. Masunga	MSc in Molecular Biology	Molecular biologist/Pathologist
6	D. Nyanda	MSc in Agricultural Education and Extension	Technology Transfer
7	B. P. Khafa	MSc in Crop Science	Breeder
8	J. Msemo	MSc in Post Harvesting	Technology Transfer
9	L. Lwiza	MSc in Soil Science and Land Management	Agronomist
10	M. Mziray	MSc in Water Management	Pathologist/Nematologist
11	M. Kinyau	MSc in Agriculture Economics	Socio-Economist/ Technology Transfer
12	F. Urassa	BSc in Agriculture General	Entomologist
13	R. Pachi	BSc in General Science	Agronomist
14	A. Yusuph	Environmental and Natural Resources Economics	Entomologist
15	Dr. N. Luambano	PhD in Nematology	Nematologist
		TECHNICIANS	
16	S. Kajiru	Dip in Agriculture	Field Officer
17	M. Mwinjuma	Dip in Agro-mechanization	Field Officer
18	R. Mlimi	Dip in Agriculture	Field Officer
19	R. Massawe	Dip in Lab Technology	Lab Technician
20	Y. Mbaga	Dip in Lab Technology	Lab Technician
21	**J. Sebete	BSc in Agronomy (SUA)	Agronomist
22	**G. Mwasinga	MSc in Crop Sci. & Production (SUA)	Breeder
23	**B. Kashando	MSc in Agro and Environmental Nematology (University of Ghent)	Pathologist/Nematologist
24	* Dr. J. Katundu	PhD Entomology	Entomologist

KEY: * On contract, ** On study leave

RESEARCH ACTIVITIES

Sugarcane Breeding

Variety Importation

- Seven varieties were imported from **CIRARD** on 21st March 2018, R 587, R 98/4146, R 00/8180, R 00/2460, GT15, FR 89/746 and CP 06-2042, all varieties geminated and growing well.
- Six varieties from SASRI; N35, N**39**, N40, N42, N48 and N57 were imported and planted on 21th March 2017; 5 varieties released to open quarantine in December 2017.
- Eleven CIRARD varieties; R 97/0478, R 96/0020, R 00/2179, R 96/6396, NA891090, FR92394, FR90881, DB70121, BJ9932, B03572 and R 99/627. Only 10 varieties released to open quarantine**.** DB 70121, BJ 9932 and BO 3572 did not germinate.
- R varieties 10**th** batch: R 98/6092, R 98/2454, R 97/2168, R 96/8149, R 98/2431, R 99/4065, R 95/2204 and R 95/2100; and SASRI varieties **5th** batch: N29, N38, N43, N50, N51, N52 and N53 were released from quarantine (14-15/8/2017).

Smut Screening

- Five new smut screening trials of 55 B (26) 1rst batch and (29) 2nd batch and (40) R, (7) N and (4) CP varieties were established at KATRIN in August, 2017 and they perform well.
- Trial 1: Varieties N29, N51 and N53 had smut infections similar to resistant EA70-79, while other varieties had smut infection similar to susceptible check, NCo376 ($P \leq 0.01$).
- Trial 2 showed that varieties CPCL02-6848, CPCL05-1791, R 00/4055, R 96/2281 and CPCL05-1102 had no or low infections compared to EA70-97, but R 98/8115, R 93/4541, R 95/2202 and R 99/4064 had high infection similar to NCo376 ($P \leq 0.001$).
- Lower infections recorded in B001250, B03110, R 94/6447, R 97/4029 R 96/2569, and R 94/0142 and highest (<0.001) infections recorded in R 96/8299, R 95/0017, R 581, R 91/2200 and R 98/4162 in Trial 3.
- Trial 4: Lower infection was recorded in BR00010, B01218, BJ8820, B991110 and B99907 which were similar to resistant check, while highest smut infection was recorded in varieties B00713, B00111, BT88404 and BR971004 ($P<0.001$).

- Varieties BBZ951034, BJ8231, BR030003, BR971007, BR971014 and B991037 had lowest infection similar to resistant control, while B99186, B991114, BR97101, BBZ951049, BJ8534, DB8203, BJ8897, BR96013 and DB94177 similar to NCo376 in Trial 5.

Irrigated Variety Trials

Fourteen B Varieties were evaluated against N25 and R 579 in field 410 under irrigation at KSC during the reported period. Results indicated significant differences ($P \leq 0.001$) in TCHA and TSHA among tested varieties.

- Varieties B80689 followed by control varieties N25 and R 579 had the highest TCHA. Conversely, varieties BR96013, BJ8256 and BJ8820 had the lowest TCHA.
- Variety B80689 followed by N25 and R 579 had the highest TSHA similar to the best control check, N25, while varieties BR96013, BJ8256 and BJ8820 had the lowest TSHA.

Twenty six CP and Q varieties were tested against N25 and NCo376 in Field number 411 under irrigation at KSC. The results on mean TCHA among varieties tested was difference ($P < 0.001$).

- Variety Q177 followed by Q200 had higher TCHA than other test varieties, contrary to varieties CPCLO2-1295, CPO4-1321and CPO4-1935 which had the lowest TCHA.
- Similarly, the results for annual sugar yield (TSHA) showed difference, whereby varieties Q200, CPCL95-2287 and Q199 had the highest TSHA similar to the control N25, while varieties CPCL02-1295, CP04-1321, and CP04-1619 had the lowest TSHA.

Fifteen B, CG and R varieties were tested against N25 inn Field number 417 under irrigation at KSC. Results showed difference ($P=0.001$) in TCHA among varieties tested.

- The variety N25 out-yielded the test candidates followed by R 96/2569 and BR9701011 in terms of TCHA. Conversely, varieties DB8203, R 97/4029 and CG99-125 had the lowest TCHA.
- TSHA indicated difference ($P \leq 0.01$) among varieties tested, whereby control varieties N25 followed by R 96/2569 and BR9701011 had the highest TSHA; varieties DB8203, CG99-125 and B03110 had the lowest compared control and other test varieties.

Nineteen, 6N, 6Q and 7R varieties were tested against N25 in Field number 419 under irrigation at KSC.

- Results on mean TCHA indicated difference (P=0.01) in TCHA among varieties tested. Varieties N36 followed by N49 and N23 had the highest TCHA similar to control variety N25. Conversely, varieties Q228, R 91/2021 and Q234 had the lowest TCHA.
- The results indicated difference ($P \leq 0.05$) in TSHA among varieties tested. Varieties N36, N49 and N47 had the highest TSHA; Q228, Q234 and R 91/2021 had the lowest TSHA. Other traits (pol and purity) except sucrose were also different.

Fourteen varieties (12B and 2R) were evaluated against N25 and R 579 during the reported period in the Field number 511 under irrigation at KSC.

- Results indicated differences ($P<0.001$) in TCHA among varieties tested. However, control variety N25 out-yielded test varieties. Test varieties with highest TCHA similar to control include BJ8231, R 96/2116 and R 94/0142, while, varieties B00167, BBZ92953 and BT88404 had the lowest TCHA.
- Candidate varieties BJ823, R 94/0142, and R 96/2116 had the highest TSHA superior to the best check though not different, while, varieties BOO167, BT88404 and BBZ92953 had the lowest TSHA.

Fifteen (13B and 2R) varieties were evaluated against N25 and NCo376 in field 362 under irrigation at KSC. The results for R1 showed differences ($P\leq0.001$) in TCHA and TSHA among varieties tested.

- Variety N25 had highest TCHA followed by test variety DB9633 and R 97/4004, other varieties had TCHA below the mean led by B96186, BBZ951049 and B00279.
- The highest TSHA was also recorded in DB9633, R 97/4004 and N25, while B96186, KNB89180 and BBZ951049 had the lowest.

Twenty eight CG varieties were evaluated against N41, N25 and R 579 in field 354 under irrigation at KSC in R3. Results showed differences (P=0.01) in TCHA and TSHA among varieties tested.

- The highest TCHA was observed in varieties CG00-092 followed by N25 and CG00-028. Conversely CG96-135, CG98-62 and CG98-47, scored the lowest TCHA.
- The highest TSHA was recorded in CG96-01 followed by CG00-028, N25 and CG00-092 and the lowest TSH was obtained in CG96-135, CG97-97 and CG98-47.

- Varieties CG96-40, CG96-52 and CG00-033 had the highest sucrose content above the mean and the best check.

Twelve varieties (6Q and 6R) were tested against N25 and R 579 in field BO5 **at TPC** in R3 under irrigation. Results showed differences (P≤0.001) in TCHA and TSHA among varieties evaluated.

- The highest TCHA was recorded in standard varieties N25 followed by R 85/1334 and R 579, the lowest TCHA was recorded in R 92/8029, R 91/2021 and Q230.
- Varieties N25 followed by KQ228, R 579 and R 85/1334 had the highest TSHA; and, varieties R 583, R 91/2021 and R 92/8029 had the lowest.

Twelve varieties (6Q and 6R) were tested against N25 and R 579 in field L3S at TPC in R3 under irrigation. Results showed differences (P≤0.001) in TCHA and TSHA among varieties evaluated.

- The highest TCHA was recorded in control varieties R 579 and N25. Among the test varieties, candidates R 85/1334, Q220 and Q208 had the highest TCHA though lower to check varieties. Varieties R 92/8029, R 91/2021 and Q234 had the lowest TCHA.
- Variety KQ228 had the highest TSHA followed by N25, Q208 and R 579. Conversely, candidates R 91/2021, R 583 and R 92/8029 had the lowest TSHA.

Seven varieties (4N and 3R) were evaluated against N19, N25 and Co617 in field TP8a under irrigation in PC for the reported period at KSL.

- There was no difference (P≤0.05) in TCHA among tested varieties. Control variety R 579 performed better followed by MN1 and N25, while, varieties N49 and N47 were the lowest yielders.
- Stalk population has difference (P≤0.05) among tested varieties. The highest stalk population was recorded in N49 and R 579, while MN1 and R 570 had the lowest. This was attributed by good agronomic practices.

Seven varieties (5N, R and MN1) were evaluated against N19, N25 and Co617 in Field number GP6D in R1 at KSL. There were differences (P≤0.05) among the candidate varieties for all traits measured.

- The highest performance was observed in N12, followed by MN1, N25 and N47. While, varieties R 570, N49 and N19 performed lower similar to control variety Co617.

- The varieties MN1, N41, N49 and N12 had the highest stalk population as opposed to R 570 and N19 which had the lowest.

Eight varieties were tested in field 1A at MSE in PC. Results indicated differences ($P \leq 0.05$) in TCHA among tested varieties.

- Varieties R 96/2569 followed by R 96/2116 and R 97/4004 had the highest TCHA; varieties R 579 and R 570 had the lowest TCHA.

The same varieties were tested in field 10G at MSE in PC. Results indicated differences ($P \leq 0.001$) in TCHA among tested varieties.

- The varieties R 579, R 96/2569 and R 97/4004 scored the highest TCHA similar to control variety, R 96/2116, R 585 and R 570 had the lowest TCHA.
- Stalk population was not different; however, the mean stalk was relatively lower; possibly due to water stress during tillering and grand growth phase.

Rainfed Variety Trials

The variety trials established in Field number 103 at KSC to test varieties R 570, R 581, R 583, R 92/4246, N12, N47, TZ93-KA-120 and TZ93-KA-122 against NCo376 under rainfed in R1. The Results indicated no differences (P=0.05) among varieties for both TCHA and TSHA.

- Varieties R 570, TZ93-KA-122 and N12 had the highest TCHA and TSHA;
- Varieties R 581, R 92/4246 and N47 had the lowest TCHA and TSHA; however, superior to the check NCo376, the yields were above to the lowest yield potential of 70 TCHA.

Eight varieties were planted in field 124 and evaluated against NCo376 under rainfed condition in R2 at KSC. Results showed no differences ($P \leq 0.05$) in TCHA among tested varieties.

- Varieties TZ93-KA-122, N47, N12 and R 570 had the highest TCHA, while, the lowest TCHA was recorded in varieties NCo376, R 583 and R 581.
- The same trend observed in TSHA, whereby the highest TSHA was recorded in TZ93-KA-122, N12 and N47. Conversely, R 583 and R 581 had the lowest TSHA.

The means for traits studied in field number 622 under rainfed in R1 showed differences in TCHA ($P \leq 0.05$) and TSHA ($P < 0.01$) among tested varieties at KSC.

- The highest TCHA was recorded in control variety NCo376 followed by N12, R 583 and R 570; and the lowest TCH was observed in TZ93-KA-122 and R 92/4246.

- The highest TSHA was recorded in NCo376 followed by R 583 and N47, while TZ93-KA-122 and R 92/4246 had the lowest TSHA.

The results for means of parameters studied in Field number 130 under rainfed in PC at KSC**.** The results indicated no differences (P=0.05) in TCHA and TSHA among tested varieties.

- Varieties TZ93-KA-122 followed by N12 and R 581 had the highest TCHA similar to control variety. Alternatively, TZ93-KA-120 and R 92/4246 had the lowest TCHA.
- The highest TSHA was recorded in TZ93-KA-120 followed by N12 and R 583; on other hand, varieties R 94/6113 and R 581 scored the lowest.

Field 670 was planted with nine (2N, 5R and 2TZ) varieties which were tested under rainfed in PC against NCo376 at KSC. Results showed no significant differences (P=0.05) in TCHA and TSHA for varieties tested.

- The highest TCHA was recorded in variety R 94/6113 followed by R 92/4246 and R 581, contrary to, the lowest TCHA which was observed in N12 and TZ93-KA-122.
- The highest TSHA was recorded in variety R 94/6113 followed by R 581 and NCo376 and the lowest was recorded in, N12 and TZ93-KA-122.

Five varieties (4N and R) were evaluated against Co617 in field BR4C in PC in the reported period at KSL.

- There was no difference (P≤0.05) among the tested varieties in TCHA, however, variety N12, followed by MN1 and N47 had the highest TCHA, while R 570 and N41 performed least.
- The difference observed (P≤0.05) among test varieties in stalk population, the highest record was in Co617 followed by N12 and N47. Conversely the lowest record observed in R 570 and MN1.

Five varieties (4N and R) were evaluated against Co617 in field LR6a in PC at KSL. Results indicated differences ((P≤0.01) among the tested varieties.

- The variety MN1 performed better (TCHA) compared to others followed by Co617 and N41, while N12, R 570 and N47 performed least.
- The highest stalk population recorded in MN1 followed by Co617 and N47, while the lowest record observed in R 570 and N41, but did not differ.

National Performance Trials (NPT)

- Two varieties (R 570: N47) were registered for NPT in December 2017 under rainfed condition, thus three trials were established at KSC, MSE and KSL between December and March 2018.
- One NPT trial testing varieties N36 and R 85/1334 was established at TPC in December 2017.

Advanced Fuzz Evaluation and Selection

- A total of 31 new promising clones of sugarcane were selected from imported fuzz, these were planted in replicated trials at KATRIN, KSC and KSL under irrigated and rainfed culture for further evaluation and selection.

Rapid Seedcane Multiplication

The rapid seedcane multiplication was established at SRI in order to facilitate rapid multiplication and distribution of clean and healthy planting materials to small-scale farmers.

- The preliminary result showed that germination was highest for variety N41 followed by N19 and NCo376 with 93, 92 and 90%, respectively, contrary to R 570 and R 579 which had the lowest germination percentage.
- The low germination percentages for the two varieties call for further investigations.

Germplasm Conservation and Maintenance

The objective of this project is to ensure readily availability of genetic resources for future crop improvement program, in 2017-18 germplasm conservation was established at SRI..

- A total of 279 sugarcane varieties have been collected from all sugar estates, planted, germinated and are growing well.
- The most challenge is availability of irrigation water during the coming dry months this can cause stress to the plants and exacerbate the problem of termites.

Sugarcane Agronomy

Variety Trials in OG Fields

In 2017/18 season, this trial enter into the second phase, whereby two promising (N47 and R 570) among three (N12, N47 and R 570) have shown good performance as NCo376 but have low

smut infections, and have been tested in replicated and large blocks of one acre. Also evaluation of three varieties in R1, R2 and R3 continued.

- In ratoon trials all tested varieties performed better in term of yields (TCH, sucrose and TSH) compared to standard NCo376.
- The variety N12 had high smut infection next to NCo376 which is referred to as very susceptible; therefore regarding to that characteristic the variety was discontinued for further evaluation.
- Varieties N47 and R 570 have passed to second phase of evaluation in large block and are being observed to come up with appropriate and viable recommendation.
- Results of large blocks indicated NCo376 had higher tillers count in all sites followed by R 570 except for **Mfilisi** site where N47 performed above other varieties.

Establishment of Fertilizers Trials at Kagera Sugar Mill Area

Seven (7) trials were established in November/December 2016 but due to unavoidable circumstances like water logging and fire accidents three sites were dropped and data were collected in only four (4) sites, while 7 trials were established in October/November 2017 in four zones of Kagera Mill area (Nsunga, Kasambya, Bubale and Kyaka).

- Regarding stalk count treatment 7 ($N_{125}P_{75}K_{125}Ca_{7.5}Mg_{1.25}S_{17.5}B_{0.03}$) performed better across all sites followed by treatment 12 ($N_{150}P_{100}K_{150}Ca_{7.5}Mg_{1.25}S_{17.5}B_{0.03}$) then treatment 5 ($N_{125}P_{25}K_{125}Ca_{7.5}Mg_{1.25}S_{17.5}B_{0.03}$) in PC of 2016-17.
- The same results were observed in tiller count of plant cane of 2017-18 season.

YARA Fertilizer trials in outgrowers' fields at Kilombero

The results of YARA fertilizer trial tested in R2 at Kilombero Growers areas collected in two sites only due to an avoidable circumstance. Results indicated no differences ($P \leq 0.05$) in all treatments.

- On average treatment 4 (Advanced: $N_{120}P_{16}K_{40}Ca_{14}Mg_{6}S_{1}B_{0.02}$) performed better (133 TCH) followed by treatment 1 (SRI –Recommendation: $N_{100}P_{25}K_{100}$) compared to other treatments 2 and (Basic: $N_{39}P_{2}K_{6.2}Ca_{1.9}Mg_{1.25}S_{0.63}B_{0.13}$) and treatment 3 (Medium: $N_{105}P_{7}K_{25}Ca_{7.5}Mg_{5}S_{2.5}B_{0.5}$) having average of 108 TCH.
- The same trend was observed in TSH, treatment 4 has average of 12 TSH, and followed by treatment 1 and average lower TSH (10) recorded in treatment 2 and 3.

Baseline survey on the status of Striga in sugarcane fields in Tanzania

A total of 217 fields were surveyed, 100 blocks in the estate (50 K1 and 50 K2) and 117 farms in OG in 2017/18 season at KSC mill area as a pilot study.

- Out of 100 blocks surveyed in estate 74 blocks were infested by *Striga* and out of 117 out-growers farms only two (2) farms had *Striga* infestation.
- Higher infestation at the estate's fields could be associated with machinery movements, application of contaminated filter mud, negligence of management at the beginning of problem, monocropping system as well the effluent from the upstream water.

Evaluation of different herbicide for use in sugarcane fields at Kagera

The objective of the trial is to evaluate effectiveness of different herbicides used alone or in combinations and use the results as a basis for recommendation for use in sugarcane fields.

Expected output was herbicide to be used by OG farmers at Kagera mill area would be determined after three seasons.

The combination of Acetochlor: Metribuzine: Chlorimuron: Paraquat: Surfactant at different levels per hectare had been design to be tested at Kagera Mill areas under rainfed condition. Eleven treatments were designed;

	Acetochlor:	**Metribuzine:**	**Chlorimuron:**	**Paraquat:**	**Surfactant**
T1	4.0	1.6	0.250	1	0.2
T2	0.0	1.6	0.250	1	0.2
T3	0.0	1.6	0.250	1	0.0
T4	4.0	1.6	0.375	1	0.2
T5	0.0	1.6	0.375	1	0.2
T6	0.0	1.6	0.375	1	0.0
T7	4.0	2.4	0.250	1	0.2
T8	0.0	2.4	0.250	1	0.2
T9	0.0	2.4	0.250	1	0.0
T10	weed free check				
T11	Weed check				

Data collection is in progress and the results will be presented next season.

Sugarcane Entomology

Monitoring of Insect Pests of Sugarcane

Insect Pests Infestation in MCP Fields at TPC

- A total of 47 fields were surveyed for Eldana infestation in this season, only 4 fields had Eldana infestation above economic threshold of 4% internode bored. These fields were planted with N30 (N74 and P4S fields), R 579 (BO5 field) and variety M700/86 (G3 field).
- Survey for white scale damage was done in 15 fields; only one field recorded high infestation of white scale and planted with N25 variety which is susceptible variety for whitescale infestation. However general field observations have shown low incidence of the pest in the estate this year.
- About 23 fields surveyed for YSA infestation at TPC estate and only 5 fields were infested above economic threshold (30%), four fields (10C, 10K, Q2N, and Q2S) planted with N25 and one field (N70) planted with R 575.

Insect Pests Infestation in MCP Fields at KSL

- Survey for Eldana incidence was done in 37 fields and only 2 fields (KP2A and DP2B) had infestation above economic thresholds (4.8 and 4.4%), the fields planted with variety Co 617 and N19. Farmers advised to harvest them immediately to avoid crop loss.
- Also survey was done in a total of 37 fields for whitescale incidence, the results show that 23 fields had no whitescale infestation and the remaining fields had low whitescale incidence. However the estate should avoid promoting varieties which are susceptible to white scale.
- Survey for YSA infestation was conducted in 44 fields and all fields had infestation, but below economic threshold of 30%, chemicals are used intensively in affected fields to reduce the infestation rate.

Insect Pests Infestation in MCP Fields at KSC

- The surveys done for *Eldana* infestation at Kilombero indicated that out of 42 fields surveyed one field (Ruembe) had infestation above thresholds (4.8% internodes bored) planted with variety N41.
- The white scale infestation assessed in all fields was relatively low, but a maximum infestation of 70.5 % infested stalks was recorded in Field 647 planted with susceptible variety NCo376.

- YSA invaded in Kilombero Mill area in November 2017. The first incidence was observed in Kilombero outgrowers fields neighboring the estate. Out of 59 fields scouted for YSA infestation 4 fields had YSA infestation above economic threshold of 30%.
- However, the pest situation in Kilombero is changing rapidly. At the moment more fields are reportedly to have been infested by YSA at different levels of attack to the extent that chemical control is inevitable in some of the damaged fields.

Insect Pests Infestation in MCP Fields at MSE

- There were no fields infested with Eldana above economic threshold of 4% internodes bored out of 15 fields.
- For white scale infestation 15 fields were surveyed and the results shows zero to low white scale infestation.
- A total of 21 fields were surveyed for YSA infestation, out of those, 8 fields were recorded to have infestation above economic threshold of 30% infested stools.

Insect Pests Infestation in Mbigiri Farm (Mkulazi- Project)

- The visits were made during October, 2017 to March, 2018. A few incidences of Eldana and white scale were noticed.
- YSA infestation seems to double within the period of one month and this suggests a higher risk in the new fields which are being planted in case of inadequate rainfall in the coming months.

Insect Pests Infestation in OG Fields

- A total of 33 fields were surveyed for Eldana infestation in all estates, two fields from Kagera had Eldana infestation above economic thresholds (6.5% and 7.6% internode bored). Farmers were advised to harvest the crops immediately to minimize the economic loss.
- There were no incidences of whitescale infestation observed in surveyed OG fields in Kagera. In Kilombero and Mtibwa the surveyed OG fields had relatively low white scale infestation.
- A total of 41 fields surveyed for YSA infestations at Kagera (13) and Kilombero (28), 25 fields, (8 Kagera and 17 Kilombero) had infestation above economic threshold (30%) and they were accordingly advised to apply insecticides immediately.

- The YSA inversion in Kilombero growers' fields was initially noticed in Sonjo and Sanje areas but within a short period the insect was able to spread to several locations in both K1 and K2.
- Training and sensitization on YSA recognition damage and control was conducted to outgrowers and MCP growers in collaboration with SBT between December, 2017 and March, 2018 at KSC.
- A total of 1362 growers and 24 supervisors were sensitized from 39 different villages, 30 from K1 (Kilombero) and 9 from K2 (Kilosa).
- For the control of YSA the Kilombero Growers (KG) need the support of SBT and other parties to acquire suitable insecticides, spray equipments, and logistics of field spraying.

Evaluation of White scale damage and sugar loss in selected varieties

The trial was set to test varieties included R 583, N12, N47, R 581 and EA70-97 as a tolerant standard and MN1 or N25 as susceptible controls at KSC.

- The results of this season showed that white scale cover (WSC) on the ten top most internodes of sampled stalks was relatively very low infestation of 0.4% WSC to a maximum of 3.4 % WSC in varieties R 581 and N25, respectively.
- In other words upward movement of whitescale from the inoculated internodes was slower in variety R581 as compared to N25.
- On the basis of whitescale establishment varieties R 581, N12 and R 583 could be classified as resistant and variety N47 as susceptible to whitescale.
- Variety N47 responded as a susceptible variety (5.2 - 9.5%) with sucrose reduction of 9.3% at high white scale infestation level.
- The new varieties (R 583, R 581, N12 and N47) have got high purity content range from 78.73 to 81.93 compared to susceptible varieties (MN1 and N25) which have low purity content of 76.27 and 76.49 respectively.
- The highest purity and sucrose contents were obtained from variety N47.
- New varieties have high sucrose content ranging from 8.35% to 9.51% compared to susceptible varieties which have low sucrose content of 7.15% and 7.75 %.
- The ranking of new varieties places N12 as the most tolerant to white scale followed by R 581, R 583 in that order, while variety N47 can be regarded as intermediate / susceptible.

Production of White scale predator, R. lophanthae, in screen

The trial for rearing biological agent ladybird beetle, Rhyzobius *lophanthae for* controlling whitescale has been the most efficient at TPC in early 1970's. The effort to introduce this predator in places where whitescale has been a problem is in progress.

- In this year screen house has been constructed at SRI for rearing of whitescale predators. The host plant, sugarcane varieties for whitescale infestation N25, MN1 and R 579 have been planted in February 2018 in pots as food for the whitescale as prey insects, the trial is in progress.

The control of Eldana saccharina in sugarcane fields by habitat management: "Push-Pull" approaches

The project was postponed due to logistical problems of acquisition and multiplication of planting materials (eg; molasses grass).

The effectiveness of prophylactic soil treatments of Imidacloprid and augmentative foliar applications of Thiamethoxam, Abamectin, Pirimicarb and Acetamiprid for YSA control

Chemical control has been recommended in most countries of southern Africa and other areas where YSA has been a major problem on sugarcane. Three insecticides have been used in TPC, Kagera and recently, Kilombero, MCP sugarcane with special permit.

- Currently Typhoon 350 SC (imidacloprid), Thoxam 250 WG (thiamethoxam) and Drone 222 SL (acetamiprid) are undergoing field testing for their efficacies against YSA for registration in Tanzania.
- The trials established at KSL, their treatments included soil application of Imidacloprid as prophylactic treatment at planting and two foliar applications of Thoxam, Drone, Abamectin and Pirimicarb at eight Weeks After Planting (8 WAP) and at 12 WAP.
- Similar trial has been established at TPC and KSC in which observations and data collection are in progress.

Sugarcane Pathology and Nematology

Monitoring of Ratoon Stunting Disease on sugarcane fields

A total of 70 samples were collected (60 estates and 10 out-growers) for vascular sap extraction at KSC laboratory and later the bacteria was detected on phase contrast microscope and the

duplicate samples shipped to SRI to confirm the results using Immuno-Fluorescence Microscopy (IFM).

- The results showed that all tested sample were negative for bacteria causing RSD when detected by phase contrast microscope.
- The IFM test was not done waiting for antiserum which is used on detection of bacteria causing RSD.

Smut Assessment

For this season 2017/2018, a total of 34 fields were assessed for smut infection at TPC (10), Mtibwa (7) and Kilombero (17).

- Out of ten fields assessed at TPC in commercial fields, three fields (D28, E1 & E6) had smut infestation between 1.2 % and 1.6% below the economic threshold in varieties R 575 and N41 in 6^{th} and 1^{st} ratoon.
- Two fields had the infestations above economic threshold (4%) at Mtibwa, farmers advised to plough the fields as the management strategies.
- At Kilombero, 88.2% of the fields that were assessed had smut infestation but was below economic threshold level and 11.8% did not have smut.
- Generally, in out growers' fields there was high smut infestations compared to estate in MSE and KSC mill areas.
- The infestation was due to the use of infected planting materials, Unreliable source of clean planting materials, lack of awareness on the importance of using disease free planting materials and the use of susceptible variety (NCo376).
- Training and sensitization on smut identification and management; the use clean planting materials and resistant varieties (R 570 and N47) are recommended.

A Report on Newly Emerged Sugarcane White Leaf Disease (SCWL)

During routine smut assessment, MSE staff reported on the existence of newly emerged sugarcane disease (Sugarcane White Leaf Disease - SCWL). SRI pathology team did assessment in 8 fields at MSE from 17-18 October 2017.

- The results indicated that one field J5 (A) planted with variety N12 at MSE had several stools with symptoms of SCWLD and leaf samples were collected for laboratory confirmation.

- A total of 18 fields at TPC were surveyed for the SCWL on 19-20 October, 2017, none of them found with the symptoms.
- At Kilombero the symptoms were observed in one field planted variety R 570 in 2017 when the breeding team was on their routine activities.
- Also a total of 139 (61 estate and 78 OG) fields at KSL were surveyed for the disease from 19th February to 2nd March 2018 and the fields had an average age of 1 to 3 months and 1 to 6 months for estate and out growers respectively. The disease incidence was higher (28%) in estate as compared to out growers' fields (7%).
- The four fields planted variety N25 had highest incidences, followed by variety Co 617 and N49 both encountered in 3 fields each. Variety MN1, N19 and N46 had one field each with SCWL symptoms. The symptom was higher on younger plants of one to five months.
- The sample were collected and submitted for confirmation of the disease.

Management of disease spread to out-growers' fields

The study conducted in out-growers' fields of Kilombero and Mtibwa Mill areas. This work was done between 11th and 14th November 2017 and a total of 30 farmers were assessed during the survey.

- All fields at Mtibwa had smut infestation but two fields the infestations (4.7 and 5.5%) were above economic threshold (> 4%), farmers were advised to uproot the fields.
- The result indicated that during the survey 85% of farmers at KSC source of planting materials are from their own fields.
- The results showed that most farmers were using planting materials which were not clean; had smut, white scale and some have YSA which were spreading the pest and diseases to their fields.
- Also farmers were not aware on the importance of using clean planting materials and labours that were doing farm operation don't have any idea on sanitation.
- Therefore, it is important to plan for training and sensitization on sugarcane diseases, sanitation measures, also establish a seed system which would help out growers' farmers to have access to clean planting materials as well as regular monitoring during planting and harvesting.

Monitoring and Management of Plant Parasitic Nematode (PPN)

A total of 122 (40 –Kagera, 40-Kilombero and 42-Mtibwa) composite soil and root samples were collected from root rhizosphere of sugarcane in all OG fields.

- A total of 9 species of parasitic nematodes were in out-growers' fields of Kilombero, Kagera and Mtibwa. These include *Pratylenchus*, *Melodogyne Helicotylenchus*, *Longidorus, Trichodorus, Tylenchus*, *Xiphinema*, *Criconema* and *Haploluimus.*
- The high populations of nematodes were found in soil samples compared to root samples and more nematodes were identified in Kagera compared to Kilombero and Mtibwa.
- High populations of lesion nematodes (*Pratylenchus spp*) were also observed in soil samples compared to root samples for both Kilombero and Mtibwa out-growers fields.
- The root knot nematode (*Melodogyne*) which is one among the two important nematodes of sugarcane was also observed at Kagera OG fields.
- It is advised to create awareness and educate farmers on the damage potentials caused by nematode associated with sugarcane.
- Lesion nematodes were isolated on sugarcane varieties that were assessed on both estates and the higher nematode population density was encountered on variety N25 at KSL and three varieties (N41; N36; R 579) at KSC but R 579 was not found at Kagera. Also variety N25 indicates to be susceptible to nematode infestation as it favours all the three nematode and variety R 579 is more tolerant for Kagera.
- Also nematode population has shown an influence on number of tillers as observed in sugarcane varieties N41 in Kagera and N25, although more data will be collected.
- These data will help to understand when nematode is at high peak which will be suitable for application of control measure that will give maximum protection against plant parasitic nematodes on sugarcane.

Efficacy trials of nematicide for the management of plant parasitic nematodes in sugarcane

Three experiments are conducted at KSL. The first trial was set on 27thJuly 2016 and harvested on May 2017, second trial planted on 16th of Feb 2017 and harvested on 20th February 2018. The 3rd was planted on 6th of October 2017 and will be terminated on October, 2018.

- Assessment and data collection have been done using three treatment levels of the nematicides and control; the report will be submitted for registration.

Technology Transfer Program

Establishment of Demonstration plots and FFS at Kilombero and Mtibwa

- During 2017/18 two FFS groups and fields were established at Mtibwa mill area, Kisala and Mzambarauni villages with a total of 42 farmers where 18 males and 24 females.
- Follow-up of the FFS for 2016/17 at Kilombero mill areas was done and the results showed that cane yield (TCH) of FFS ranged from 70-120 TCH for improved practice (IP), whereas farmer practice (FP) ranged from 44-65 TCH, the average yield increase by 86.2%.
- The year 2017/18 nine (9) demonstration plots were established; Kitete, Mbwade, Lumango, Mang'ula (Ulanga cotton), Nyange and Sonjo at Kilombero mill area; and Kilimanjaro, Kwadori and Kidudwe villages at Mtibwa mill area.
- Follow-up of demonstration plots for 2016/17 was done and the results showed that cane yield of demonstration plots ranged from 87.5-101.5 TCH, whereas FP yields ranged from 42.2-51.0 TCH, the average yield increase by 140.5%.
- This indicate that best management practices demonstrated cane growers can achieve higher level of productivity and ensure their cane farming enterprises are sustainable.

Backstopping for Training of Trainers

- Forty two (42) participants (15 extension workers and 27 association leaders) were trained on assessment of seedcane through FFS in collaboration with SUSTAIN Project at KSC mill areas.
- The SUSTAIN Project trained 500 sugarcane growers in better seedcane husbandry practices through FFS scaling up at KSC mill areas.
- Furthermore 2475 farmers (618 women, 1857 men) were trained on sugarcane climate smart agriculture and farming as a business at Kilombero mill area in collaboration with SUSTAIN Project.
- During this season 7 banners, 650 posters, 3400 flyers and 1400 brochures on SRI activities, crop improvement, good agronomic practices, pests and diseases were prepared, printed and distributed to farmers and displayed during exhibitions.
- A total of 50 posters of yellow sugarcane aphid were distributed to outgrowers in all 17 associations in collaborations with Sugar Board of Tanzania (SBT).

- Sugarcane program and Sugar Board of Tanzania (SBT) attended **Nane-nane exhibition at Morogoro** about 5059 attended SBT pavilion and 400 attended Ministry of Agriculture pavilion (sugarcane crop area) and got the explanation and advice on sugarcane production.
- A total of 7 banners were exhibited, 1200 flyers, 200 posters and 2000 brochures were distributed to visitors of different cadre include political leaders, Government leaders, councilors and other stakeholders in sugarcane subsector.
- The group of women scientist from SRI attended a **TAWLAE Annual Meeting** which was held in Dar es Salaam during this event a total of 150 participants attended and about 100 flyers and 70 brochures were distributed to participants who attended the TAWLAE exhibition.
- A total of 7 banners were displayed, 60 flyers and 40 brochures were distributed to participants who attended **TSSCT Annual Meeting** held at Kibaha Sugarcane Research 70 different scientists and cane technologist attended the meeting.
- In order to cope with the demand of training to senior staffs and professionals who are working in sugar industry SRI is preparing the training manual (English language) for senior officers and sugarcane technologists, preparation is in progress.

Monitoring and Evaluation for Technology Transfer activities

The monitoring and evaluation (M&E) in this season was done **at Mtibwa** mill area in collaboration with FFS group members, farmers' organization leaders, Estate agronomist, TASGA and SIDTF representatives, extension officers and 45 farmers who participated on FFS and demonstrations plots at Mtibwa mill area.

A team of M&E suggested to SRI and agriculture extension officers to prepare joint training to farmers, to establish nursery B which will enable farmers to use clean seedcane from B nursery rather than use from seedcane from neighbours' commercial fields.

Radio Broadcasting Program

In this season SRI prepared radio program and was aired from January 2018. The Abood FM radio was selected as the result of baseline survey made. The program is aired at 18:30hrs on each Friday and repeated on Wednesday the same time.

The program gives training on series of good sugarcane farming practices including selection of clean seedcane, land preparation, planting, fertilizer and herbicide application, just to mention some.

The radio coverage reached the intended audience and beyond that example of other places include Simiyu, Tanga, Dodoma, Mbeya, Singida, Coast, Dar es Salaam, Iringa, Songwe, Pemba and Morogoro regions.

During this program farmers indicated that it was difficult to conceptualize the following topics:

- Adopting best sugarcane farming technologies
- Implementing practices of rouging smut
- Use of fertilizers and disease management.

Establishment of Nursery B at Kilombero and Mtibwa Mill Area

To address the problem of shortage of clean seedcane, SUSTAIN project funded by African Wildlife Fund (AWF) in collaboration with SRI, OG's office at KSC and extension workers came with initiative to assist farmers to produce clean seedcane (establishment of B-nurseries) by adopting a farmers' field approach.

- A total of 20 fields were established at Kilombero mill area in this season, 17 germinated well. The fields were planted in June, 2017.
- Field assessment was done by SUSTAIN Project, SRI, KSC and OG Department – KSC to ascertain the performance of the nurseries and smut infection levels.
- The result shows that 11 fields fitted for seedcane nursery in the following sites; Kielezo - Game bridge, Ulanga cotton, Kidatu B, Sanje, Mang'ula "A", Ulanga Cotton (Barabarani), Sonjo, Msolwa station, Lumango, Kifinga and Kidogobasi.
- The project is expected to end December 2018, therefore SRI in collaboration with VAEOs and LAOs have initiated exit strategies by establishing 6 acres of seedcane nursery were established at Kilombero and Mtibwa mill area in this season.

PAPERS, POSTER AND TRAINING MATERIALS

Papers Presented at Different Scientific Conferences

1. Ngailo, S., G. Mwasinga, R. Mlimi and B. P. Khafa (2018). Investigating genotype by environment interactions on the performance of new rainfed sugarcane varieties in Tanzania. A case of KSC Mill Area. Paper Presented to the 7th National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th to 28th April 2018 at Sugarcane Research Institute (SRI), Kibaha, Tanzania.
2. Kalimba, H. F., Kajiru, S., Khafa, B., Mlimi R. and Msita, H. B. (2018). Assessment of Different Management Options on Sugarcane Varieties in Outgrowers Fields at Kilombero. Paper Presented to the 7th National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th to 28th April 2018 at Sugarcane Research Institute (SRI), Kibaha, Tanzania.
3. Msita, H. B. (2018). Industrialized Tanzania: the Role of Cane and Sugar Technologists towards Country's Sugar Self-Sufficiency. Theme Paper Presented to the 7th National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th – 28th April 2018 at Sugarcane Research Institute (SRI), Kibaha, Tanzania.
4. Msita, H. B., Kajiru, S., Kalimba, H., Mlimi, R. and Maranga, K. M. (2017). Effects of Yara Fertilizer Formulations on Sugarcane Yield in Outgrowers' Fields of Kilombero Sugar Mill Area, Tanzania. Paper Presented to the International Annual Meeting of the American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America, Held at Tampa Convention Center, Tampa, Florida, USA, from 22nd to 25th October 2017. Theme of the Year: "Managing Global Resource for a Secure Future".
5. Katundu, J. M., Urassa, F. A., Mwinjumah, M. (2017). Development of inoculation technique and evaluation of tolerance of sugarcane varieties to whitescale. Paper presented to the International Symposium on Sugarcane Research Since Co 205: 100 Years and Beyond Sucrosym 2017 held on 18th to 22nd September 2017 at Hotel Le Meridien, Coimbatore, India.
6. Msita, H. B., Khafa, B. P., Kajiru, S R. Mlimi and Kalimba, H. F. (2017). Evaluation of Existing Agronomic Package to the Selected Sugarcane Varieties in Outgrowers' Fields of Kilombero Sugar Mill Areas, Tanzania. Paper presented to the International Symposium on

Sugarcane Research Since Co 205: 100Years and Beyond Sucrosym 2017 held on 18th to 22nd September 2017 at Hotel Le Meridien, Coimbatore, India.

7. Sugarcane Research Institute (SRI) (2017). Sugarcane Varieties and Cane Yield Improvement. Paper Presented to the 7th Tanzania Sugar Industry Stakeholders' Forum on 30th June 2017 at Nashera Hotel, Morogoro.

Papers Submitted to different Scientific Conferences

1. Lwiza L.M., Kalimba, H. F., Kajiru, S. and Msita, H. B. (2018). Nutrient assessment in outgrowers fields of Kagera mill area, Tanzania. Paper submitted to the 7th Annual National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th April 2018 at SRI Kibaha, Tanzania
2. M. Masunga, B. Kashando, R. Polini, Y. Mbaga and N. Luambano (2018), Distribution of Plant Parasitic Nematode to Sugarcane growing areas in Tanzania. Paper submitted to the 7th Annual National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th April 2018 at SRI Kibaha, Tanzania
3. Nyanda D., Kinyau M. and Msemo J. (2018). Adoption of Farmer Field School for Increasing Sugarcane Production to Outgrowers for Enhancement of Industry in Tanzania (Case Study at Kilombero and Mtibwa). Paper submitted to the 7th Annual National Workshop of Tanzania Society of Sugar and Cane Technologist (TSSCT), held on 27th April 2018 at SRI Kibaha, Tanzania

Preparation and Printing of Training Materials

Burners:

1. Sugarcane Program Activities (two versions)
2. Sugarcane Breeding Activities (two versions)
3. Sugarcane Agronomy Activities (two versions)
4. Sugarcane Entomology Activities (two versions)
5. Sugarcane Diseases: Smut Diseases (two versions)
6. Sugarcane Diseases: RSD Disease (two versions)
7. Sugarcane Nematodes (two versions)

Fliers:

1. Sugarcane Program Activities (two versions)

2. Sugarcane Breeding Activities (two versions)
3. Sugarcane Agronomy Activities (two versions)
4. Sugarcane Entomology Activities (two versions)
5. Sugarcane Diseases: Smut Diseases (two versions)
6. Sugarcane Diseases: RSD Disease (two versions)
7. Sugarcane Nematodes (two versions)

Training Manual

1. Training on Best Management on Sugarcane Farming in Tanzania for senior staff (under preparation)

Project Concept Notes and Proposal Developed by the Program and submitted to the Funding institutions

1. Establishment of seedcane multiplication plot (Nursery "B") at Kilombero, Kagera and Mtibwa mill area - Submitted to Sugar Board of Tanzania (Submitted)
2. The Genetic Diversity of Sugarcane Genotypes Cultivated and Maintained in Sugarcane Estates in Tanzania – Submitted to COSTECH. (It went through the first round waiting for the reviewers)
3. Improving Sugarcane productivity through the enhancement of the sugarcane genetic variability" Submitted to Upscale Funding – COSTECH (Submitted)
4. Assessment of Environmental and Social Impacts of Sugarcane Industry in Tanzania in collaboration with SUA, Morogoro- Submitted to COSTECH. (It went through internal reviewers, waiting for the external reviewers results)
5. Establishment of Small Sugar Mill in collaboration with National Sugar Institute (NSI), Small Industry Development Organization (SIDO), Agricultural Research Institute (ARI)-Ilonga – submitted to COSTECH (Infrastructure call)
6. Climate Change for Improved Sugarcane Productivity in collaboration with Sokoine University of Agriculture (SUA) and University of Copenhagen, Denmark - submitted to DANIDA call (Development Research, South-Driven Development Research)
7. Extraction, Preservation and Bottling Sugarcane Juice in Tanzania in collaboration with ARI-Ilonga and MARON Group - Submitted to the Commission for Science &

Technology (COSTECH) in Collaboration with the SICD/Souderton University Funds for the "*Fostering Of Innovations For Sustainable Development Programme*"

8. Improving Resource Use Efficiency for Increased Food Security, Nutrition and Environmental Sustainability of Sugarcane Based Cropping Systems in Eastern Africa in collaboration with Kenya Agriculture and Livestock Research Organization (KALRO) - Sugar Research Institute (SRI) - submitted to African Union Research Grants: 2018 - Open Call for Proposals.
9. Upgrading tissue culture laboratory to catalyze cassava industrialization for local and international markets collaborate with Root and Tuber Eastern Zone - submitted to COSTECH (Infrastructure call).
10. The Establishment of Soil, Water and Plant Issue Testing Laboratory (SWTL), the Concept Note and MoU between the Ministry of External Affairs of the Republic of India and the Ministry of Agriculture of the United Republic of Tanzania has been submitted to the High Commission of India for scrutiny.

SUGARCANE BREEDING SECTION

Project Title: Importation of New Varieties

Project code: **SCB 2017/01**

Investigators: **S. Ngailo, Ms. Beata P. Khafa, G. Mwasinga and R. Mlimi**

Location: **Sugarcane Research Institute (SRI) – Kibaha**

Commencing: **2017/18**

Completion: **Ongoing**

Reporting: **June 2018**

Introduction

The main objective of this activity is to introduce new germplasm of sugarcane and evaluate its performance in various sugarcane growing areas of the country and identify the best varieties for commercialization.

During the 2017/18 season, the following activities were implemented and results are presented.

Importation of New Sugarcane Varieties

- ***Imported varieties in closed quarantine:***

Seven (7) varieties, R 587, R 98/4146, R 00/8180, R 00/2460, GT15, FR 89/746 and CP 06-2042 were imported from CIRARD and planted in closed quarantine on 21st March 2018. All varieties germinated and are in good condition.

Table 2.1. CIRARD varieties planted in closed quarantine

S/N	Variety	No of setts & eye buds	Germination (%)	Remarks
1	R 587	6 setts with 1 eye bud each	100	Good
2	R 98/4146	6 setts 1eye buds each	100	Very Good
3	R 00/8180	6 setts 1 eye bud each	83	Good
4	R 00/2460	6 setts 1eye bud each	83	Good
5	GT15	6 setts (2 setts 1 eye bud each)	100	Very Good
6	FR 89/746	6 setts with 1eye bud each	100	Very good
7	CP 06-2042	6 setts with 1eye bud each	83	Good

Varieties under open quarantine

- Six varieties from SASRI namely; N35, N**39**, N40, N42, N48 and N57 were imported and planted on 21th March 2017; however, only five varieties were released to open quarantine; variety **N39** was observed to be affected by unknown diseased therefore still maintained in closed quarantine for further observation and investigation.
- Similarly, eleven varieties imported from CIRARD on 7th April 2017 namely; R 97/0478, R 96/0020, R 00/2179, R 96/6396, NA891090, FR92394, FR90881, DB70121, BJ9932, B03572 and **R 99/627.** However only ten varieties were released to open quarantine; variety **R 99/627** was observed to have disorder therefore still maintained in closed quarantine for further observation and investigation.
- Therefore a total of fifteen varieties were released from closed quarantine and planted in open quarantine in 9th January, 2018. Germination was not very good and DB 70121, BJ 9932 and BO 3572 did not germinate.

Varieties released from open quarantine

Further, a total of fifteen (8R & 7N) varieties were released from open quarantine and distributed to sugarcane estates (KSC, TPC, KS & MSE) from 14th to 15th August 2017 for multiplication and evaluation. The varieties include:

- R varieties 10**th** batch: R 98/6092, R 98/2454, R 97/2168, R 96/8149, R 98/2431, R 99/4065, R 95/2204 and R 95/2100
- SASRI varieties 5th batch: N29, N38, N43, N50, N51, N52 and N53

EVALUATION OF NEW VARIETIES

Project Title: Smut Screening Trials

Project Code: **SCB 2017/02**

Investigators: **S. Ngailo, Beata P., Mwasinga, G and R. Mlimi**

Collaborators: **Estates, KATRIN**

Location: **Estates, KATRIN**

Commencement: **2017/18**

Completion: **2019/20**

Reporting: **June 2018**

The objective of these experiments was to determine the reaction of newly imported sugarcane varieties to smut infection so as to identify variety(s) tolerant/resistant to this important disease of sugarcane. Test varieties were subjected to high smut inoculum pressure (artificial inoculation) and planted between spreader rows of susceptible variety, NCo376. Resistant varieties (checks) were also included.

Five smut screening trials for 55 B (26 1^{rst} batch and 29 2nd batch), 40R, 7N and 4CP varieties were established at KATRIN in August, 2017. Results showed significance differences among varieties in their reaction to smut infection. Results of five trials are briefly presented hereunder.

Smut Screening: Trial No. 1

A total of fifteen (7N & 8R) varieties were compared to NCo376 and EA70-97 in a smut screening trial. Results for PC are shown in (Table 2.2). Levels of mean percent smut infection varied among test varieties and the differences were highly significant ($P \leq 0.001$). Test varieties N29, N51 and N53 had smut infections similar to resistant check, EA70-79. Alternatively, other test varieties had smut infection statistically similar to susceptible check, NCo376.

Table 2.2. Smut screening for 7N and 8R varieties: PC

Variety	Smut (%)	Arcsine
N29	0.5	2.32
N38	2.9	9.30
N43	5.9	12.79
N50	6.6	14.49
N51	0.7	3.68
N52	5.7	13.43
N53	0.7	3.68
R 95/2100	3.0	9.48
R 95/2204	3.3	8.23
R 96/2454	5.5	10.70
R 96/8149	1.6	7.19
R 97/2168	1.8	7.74
R 98/2431	14.2	21.21
R 98/6092	2.1	8.29
R 99/4065	8.3	16.39
EA70-79	**1.7**	**5.47**
NCo376	**7.8**	**15.52**
Grand mean	4.25	9.88
SED		4.03
LSD		8.20
CV (%)		49.90

Smut Screening: Trial No. 2

Nineteen (4CP & 15R) varieties were assessed for smut reactions in comparison with NCo376 and EA70-97; susceptible and resistant varieties, respectively. Results are as presented in Table 2.3. There were highly significant differences ($P \leq 0.001$) among test varieties for their reaction to smut infection.

Table 2.3. Smut screening Nursery for 4CP and 15R varieties, PC

Variety	Smut (%)	Arcsine
CPCL02-6848	0.0	0.0
CPCL05-1102	0.5	2.4
CPCL05-1791	0.0	0.0
CPO4-1566	7.6	15.5
R 00/4055	0.2	1.5
R 93/4541	15.6	22.6
R 94/2129	4.6	11.9
R 95/2202	12.8	19.8
R 95/4065 (R 586)	4.2	11.6
R 95/4216	0.7	3.7
R 96/2281	0.0	0.0
R 97/0391	3.6	10.6
R 97/2225	1.4	5.3
R 97/6177	7.1	14.9
R 98/2310	2.3	8.4
R 98/4001	2.9	7.5
R 98/8115	18.9	24.6
R 99/4064	9.7	16.2
R 99/4065	6.1	14.1
EA70-79	**0.87**	**4.36**
NCo376	**15.55**	**21.21**
Grand mean	5.45	10.30
SED		3.28
LSD		6.62
CV (%)		38.90

Test varieties had smut infections at varying degrees including the resistant check. However, varieties CPCL02-6848, CPCL05-1791, R 96/2281, R 00/4055, CPCL05-1102, R 95/4216 and R 97/2225 had lowest smut infection statistically similar to resistant check, EA70-97. On the other hand R 98/8115, R 93/4541, R 95/2202 and R 99/4064 scored higher smut infection similar to susceptible check, NCo376.

Smut Screening: Trial No. 3

Twenty four (7B & 17R) varieties were assessed in smut screening trial against R 579, EA70-97 and NCo376 in PC stage. The mean smut reactions are presented in (Table 2.4). There were highly significant differences ($P<0.001$) in reaction to smut among test varieties; however,

susceptible check had relatively lower smut infection compared to some of the test candidates (Table 2.4).

Table 2.4: Smut screening trial for 7B and 17R varieties: PC

Variety	Smut (%)	Arcsine
B001250	0.0	0.0
B00167	8.6	16.7
B03110	0.0	0.0
B77602	3.5	8.8
B80689	1.1	3.4
B89447	2.7	9.0
B98235	3.2	8.3
R 580	3.4	10.2
R 581	20.2	25.7
R 585	0.5	3.2
R 91/2200	15.9	22.4
R 92/4246	7.7	15.7
R 93/6480	5.3	13.2
R 94/0142	1.8	5.6
R 94/2129	4.9	10.7
R 94/6113	8.4	14.7
R 94/6447	0.0	0.0
R 95/0017	23.4	27.3
R 96/2116	0.0	0.0
R 96/2569	0.8	3.9
R 96/6538	2.5	7.4
R 96/8299	25.3	27.8
R 97/4029	0.0	0.0
R 98/4162	11.3	18.6
R 579	**4.6**	**9.4**
EA70-79	**1.6**	**4.2**
NCo376	**5.9**	**13.6**
Grand mean	6.02	10.4
SED		4.3
LSD		8.7
CV (%)		51.3

The lower smut infection was recorded in varieties B001250, B03110, R 94/6447, R 97/4029 closely followed by R 96/2569 and R 94/0142. On the other hand, highest levels of smut

infection were recorded in varieties R 96/8299, R 95/0017, R 581, R 91/2200 and R 98/4162 (Table 2.4).

Smut Screening: Trial No 4

A total of twenty five **B** varieties were assessed for smut reaction against NCo376 and R 579; susceptible and resistant checks, respectively. Results on mean smut reactions are presented in Table 2.5. There were highly significant differences ($P<0.001$) among varieties tested. Lower smut infection was recorded in varieties BR00010, B01218, BJ8820, B991110 and B99907 which were similar to resistant check (Table 2.5). On the other hand, highest smut infection was recorded in varieties B00713 followed by B00111, BT88404 and BR971004 (Table 2.5).

Smut Screening: Trial No 5

Twenty four (23B & 1M) varieties were evaluated for smut reaction against NCo376, N41 and R 579 in PC stage. Results are as presented Table 2.6. Results indicated highly significant differences ($P<0.001$) among tested varieties. Test varieties demonstrated varying levels of their reaction to smut infestation including the resistant variety. However, varieties BBZ951034, BJ8231, BR030003, BR971007, BR971014 and B991037 had lowest smut infection statistically similar to resistant control. On other hand, varieties B99186 followed by B991114, BR97101, BBZ951049, BJ8534, DB8203, BJ8897, BR96013 and DB94177 scored higher smut infection similar to susceptible check.

Table 2.5: Smut screening for 25B varieties: PC

Variety	Smut (%)	Arcsine
B00111	22.4	26.2
B00279	5.3	10.7
B00713	26.6	28.1
B0072	6.3	11.6
B01218	0.4	2.1
B041291	5.1	12.9
B991110	1.5	5.6
B99907	1.7	7.0
BBZ8257	5.5	10.9
BJ82156	2.6	7.4
BJ8820	1.1	4.9
BR00010	0.0	0.0
BR021002	4.6	9.7
BR96013	4.6	9.2
BR971004	10.8	18.1
BR972001	3.2	5.9
BT7782	3.3	10.1
BT88404	16.7	23.2
DB7869	6.7	14.4
DB8113	7.2	14.8
DB9633	5.6	11.1
KNB9180	5.1	12.8
KNB9211	3.8	7.9
KNB9218	3.3	9.3
KNB9252	2.4	6.9
R 579	**0.0**	**0.0**
NCo376	**13.8**	**19.8**
Grand mean	6.3	11.1
SED		5.6
LSD		11.2
CV (%)		61.2

Table 2.6. Smut screening for 23B and 1M varieties: PC

Variety	Smut (%)	Arcsine
B991037	2.2	7.0
B991114	26.8	28.7
B99186	27.9	30.1
BBZ92653	9.4	14.2
BBZ951034	0.0	0.0
BBZ951049	15.9	22.4
BJ78100	3.4	8.4
BJ8231	0.0	0.0
BJ8534	13.0	20.4
BJ8897	11.3	19.1
BR030003	0.0	0.0
BR041001	8.5	16.4
BR08004	8.9	16.1
BR08012	5.0	12.3
BR93017	6.6	14.7
BR96013	11.1	19.0
BR971007	0.7	3.7
BR971011	24.5	24.4
BR971014	1.2	6.2
DB8203	11.5	18.9
DB94177	11.0	18.8
DB9436	9.2	17.2
DB9526	6.3	14.2
M700/86	4.0	8.5
N41	3.99	9.98
R 579	0.41	2.12
NCo376	13.13	20.75
Grand mean		13.83
SED		5.04
LSD		10.12
CV (%)		44.60

Project Title: Preliminary Yield Trials

Project Codes.	**SCB 2013/04, SCB 2015/03, SCB 2016/04, SCB 2016/05 2017/4, SCB 2017/03, SCB 2017/06**
Principle investigator	**S. Ngailo, Beata P. Khafa, R. Mlimi and G. Mwasinga**
Collaborators	**Estates**
Location	**KSC, MSE, TPC and KSL**
Date of Commencement	**2013/14**
Date of Completion	**Ongoing**
Reporting Period	**July 2017-June 2018**

The objective of these trials was to evaluate newly introduced varieties so as to identify and select varieties that are high yielding, tolerant to pests and diseases and well adapted to Tanzanian sugarcane growing areas.

- A total of six new preliminary variety trials testing R, N, B and CP varieties were established in different estate fields (2 at KSC, 2 at MSE and 2 at TPC) in 2017/18 season.
- Two rainfed trials testing R, N and TZ varieties were planted at KSC and MSE in 2017/18 season.
- A total of 19 ongoing variety trials in estates were harvested and results reported.
- Data from twelve (12) preliminary variety trials from KSC obtained, analyzed and are reported
- Two (2) preliminary variety trials from TPC obtained, analyzed and are reported
- Two (2) preliminary variety trials from MSE obtained, analyzed and are reported
- Three (3) preliminary variety trials from KSL obtained, analyzed and are reported

Irrigated variety trials at Kilombero Sugarcane Company (KSC)

Field 410

Fourteen B varieties were evaluated against N25 and R 579 in field 410 at KSC during the reported period. Results indicated significant differences ($P \leq 0.001$) in TCHA among varieties tested (Table 2.7). Varieties B80689 followed by control varieties N25 and R 579 had the highest TCHA. Conversely, varieties BR96013, BJ8256 and BJ8820 had the lowest TCHA.

Similarly, results for TSHA also indicated highly significant differences ($P \leq 0.001$) among evaluated varieties. Candidate variety B80689 closely followed by N25 and R 579 had the highest TSHA similar to the best control check, N25 (Table 2.7). Conversely, varieties BR96013, BJ8256 and BJ8820 had the lowest TSHA (Table 2.7). Alternative, other parameters were statistically not different ($P \leq 0.05$).

Table 2.7. Preliminary sugarcane variety trial (Field 410)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
B001250	16.19	12.59	77.76	9.01	87.34	7.86
B80689	16.06	12.42	77.32	8.86	116.91	10.33
B98235	14.86	11.97	80.68	8.96	74.98	6.7
BJ78100	15.43	11.96	77.44	8.54	68.21	5.85
BJ8256	16.3	12.73	78.09	9.16	32.85	2.97
BJ8534	16.26	13.13	80.74	9.79	84.83	8.3
BJ8820	13.58	11.38	84.44	8.86	46.57	4.14
BR041001	15.36	12.14	79.5	9.13	68.5	6.28
BR0812	16.17	13.11	81.04	9.85	68.21	6.57
BR96013	16.46	13.51	82.09	10.3	19.9	2.06
BR971004	14.99	11.75	78.35	8.48	95.85	8.21
BR971014	15.8	12.71	80.4	9.47	65.7	6.16
DB8113	15.21	12.51	81.71	9.48	85.6	8.15
DB9526	15.21	12	77.87	8.75	95.85	8.44
R 579	**15.78**	**12.68**	**81.79**	**9.45**	**101.45**	**9.46**
N25	**14.76**	**12.09**	**81.93**	**9.32**	**108.79**	**10.2**
Grand mean	15.53	12.42	80.07	9.21	76.35	6.98
LSD	1.725	1.397	6.396	1.537	23.46	2.488
CV (%)	6.7	6.7	4.8	10	18.4	21.4
SED	0.845	0.684	3.132	0.752	11.487	1.218

Growth start date: 12/08/2015 Previous harvest date: 14/09/2016

Age at harvest: 11.4 Months Harvest date: 28/08/2017

Crop cycle: R1

Field 411

Twenty six CP and Q varieties were tested against N25 and NCo376. Results on mean TCHA among varieties tested are presented in Table 2.8. There was highly significant difference ($P < 0.001$) among tested varieties. Variety Q177 followed by Q200 out yielded other test candidates

in terms of TCHA (Table 2.8). To the contrary, varieties CPCLO2-1295, CPO4-1321and CPO4-1935 had the lowest TCHA.

Similarly, the results for annual sugar yield (TSHA) are presented in Table 2.8. As for TCHA, there was highly significant difference (P <0.001) among tested varieties. Varieties Q200, CPCL95-2287 and Q199 had the highest TSHA statistically similar to the best control N25. Conversely, varieties CPCL02-1295, CP04-1321, and CP04-1619 had the lowest TSHA (Table 2.8). Other traits were statistically similar.

Field 417

Fifteen B, CG and R varieties were tested against N25. Results are presented in Table 2.9. There was highly significant difference (P=0.001) in TCHA among varieties tested. However, the check variety, N25 out-yielded the test candidates followed by R 96/2569 and BR9701011 in terms of TCHA. Conversely, varieties DB8203, R 97/4029 and CG99-125 had the lowest TCHA (Table 2.9).

Similarly, results on TSHA are presented in Table 2.9. Based on TSHA, results indicated significant difference (P≤ 0.01) among varieties tested. While control varieties N25 followed by R 96/2569 and BR9701011 had the highest TSHA; varieties DB8203, CG99-125 and B03110 had the lowest compared control and other test varieties.

Field 419

Nineteen, 6N, 6Q and 7R varieties were tested against N25. Results on mean TCHA are presented in Table 2.10. Results indicated highly significant difference (P=0.01) in TCHA among varieties tested. However, varieties N36 followed by N49 and N23 had the highest TCHA statistically similar to control variety N25. Conversely, varieties Q228, R 91/2021 and Q234 had the lowest TCHA.

On the other hand, results indicated significant difference (P ≤ 0.05) in TSHA among varieties tested. While varieties N36, N49 and N47 had the highest TSHA; Q228, Q234 and R 91/2021 had the lowest TSHA (Table 2.10). Other traits namely pol and purity except sucrose were significantly different at P ≤ 0.05.

Table 2.8. Preliminary sugarcane variety trial (Field 411)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
CPCL95-2287	15.85	14.13	89.43	11.7	166.95	19.65
CPCLO2-0843	16.02	13.99	87.38	11.3	106.55	12.11
CPCLO2-0926	17.07	13.63	79.85	10.02	123.08	12.34
CPCLO2-1295	16.53	13.28	80.17	9.74	56.98	5.55
CPCLO2-2273	14.7	13.66	93.02	11.69	93.45	10.88
CPO4-1252	15.84	13.45	84.97	10.51	113.96	12.18
CPO4-1258	15.76	14.49	92.16	12.26	111.68	13.69
CPO4-1321	16.7	13.56	81.2	10.19	79.77	8.04
CPO4-1367	16.86	14.11	83.7	10.88	120.8	13.28
CPO4-1374	16.06	14.12	88.02	11.83	106.55	12.57
CPO4-1426	16.48	13.49	82.29	10.17	117.38	11.77
CPO4-1566	15.18	13.3	88.03	10.79	103.13	11.22
CPO4-1619	15.11	12.64	84.57	9.71	99.15	9.73
CPO4-1844	16.59	14.66	88.32	11.97	123.08	14.73
CPO4-1935	15.43	13.74	89.22	11.3	90.03	10.12
Q151	17.42	14.39	82.61	10.99	162.39	17.84
Q155	16.31	13.5	82.71	10.3	171.51	17.69
Q171	16.41	14.29	87.08	11.63	126.50	14.67
Q177	16.63	12.91	77.65	9.14	200.00	18.30
Q183	16.78	13.69	81.77	10.31	102.56	10.13
Q190	15.44	13.89	89.9	11.53	143.59	16.45
Q199	16.91	14.81	87.55	12.02	155.56	18.81
Q200	15.61	13.58	87.19	10.89	185.19	20.28
Q219	16.48	12.99	78.87	9.35	163.53	15.15
Q96	15.28	13.06	86.75	10.29	115.10	12.01
Q99	16.41	12.78	77.96	9.14	165.81	15.16
N25	**15.94**	**12.39**	**77.67**	**8.76**	**197.72**	**17.3**
NCo376	**16.12**	**13.31**	**76.34**	**8.54**	**133.33**	**11.38**
Grand mean	16.14	13.64	84.52	10.61	129.83	13.68
LSD	2.205	1.653	13.426	2.513	36.831	5.469
CV (%)	6.7	5.9	7.7	11.5	13.8	19.5
SED	1.074	0.806	6.543	1.225	17.95	2.665

Growth start date: 12/09/2015 Previous harvest date: 18/09/2016

Age at harvest: 12. Months Harvest date 06/09/2017

Crop cycle: R2

Table 2.9. Preliminary sugarcane variety trial (Field 417)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
R 580	14.88	11.5	77.25	8.23	84.4	6.92
B03110	14.45	11.31	78.29	8.24	74.1	6.11
B041291	14.74	11.87	80.42	8.88	73.4	6.59
B99114	16.84	13.67	81.13	10.41	63.5	6.58
BR9701011	15.24	11.79	77.43	8.45	104.6	8.85
CG00-092	14.54	11.4	78.53	8.67	86.1	7.28
CG96-52	16.61	12.6	75.94	8.83	72.5	6.42
CG99-087	15.85	12.5	78.9	9.18	72.1	6.62
CG99-125	15.42	12.5	81.01	9.45	61.6	5.84
CGSP98-12	14.45	11.45	79.41	8.46	85.5	7.24
DB8203	15.53	11.87	76.4	8.39	59.6	5.02
R 94/6447	15.63	12.56	80.36	9.38	79	7.42
R 96/2569	14.34	11.47	80.04	8.56	108.4	9.29
R 96/6538	15.66	12.34	78.85	9.04	73.9	6.69
R 97/4029	15.61	12.33	79.29	9.08	76.4	6.91
N25	**14.97**	**12.12**	**81**	**9.15**	**110.6**	**10.09**
Grand mean	15.3	12.08	79.02	8.9	80.4	7.12
LSD	1.41	1.01	4.303	1.085	23.7	2.321
CV (%)	5.5	5	3.3	7.3	17.7	19.6
SED	0.69	0.495	2.107	0.531	11.6	1.137

Growth start date: 25/09/2015 Previous harvest date: 08/12/2016

Age at harvest: 12 Months Harvest date: 06/12/2017

Crop cycle: R1

Field 511

Fourteen varieties (12B and 2R) were evaluated against N25 and R 579 during the reported period. The means for parameters studied are presented in Table 2.11. Results indicated significant differences ($P<0.001$) in TCHA among varieties tested. However, control variety N25 out-yielded test varieties. Test varieties with highest TCHA similar to control include BJ8231, R 96/2116 and R 94/0142. Conversely, varieties B00167, BBZ92953 and BT88404 had the lowest TCHA **(**Table 2.11).

Similarly, results indicated significant differences (P<0.001) among evaluated varieties for TSHA. Candidate varieties BJ823, R 94/0142, and R 96/2116 had the highest TSHA superior to the best check though statistically similar. Conversely, varieties BOO167, BT88404 and BBZ92953 had the lowest TSHA and were statistically similar (Table 2.11).

On the other hand, brix and pol were significant different ($P \leq 0.05$), purity and sucrose were not different among varieties studied.

Table 2.10. Preliminary sugarcane variety trial (Field 419)

Variety	Pol	Purity	Sucrose	TCHA	TSHA
R 582	13.57	88.11	11.06	97.90	10.78
R 583	13.67	92.09	11.39	85.60	9.72
N23	13.21	87.25	10.62	99.20	10.72
N36	13.28	94.59	11.41	104.80	11.99
N45	13.20	88.91	10.86	99.00	10.73
N46	13.20	93.45	11.40	74.90	8.54
N47	14.00	96.48	12.19	91.10	11.11
N49	14.04	92.46	11.86	99.90	11.88
Q208	13.30	85.37	10.69	83.20	8.93
Q220	13.21	89.47	10.92	76.90	8.44
Q228	13.89	89.09	11.39	63.50	7.22
Q230	13.99	86.69	11.27	72.60	8.23
Q231	13.91	85.91	11.06	84.40	9.36
Q234	13.39	85.63	10.97	67.90	7.49
R 85/1334	13.59	91.78	11.42	72.60	8.29
R 91/2021	13.02	94.23	11.43	66.60	7.61
R 92/6246	13.56	92.58	11.49	89.30	10.26
R 92/6545	13.61	91.31	11.35	83.70	9.48
R 92/8029	13.52	91.96	11.38	77.70	8.81
N25	**13.39**	**91.94**	**11.26**	**87.90**	**9.90**
Grand mean	13.53	90.46	11.27	83.90	9.47
LSD	0.65	6.66	1.09	22.45	2.90
CV (%)	2.90	4.50	5.90	16.20	18.50
SED	0.32	3.29	0.54	11.09	1.43

Growth start date: 22/02/2016 Previous harvest date: 26/01/201

Age at harvest: 11.9 Months Harvest date: 11/01/2018

Crop cycle: R3

Table 2.11. Preliminary sugarcane variety trial (Field 511)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
B00167	15.83	12.48	78.83	9.07	13.90	1.30
B0072	15.76	11.96	75.98	8.30	67.30	5.56
B89447	13.70	10.56	77.04	7.41	60.10	4.45
B991037	15.44	11.53	74.68	7.74	56.50	4.31
BBZ92953	15.15	12.50	82.87	9.50	33.70	3.12
BJ8231	15.11	12.73	84.53	9.85	93.30	9.11
BR030003	15.32	12.60	82.79	9.59	54.40	5.13
BR93017	14.16	11.47	81.07	8.59	58.50	5.01
BR96013	16.00	12.42	77.54	8.84	47.60	4.21
BT88404	16.00	11.45	71.55	7.37	22.40	1.68
DB7869	14.51	10.91	74.54	7.49	72.20	5.64
KNB9211	15.82	12.69	80.14	9.38	61.70	5.75
R 94/0142	15.27	12.76	83.56	9.79	89.80	8.89
R 96/2116	15.35	12.37	80.51	9.11	91.10	8.36
R 579	**15.26**	**11.73**	**76.87**	**8.30**	**88.70**	**7.35**
N25	**15.51**	**11.79**	**75.98**	**8.17**	**100.40**	**8.21**
Grand mean	15.26	12.00	78.66	8.66	63.20	5.51
LSD	1.33	1.38	9.67	2.02	26.60	2.63
CV (%)	5.20	6.90	7.40	14.00	25.20	28.60
SED	0.65	0.67	4.74	0.99	13.03	1.29

Growth start date: 28/07/2015 Previous harvest date: 28/07/2016

Age at harvest: 12 Months Harvest date: 05/07/2017

Crop cycle: R1

Field 362

A total of fifteen (13B and 2R) varieties were evaluated against N25 and NCo376 in field 362. The results for first ratoon are as presented in (Table 2.12). There were highly significant differences ($P \leq 0.001$) in TCHA and TSHA among varieties tested. With regard to TCHA, variety N25 closely followed by test variety DB9633 and R 97/4004 recorded the highest. Eight test varieties had TCHA below the mean led by B96186, BBZ951049 and B00279 (Table 2.12). On the other hand, the highest TSHA was also recorded in DB9633, R 97/4004 and N25 while B96186, KNB89180 and BBZ951049 had the lowest. Other parameters except purity were not statistically different.

Table 2.12. Preliminary sugarcane variety trial (F 362)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
B00111	15.67	14.11	82.85	10.86	53.70	5.88
B00279	15.36	13.17	81.53	9.94	53.50	5.23
B01218	16.49	13.51	83.09	10.43	56.50	5.99
B77602	15.33	13.10	80.19	9.71	70.30	6.84
B96186	14.74	13.54	82.39	10.35	30.40	3.19
BB9436	14.04	13.08	82.10	9.96	90.10	9.07
BBZ951049	15.32	13.61	79.38	10.07	43.00	4.36
BR971007	15.11	12.97	80.92	9.73	87.90	8.55
BR972001	15.26	13.33	85.38	10.55	63.70	6.72
BT7782	14.85	13.61	84.19	10.66	54.30	5.81
DB9633	15.70	14.15	85.46	11.14	100.70	11.23
KNB89180	15.86	13.88	81.56	10.52	39.40	4.14
KNB9218	14.91	13.11	90.49	10.96	74.70	8.18
R 585	16.05	13.97	88.63	11.38	79.50	9.02
R 97/4004	14.52	13.89	90.45	11.57	94.30	10.95
N25	**14.96**	**12.71**	**84.25**	**9.90**	**108.90**	**10.71**
Grand mean	15.26	13.48	83.93	10.48	68.80	7.24
LSD	1.41	1.43	5.33	1.37	20.37	2.36
CV (%)	5.50	6.40	3.80	7.80	17.80	19.50
SED	0.69	0.70	2.61	0.67	9.97	1.15

Growth start date: 23/9/2015 Harvest date: 15/09/2017

Age at harvest: 12 months Crop cycle: R1

Field 354

Twenty eight CG varieties were evaluated against N41, N25 and R 579 in field 354. These were in third ratoon. The means for traits evaluated are presented in Table 2.13. Results showed significant differences (P=0.01) in TCHA among varieties tested. Among tested varieties, the highest TCHA was observed in varieties CG00-092 followed by N25 and CG00-028. Conversely CG96-135, CG98-62 and CG98-47, scored the lowest TCHA (Table 2.13). With regard to TSHA, varieties did not differ significantly. The highest TSHA was recorded in CG96-01 followed by CG00-028, N25 and CG00-092 and the lowest TSH was obtained in CG96-135, CG97-97 and CG98-47 (Table 2.13).

Table 2.13. Preliminary sugarcane variety trial (F 354)

Variety	Pol	Purity	Sucrose	TCHA	TSHA
CG00-028	13.68	90.34	10.64	100.70	10.71
CG00-033	13.12	88.15	10.70	89.10	9.55
CG00-044	12.92	86.97	10.44	65.40	6.81
CG00-092	12.98	81.86	8.82	120.10	10.61
CG00-120	12.12	85.41	9.55	78.40	7.48
CG00-129	12.78	88.93	10.47	70.40	7.34
CG96-01	12.63	87.54	25.23	95.00	24.27
CG96-135	12.61	91.53	9.98	28.90	2.99
CG96-40	14.65	84.72	10.75	61.40	6.60
CG96-52	13.61	87.76	10.72	78.10	8.48
CG96-59	13.02	85.95	10.38	78.90	8.08
CG96-78	13.75	85.48	10.08	93.00	9.35
CG97-100	13.92	83.49	9.82	64.70	6.35
CG97-97	12.86	81.24	8.70	60.40	5.11
CG98-10	13.52	82.45	9.21	62.70	5.79
CG98-100	12.96	88.35	9.61	67.70	6.45
CG98-32	14.11	80.79	9.27	73.60	6.95
CG98-46	13.01	90.78	10.45	81.80	8.42
CG98-47	11.99	86.40	9.58	58.20	5.32
CG98-62	12.28	88.48	10.06	55.20	5.55
CG99-014	12.66	87.99	9.50	96.00	9.15
CG99-045	11.91	91.50	10.40	75.90	7.84
CG99-048	12.69	90.24	9.98	68.70	6.81
CG99-087	13.55	84.18	9.87	64.20	6.34
CG99-125	14.06	85.10	10.13	67.70	6.85
CGSP98-09	13.90	86.20	10.23	82.30	8.42
CGSP98-12	13.21	87.48	10.13	60.40	6.17
CGSP98-16	14.00	82.53	9.61	77.60	7.46
N41	**12.86**	**89.05**	**9.88**	**98.60**	**9.88**
N25	**12.09**	**92.51**	**9.89**	**108.20**	**10.71**
R 579	**13.77**	**86.74**	**10.30**	**82.60**	**8.46**
Grand mean	13.09	86.63	10.41	77.50	8.14
LSD	2.60	8.87	8.01	35.89	8.53
CV (%)	9.80	5.00	37.70	22.70	51.40
SED	1.28	4.35	3.93	17.60	4.18

Growth start date: 22/08/2013 Harvest date: 23/01/2018

Age at harvest: 15 months Crop cycle: R3

About 54% and 68% of the test varieties had TCHA and TSHA below their respective TCHA and TSHA grand means (Table 2.13). Varieties CG96-40, CG96-52 and CG00-033 had the highest sucrose content above the mean and the best check (Table 2.13).

Rainfed variety trials

Variety trials were established at KSC estate to test the performance of varieties under rainfed conditions. The varieties tested include R 570, R 581, R 583, R 92/4246, N12, N47, TZ93-KA-120 and TZ93-KA-122. They were evaluated against NCo376.

Field 103

The means for parameters studied are as presented in Table 2.14. Results for R1 indicated no significant differences (P=0.05) among candidate varieties for both TCHA and TSHA. While, varieties R570, TZ93-KA-122 and N12 had the highest TCHA and TSHA; candidates R 581, R 92/4246 and N47 had the lowest TCHA and TSHA; however, superior to the check (Table 2.14). Generally, the yields were above to the lowest yield potential of 70 TCHA.

Table 2.14. Preliminary sugarcane variety trial (Field 103)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
N12	15.99	12.85	80.66	9.52	101.1	9.72
N47	16.45	13.55	82.46	10.33	90.4	9.42
R 570	17.31	13.68	79.34	9.92	113.5	11.22
R 581	15.57	13.21	84.87	10.34	52.7	5.55
R 583	14.99	12.69	84.97	9.91	90.4	9.09
R 92/4246	16.65	13.65	82.13	10.97	83.5	9.40
TZ93-KA-120	15.49	13.47	86.91	10.81	91.5	9.95
TZ93-KA-122	16.11	13.59	84.3	10.57	102	10.7
NCo376	**16.38**	**13.27**	**81.21**	**9.94**	**87.2**	**8.74**
Grand mean	16.1	13.33	82.98	10.26	90.3	9.31
LSD	1.41	0.98	6.42	1.298	42.12	4.6
CV (%)	6	5	5.3	8.7	32	33.9
SED	0.68	0.475	3.111	0.629	20.41	2.229

Growth start date: 30/12/2015 Previous harvest date: 30/12/2016

Age at harvest: 10.4 Months Harvest date: 12/10/2017

Crop cycle: R1

Field 124

Eight varieties were planted in field 124 and evaluated against NCo376. The means for parameters studied are as presented in Table 2.15. Results showed no significant differences (P≤0.05) in TCHA among tested varieties. Varieties TZ93-KA-122, N47, N12 and R 570 had the highest TCHA (Table 2.15). Alternatively, the lowest TCHA was recorded in varieties NCo376, R 583 and R 581 (Table 2.15).

Also, test varieties did not differ significantly in TSHA. The highest TSHA was recorded in TZ93-KA-122, N12 and N47. Conversely, R 583 and R 581 had the lowest TSHA. Similar to TCHA and TSHA, other parameters were statistically alike.

Table 2.15. Preliminary sugarcane variety trial (F 124)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
N12	16.02	13.84	86.38	11.04	80.70	8.99
N47	15.81	13.18	83.39	10.16	87.20	8.86
R 570	15.79	12.98	82.25	9.83	72.80	7.47
R 581	14.78	12.9	87.51	10.39	68.10	6.98
R 583	14.51	12.64	87.47	10.18	68.00	6.86
R 92/4246	15.16	12.72	83.82	9.86	78.90	7.56
TZ93-KA-120	15.59	13.53	86.81	10.82	71.10	7.78
TZ93-KA-122	15.78	13.01	83.71	9.88	101.50	9.93
NCo376	**15.31**	**13.66**	**89.55**	**11.26**	**64.40**	**7.35**
Grand mean	15.42	13.16	85.65	10.38	77.00	7.97
LSD	2.037	1.908	5.376	1.849	42.99	4.34
CV (%)	7.6	8.4	3.6	10.3	32.30	31.4
SED	0.961	0.9	2.536	0.872	20.28	2.047

Growth start date: 07/12/2015 Previous harvest date: 30/12/2016

Age at harvest: 12 Months Harvest date: 09/10/2017

Crop cycle: R2

Field 622

The means for traits studied in this field are presented in Table 2.16. Results showed significant differences (P≤0.05) in TCHA among tested varieties. The highest TCHA was recorded in control variety NCo376 closely followed by N12, R 583 and R 570 (Table 2.16). Alternatively, the lowest TCH was observed in TZ93-KA-122 and R 92/4246.

Similarly, test varieties differ significantly (P<0.01) in TSHA. The highest TSHA was recorded in NCo376 followed by R 583 and N47 (Table 2.16). Conversely, TZ93-KA-122 and R 92/4246 had the lowest TSHA (Table 2.16). Uneven rainfall distribution and water stagnation during crop growth could have largely contributed to lower yields recorded.

Table 2.16. Preliminary sugarcane variety trial (F 622)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
N12	14.71	13.06	88.11	11.35	54.50	6.19
N47	15.45	14.34	92.76	12.18	51.70	6.25
R 570	14.31	13.20	92.24	11.00	54.30	5.98
R 581	13.52	12.81	94.76	11.09	50.80	5.62
R 583	14.85	13.69	92.24	11.60	54.10	6.27
R 92/4246	14.01	12.88	91.95	10.87	45.30	4.94
TZ93-KA-120	14.75	13.67	92.78	11.60	50.30	5.82
TZ93-KA-122	15.03	13.66	90.84	11.35	41.30	4.66
NCo376	**14.97**	**14.04**	**93.74**	**12.03**	**60.90**	**7.34**
Grand mean	14.62	13.48	92.16	11.45	51.50	5.90
LSD	0.98	0.94	4.15	1.05	9.85	1.17
CV (%)	4.60	4.80	3.10	6.30	13.10	13.60
SED	0.47	0.45	2.01	0.51	4.77	0.57

Growth start date: 06/12/2015 Previous harvest date: 13/01/2017

Age at harvest: 12 Months Harvest date: 17/01/2018

Crop cycle: R1

Field 130

The results for means of parameters studied are presented in Table 2.17. Results on PC indicated no significant differences (P=0.05) in TCHA among tested varieties. Varieties TZ93-KA-122 followed by N12 and R 581 had the highest TCHA statistically similar to control variety. Alternatively, TZ93-KA-12 and R 92/4246 had the lowest TCHA.

Based on TSHA, results also indicated no significant differences (P=0.05) among varieties. The highest TSHA was recorded in TZ93-KA-120 followed by N12 and R 583; alternatively, varieties R 94/6113 and R 581 scored the lowest (Table 2.17). Similarly, all other traits were statistically alike except pol which was significant different at P=0.05.

Table 2.17. Preliminary sugarcane variety trial (F 130)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
N12	16.89	13.16	81.56	9.38	117.60	11.12
N47	16.35	13.64	83.56	10.48	101.40	10.70
R 570	16.32	13.13	80.57	9.72	107.40	10.88
R 581	15.32	12.30	80.66	9.10	111.50	9.01
R 583	14.77	12.70	86.09	10.09	99.20	11.03
R 92/4246	15.77	12.84	81.51	9.64	108.80	10.14
R 94/6113	15.98	12.94	81.05	9.65	104.80	6.31
TZ93-KA-120	16.02	13.10	81.83	9.82	65.40	12.97
TZ93-KA-122	15.45	12.82	83.00	9.82	132.00	10.51
NCo376	**16.69**	**13.53**	**81.09**	**10.13**	**107.00**	**10.70**
Grand mean	15.95	13.02	82.09	9.78	105.50	10.34
LSD	1.45	0.77	4.25	1.06	33.15	3.40
CV (%)	6.20	4.10	3.60	7.40	21.70	22.70
SED	0.70	0.38	2.07	0.51	16.16	1.66

Growth start date: 07/10/2016 Harvest date: 05/10/2017

Age at harvest: 12 Months

Crop cycle: PC

Field 670

Field 670 was planted with nine (2N, 5R and 2TZ) varieties which were tested against NCo376. The results for the traits measured are presented in Table 2.18). Results showed no significant differences (P=0.05) in TCHA and TSHA for varieties tested. Among tested varieties, the highest TCHA was recorded for variety R 94/6113 followed by R 92/4246 and R 581. To the contrary, the lowest TCHA was observed in N12 and TZ93-KA-122.

On the other hand, highest TSHA was recorded in variety R 94/6113 followed by R 581 and NCo376 and the lowest was recorded in, N12 and TZ93-KA-122 (Table 2.18). As for TCHA, the sugar yields were not impressive.

Table 2.18. Preliminary sugarcane variety trial (F 670)

Variety	Brix	Pol	Purity	Sucrose	TCHA	TSHA
N12	17.20	14.25	82.80	10.90	42.30	4.61
N47	15.95	13.71	85.88	10.87	54.20	5.82
R 570	16.82	14.35	85.31	11.27	51.30	5.82
R 581	15.68	13.60	86.88	11.18	58.60	6.58
R 583	15.74	13.43	85.29	10.57	56.30	5.97
R 92/4246	15.10	13.34	88.79	10.28	59.40	6.00
R 94/6113	14.60	12.67	87.26	10.15	66.30	6.71
TZ93-KA-120	15.69	13.34	84.99	10.45	54.70	5.64
TZ93-KA-122	15.00	14.17	90.07	11.70	45.30	5.31
NCo376	**16.48**	**13.88**	**84.27**	**10.81**	**58.10**	**6.45**
Grand mean	15.91	13.67	86.15	10.82	54.60	5.89
LSD	1.44	0.94	5.67	1.16	17.89	2.02
CV (%)	6.20	4.70	4.50	7.40	22.60	23.70
SED	0.70	0.46	2.76	0.56	8.72	0.99

Growth start date: 27/9/2016 Harvest date: 11/11/2017

Age at harvest: 14 Months Crop cycle: PC

TPC

Two variety trials both testing the same sets of varieties evaluated in R3 were harvested. In general check varieties N25 and R 579 had the best and most consistent performance in TCHA and TSHA. However, Candidate varieties R 85/1334, Q220 Q208 and KQ228 showed good performance in TCHA and TSHA similar to control varieties.

Field BO5

Twelve varieties (6Q and 6R) were tested against N25 and R 579 in field BO5 at TPC, these were in third ratoon. The means for the traits evaluated are presented in Table 2.19. Results showed highly significant differences ($P \leq 0.001$) in TCHA and TSHA among varieties evaluated. While the highest TCHA was recorded in standard varieties N25 followed by R 85/1334 and R 579, the lowest TCHA was recorded in R 92/8029, R 91/2021 and Q230. With regards to TSHA, varieties N25 closely followed by KQ228, R 579 and R 85/1334 had the highest TSHA. Alternatively, varieties R 583, R 91/2021 and R 92/8029 had the lowest (Table 2.19). Moreover,

there were highly significant differences (P≤0.001) among tested varieties for pol, purity and fibre.

Table 2.19. Preliminary sugarcane variety trial (Field BO5)

Variety	Pol	Purity	Fibre	TCHA	TSHA
R 583	15.27	85.29	14.44	168.82	25.62
R 584	16.46	88.34	14.91	186.12	30.73
KQ228	20.52	93.27	14.81	178.53	36.53
Q208	18.80	91.33	14.76	177.65	33.15
Q220	18.18	91.35	15.03	190.46	34.53
Q230	20.71	93.40	14.72	164.99	34.09
Q231	19.33	92.85	14.58	166.02	31.78
Q234	19.12	91.39	14.99	165.72	31.64
R 85/1334	17.47	89.85	13.89	206.40	35.89
R 91/2021	16.05	86.77	14.13	163.17	26.16
R 92/6545	16.60	88.95	14.73	182.69	30.24
R 92/8029	18.74	91.09	13.76	151.39	28.35
N25	**17.48**	**89.87**	**13.54**	**214.01**	**37.12**
R 579	**18.52**	**92.82**	**12.66**	**193.51**	**35.96**
Grand mean	18.09	90.47	14.36	179.25	32.27
LSD	1.00	1.89	0.47	16.32	3.31
CV (%)	7.90	3.00	4.70	13.00	14.70
SED	0.51	0.96	0.24	8.27	1.68

Growth start date: 14/01/2017 Harvest date: 09/02/2018

Age at harvest: 12.9Months Crop cycle: Third ratoon

Field L3S

Twelve varieties (6Q and 6R) were tested against N25 and R 579 in field L3S at TPC in third ratoon. The means for traits studied are presented in Table 2.20. Results showed highly significant differences (P≤0.001) in TCHA and TSHA among varieties evaluated. The highest TCHA was recorded in control varieties R 579 and N25. Among the test varieties, candidates R 85/1334, Q220 and Q208 had the highest TCHA though lower to check varieties (Table 2.20). Varieties R 92/8029, R 91/2021 and Q234 had the lowest TCHA.

Moreover, variety KQ228 had the highest TSHA followed by N25, Q208 and R 579. Conversely, candidates R 91/2021, R 583 and R 92/8029 had the lowest TSHA (Table 2.20). As for TCHA

and TSHA, the other parameters were also significantly different (P≤0.001) among tested varieties.

Table 2.20. Preliminary sugarcane variety trial (Field L3S)

Variety	Pol	Purity	Sucrose	Fibre	TCHA	TSHA
R 583	15.27	87.55	17.53	14.47	166.72	28.91
R 584	16.46	90.07	18.10	14.76	182.37	32.83
KQ228	20.52	93.01	21.57	14.90	180.22	38.89
Q208	18.80	91.99	20.67	14.72	186.47	38.50
Q220	18.18	91.60	19.40	15.66	188.29	36.53
Q230	20.71	93.06	20.47	15.08	162.04	33.06
Q231	19.33	92.87	20.06	14.78	171.46	34.41
Q234	19.12	90.77	20.03	14.41	155.67	31.30
R 85/1334	17.47	88.86	18.03	13.16	198.89	35.74
R 91/2021	16.05	88.81	18.02	13.71	149.71	27.05
R 92/6545	16.60	90.44	17.97	15.40	179.50	32.22
R 92/8029	18.74	91.79	19.65	14.82	149.50	29.30
N25	**17.48**	**90.92**	**19.01**	**13.58**	**204.92**	**38.80**
R 579	**18.52**	**89.08**	**18.50**	**12.28**	**206.66**	**38.22**
Grand mean	18.09	90.77	19.22	14.41	177.32	33.98
LSD	1.00	1.54	0.90	0.61	14.55	3.11
CV (%)	7.90	2.40	6.70	6.00	11.80	13.10
SED	0.51	0.78	0.45	0.31	7.37	1.57

Growth start date: 08/10/2016 Harvest date: 11/09/2017

Age at harvest: 11.1 Months Crop cycle: Third ratoon

Irrigated variety trials at Kagera Sugar Ltd

Two variety trials testing varieties MN1, R 579, R 92/6545, N41, N47, N49, R 570, N19, N25 and Co617 were harvested. While three variety trials are in plant cane, two trials are in first ratoon. The data from harvested trials showed varieties N41 and N49 to be promising similar to N25.

Field TP8a

Seven varieties (4N and 3R) were evaluated against N19, N25 and Co617 in field TP8a in plant cane for the reported period. There was no significant difference in TCHA among tested varieties. Control variety R 579 performed better followed by MN1 and N25 (Table 2.21). Conversely, varieties N49 and N47 were the lowest yielders.

Table 2.21. Preliminary sugarcane variety trial (Field TP8a)

Variety	Stalk height (cm)	Stalk population/ha	Brix	TCHA
MN1	207.00	111 383	16.71	149.70
N47	254.10	121 665	18.25	136.26
N49	261.80	131 073	19.66	136.34
R 92/6545	267.90	126 732	19.01	138.05
N19	**249.20**	**122 821**	**18.42**	**137.85**
N41	**253.60**	**126 747**	**19.01**	**145.26**
R 570	**245.00**	**120 139**	**18.02**	**138.62**
R 579	**246.40**	**127 384**	**19.11**	**164.05**
N25	**214.10**	**124 851**	**18.73**	**144.96**
Co617	**276.60**	**118 169**	**17.72**	**114.70**
Grand mean	247.60	123 097	18.46	140.58
SED	17.97	4 918.2	0.74	15.68
LSD	36.45	9 974.6	1.50	31.80
CV (%)	11.50	6.3	6.30	17.60

Growth start date: 26/02/2016 Harvest date: 14/06/2017

Age at harvest: 15.6 Months Crop cycle: PC

With regards to stalk population, the difference among varieties tested was statistically significant ($P \leq 0.05$). The highest stalk population was recorded in N49 and R 579, while MN1 and R 570 had the lowest (Table 2.21). Generally, the yields were encouraging. This could have been attributed by good management such as weed management and fertilization.

Field GP6D

Seven varieties (5N, R and MN1) were evaluated against N19, N25 and Co617. The trial was in first ratoon at KSL. There were highly significant differences (P≤0.05) among the candidate varieties for all traits measured. However, with regards to TCHA the highest performance was observed in N12, followed by MN1, N25 and N47 (Table 2.22). On the other hand, varieties R 570, N49 and N19 performed lower similar to control variety Co617.

Table 2.22. Preliminary sugarcane variety trial (Field GP6D)

Variety	Stalk height (cm)	Stalk population/ha	Brix	TCHA
MN1	221.80	145 341	20.80	142.48
N12	242.90	130 673	21.10	148.34
N47	255.80	118 673	21.60	123.30
N49	261.40	133 340	21.30	116.10
R 570	**229.10**	**102 672**	**21.30**	**103.80**
N19	**253.10**	**108 005**	**21.30**	**116.60**
N41	**253.20**	**140 007**	**21.00**	**119.11**
N25	**222.30**	**117 339**	**21.30**	**126.99**
Co617	**265.00**	**114 672**	**20.30**	**103.41**
Grand mean	240.80	127 340	21.10	122.38
SED	13.53	15 167.3	0.33	10.59
LSD	27.45	307 60.8	0.66	21.48
CV (%)	8.90	18.8	2.40	13.70

Growth start date: 16/08/2015 Previous harvest date: 13/09/2016

Age at harvest: 13.4 Months Harvest date: 26/10/2017

Crop cycle: R1

With regard to stalk population, test varieties differed significantly (P≤0.05). NM1, N41 N49 and N12 had the highest stalk population as opposed to R 570 and N19 which had the lowest (Table 2.22).

Rainfed variety trials

Results of two rainfed trials (PC) established at KSL in 2016 are reported. The varieties evaluated include N12, MN1, N41, N47, R 570 and the check Co617. The same set of variety was tested in different field (LR6a & BR4C). Varieties MN1 and N47 showed superior performance compared to Co617.

Field BR4C

Five varieties (4N and R) were evaluated against Co617 in field LR6a in plant cane in the reported period. Results indicated no significant differences among the tested varieties in

TCHA. However, Variety N12, followed by MN1 and N47 had the highest TCHA (Table 2.23). Alternatively, R 570 and N41 performed least.

Table 2.23. Preliminary sugarcane variety trial (BR4C)

Variety	Stalk height (cm)	Stalk population/ha	Brix	TCHA
MN1	171.40	126 673	20.57	70.89
N12	172.40	138 674	21.35	73.23
N47	198.20	134 673	21.49	70.84
N41	185.60	130 673	21.68	55.36
R 570	178.10	96 005	20.97	54.95
Co617	**219.40**	**117 339**	**19.89**	**64.70**
Grand mean	187.50	124 006	20.99	64.99
SED	11.21	11 301.2	0.31	9.98
LSD	23.38	23573.8	0.65	20.83
CV (%)	9.50	14.4	2.30	24.30

Growth start date: 23/11/2016 Harvest date: 03/02/2018

Age at harvest: 14.4 Months Crop cycle: PC

With regard to Stalk population test varieties differed significantly (P≤0.05). The highest stalk population was recorded in Co617 followed by N12 and N47. On the other hand the lowest stalk population was observed in R 570 and MN1.

Field LR6a

Five varieties (4N and R) were evaluated against Co617 in field LR6a in plant cane. Results indicated highly significant differences ((P≤0.01) among the tested varieties. However, Variety MN1 performed better (TCHA) compared to other varieties followed by Co617 and N41 (Table 2.24). Alternatively, N12, R 570 and N47 performed least.

Regarding stalk population, the highest was recorded in MN1 followed by Co617 and N47 (Table 2.24). On the other hand the lowest stalk population was observed in R 570 and N41. Alternative, varieties did not differ significantly in stalk population test.

MSE

Two variety trials at MSE were harvested in 2017/18 season.

Field 1A

Eight varieties were tested at MSE in field 1A. The means for stalk population and yield are presented in Table 2.25. Results on PC indicated significant differences (P ≤ 0.05) in TCHA

among tested varieties. However varieties R 96/2569 followed by R 96/2116 and R 97/4004 had the highest TCHA; varieties R 579 and R 570 had the lowest TCHA (Table 2.25).

Table 2.24. Preliminary sugarcane variety trial (LR6a)

Variety	Stalk height (cm)	Stalk population/ha	Brix	TCHA
MN1	195.90	145 341	21.00	98.47
N12	172.70	130 673	20.80	47.16
N47	211.00	133 340	21.20	68.00
N41	227.70	122 673	21.50	75.16
R 570	191.80	124 006	20.90	60.87
Co617	**232.50**	**144 007**	**19.70**	**91.14**
Grand mean	205.30	133 340	20.90	73.47
SED	24.06	18 434.40	0.38	13.58
LSD	50.18	38 453.50	0.79	28.32
CV (%)	18.50	21.90	2.90	29.20

Growth start date: 08/10/2016 Harvest date: 16/12/2017

Age at harvest: 14.3 Months Crop cycle: PC

Table 2.25. Means for stalk population and yield (TCHA) for field 1A

Variety	Stalk population/ha	TCHA
N12	45 710	108.60
R 570	40 960	94.07
R 579	35 918	79.69
R 585	40 794	109.30
R 96/2116	38 377	116.49
R 96/2569	43 544	118.57
R 97/4004	43 627	111.40
R 97/4029	40 960	103.52
NCo376	**41 377**	**84.93**
Grand mean	41 252	102.95
SED	1350.30	11.91
LSD	2786.90	24.58
CV (%)	4.60	16.40

Growth start date: 14/06/2016 Harvest date: 05/07/2017

Age at harvest: 12.7 Months Crop cycle: PC

Field 10G

Eight varieties were tested in field 10G. The means for stalk population and yield are presented in Table 2.26. Results on PC indicated there were highly significant differences ($P \leq 0.001$) in TCHA among tested varieties. The varieties R 579, R 96/2569 and R 97/4004

scored the highest TCHA statistically similar to control variety, R 96/2116, R 585 and R 570 had the lowest TCHA (Table 1.26).

On the other hand, stalk population was statistically not different. However, the mean stalk population as a one of components of yield was relatively on the lower side; possibly due to water stress during tillering and grand growth phase.

Table 1.26. Means for stalk population and yield (TCHA) for field 10G

Variety	Stalk population/ha	TCHA
N12	39 513	93.52
R 570	40 027	61.18
R 579	42 222	102.70
R 585	41 349	58.90
R 96/2116	43 435	57.80
R 96/2569	40 056	97.36
R 97/4004	42 204	96.02
R 97/4029	41 955	74.15
NCo376	**40 506**	**89.55**
Grand mean	41252	81.24
SED	2518.8	8.94
LSD	5198.5	18.45
CV (%)	8.6	15.60

Growth start date: 09/08/2016 Harvest date: 20/12/2017

Age at harvest: 16.4 Months Crop cycle: PC

Project Title: National Performance Trials

Project Codes	**SCB 2016/05, 2017/4**
Principle investigator	**TOSCI**
	S. Ngailo, Beata P. Khafa, R. Mlimi and G. Mwasinga,
Collaborators	**Estates**
Location	**KSC, MSE, TPC and KSL**
Date of Commencement	**2016/17**
Date of Completion	**Ongoing**
Reporting Period	**July 2017-June 2018**

National Performance Trials (NPT) is usually carried out by Tanzania Official Seed Certification Institute.

- Objectives of this trials is to verify performances of the new varieties observed under preliminary trials.
  - Two varieties (R 570 & N47) were registered for National Performance Trials December 2017
  - Three National Performance Trials for rainfed trials (R 570 and N47) were established at KSC, MSE and KSL between December and March 2018.
  - One NPT trial testing varieties N36 and R 85/1334 was established at TPC in December 2017.

Project Title: Advanced Fuzz Evaluation and Selection

Project Code	**SCB 2017/06**
Principle investigator	**S. Ngailo, Beata, K. P., R. Mlimi, G. Mwasinga**
Location	**KATRIN, Estates**
Date of Commencement	**2017/18**
Date of Completion	**Ongoing**
Reporting Period	**June 2018**

Introduction

Overall project objective

- To contribute to improved sugarcane productivity in Tanzania through increased genetic variability of commercial varieties

Specific Objectives

- Fuzz from predetermined genetic combination (GC) identified and imported
- Identification and selection of the best plant (stool) arising from single seedling as a potential clone.
- At least 10% clones selected from clonal stage 1 (single stool) and stage 2(single row).
- Evaluation and selection sugarcane clones from single row to 4^{th} stage (two row)
- Evaluation of selected clones from stage 3 in different agro-ecology for yield and resistance to biotic and abiotic factors.

Progress to Date

- A total of 31 new/promising clones of sugarcane were selected from imported fuzz
- Selected clones were planted in replicated trials at KATRIN and KSC. The same clones were also planted at KSL under irrigated and rainfed culture for evaluation and selection.

Project Title: Rapid Seedcane Multiplication

Project Codes.	**SCB 2017/07**
Principle investigator	**S. Ngailo, Beata, K.P., R. Mlimi, G. Mwasinga and H. B. Msita**
Location	**SRI - Kibaha**
Date of Commencement	**2017/18**
Date of Completion	**Ongoing**
Reporting Period	**June 2018**

Introduction

Sugarcane is a perennial crop as once a new crop is planted it is harvested repeatedly for up to five seasons or more. Being vegetatively propagated and practice of ratooning which is necessary for economic optimization, permits systemic pathogens to survive, multiply and spread from one crop to the next. Also, the perennial nature of the crop and the fact that it is usually grown as a monoculture favors the build-up of diseases. These factors also mean that crop rotation, which is an important method of minimizing the build-up of pathogens in many arable crops, is of limited application in sugarcane culture**.**

Sugarcane is vulnerable to diseases due to several characteristics of its agriculture

- Sugarcane is vegetatively propagated by planting setts and therefore, systemic pests and diseases may be spread at planting.
- It is a perennial monoculture crop which is harvested after 12-18 months, allowing systemic pathogens to propagate and increase from one crop to the next.1
- Poor practice of crop rotation and inadequate fallow periods between replanting after older crops are removed, enables the persistence and spread of pathogens.
- Sugarcane variety improvement is limited by environmental conditions and the lengthy of process of crossing and selection which requires 12-15 years to complete. New cultivars cannot be produced readily to offset the challenges of pests and diseases.

Profitable sugarcane production largely depends on the quality of the seedcane planted. Seedcane quality is determined by freedom from diseases and pests, varietal purity and germination capacity. Any neglect in raising good seedcane crop is one of the major defects in sugarcane cultivation all over the world. Therefore, raising of healthy and vigorous sugarcane crops for seedcane purpose is vital and recommended.

Sugarcane production in Tanzania is done by large-scale and small-scale farmers. Small-scale farmers contribute forty percent of total cane crushed per annum. However, their contribution is likely to decrease due to low productivity caused by several factors including prevalent of pests and diseases resulting from use of poor quality planting materials. Thus, a large proportion of the farmers use traditional, poor quality seedcane resulting in poor yields. Moreover, they rely on very old, degenerated and low genetic potential varieties; namely, NCo376 for KSC and MSE, and Co617 for KSL mill areas. These varieties have are susceptible to several diseases including smut. Use of seedcane from the commercial crop has been responsible for rapid multiplication of a large number of diseases and pests such as smut, ratoon stunting, stalk borers and white scale which adversely affect cane yield and quality.

Inadequate availability of quality seedcane, poor seedcane replacement rate and poor quality canes has adversely contributed to low sugarcane productivity and sugar recovery. The importance of enhancing smallholder farmers' access to quality seedcane can play a role in raising sugarcane productivity. To maximize yield potential for all sugarcane varieties, it is essential that plantings be made with seedcane that is free of pests and diseases. To accomplish this, healthy seed-cane nurseries should be established with seedcane of recommended varieties from a heat treatment program or from seedcane that has been produced by tissue culture.

Objective

Considering the significant contribution of small-scale farmers to sugar industry development and the challenges they face; strategies to address their challenges is vital. ***One of the strategies is to develop a functional system for production and supply of healthy seedcane to prevent the spread of diseases and pests in sugarcane producing areas for improved productivity.*** Therefore, the main objectives of this initiative are to facilitate rapid multiplication and distribution of clean and healthy planting materials to small-scale farmers.

Materials and Methodology

Preparation of growth media; A mixture of forest soil, sand and farm yard manure was sterilized 3hours; after cooling the soil was potted in polythene. For each variety, a single eye bud was planted per polythene bag of 4" and later transferred to 6" polythene bags. Routine irrigation was done. Pesticide (carret) was applied i.e. 25cc/15L of water to control termites. Sprouting of each variety was recorded five days after planting. At two months, fertilizer (Yara Amidas) at a rate 5g per seedling was applied.

Results

The germination of the seedlings after planting is as presented in Table 2.27. The germination percentage was highest for variety N41 followed by N19 and NCo376 with 93.33, 92.3 and 90.07%, respectively. To the contrary, R 570 and R 579 had the lowest germination percentage. The low germination percentages for the two varieties call for further investigations.

Table 2.27. Eye buds germination percentages

Variety	Eye buds planted	Eye buds germinated	Germination (%)
N19	260	240	92.30
N25	221	167	75.57
N30	277	215	77.62
N41	150	140	93.33
R 570	320	149	46.56
R 575	345	279	80.87
R 579	159	85	53.46
NCo376	10,324	9,299	90.07

Project Title: Germplasm Conservation and Maintenance

Project Code.	**SCB 2017/08**
Principle investigator	**S. Ngailo, P. Beata, R. Mlimi and G. Mwasinga**
Collaborators	**Agronomy - SRI**
Location	**SRI - Kibaha**
Commencement	**2017/18**
Completion	**Ongoing**
Reporting Period	**June 2018**

Introduction

Traditional plant breeding has contributed to crop improvement. Because of the biological complexities of sugarcane, sexual hybridization strategies have not been very effective in developing improved cultivars. Nevertheless, successful crop improvement through breeding relies on diversity of the gene pool; the wide diverse the germplasm collections the more effective the crop improvement (Withers et al., 1990; Rao, 2004). Hence collection and conservation of germplasm are prerequisite for assured availability to different users including plant breeders.

The genetic resources of most crops can be conserved as seeds in seed gene banks; however, some highly heterozygous and vegetatively crops, and those that produce recalcitrant seeds cannot (Withers et al., 1990). Conservation serves as the link between the acquisition and utilization of plant genetic resources and includes all the means by which plant genetic resource is stored and preserved. There are basically two approaches for plant genetic resources conservation; namely in field gene bank (*in situ)* and in vitro (*ex situ)* (Engelmann and Engels, 2002; Rao, 2004). While i*n situ* involves maintaining genetic resources in natural habitats where they occur, *ex situ* refers to conservation of genetic resources outside the native habitat (Engelmann and Engels, 2002; Rao, 2004). Therefore, the objective of this project is to ensure readily availability of genetic resources for future crop improvement.

Progress to date

A total of 279 sugarcane varieties have been collected from all sugar estates, planted, germinated and are growing well.

Challenges

The most challenge is availability of irrigation water during the coming dry months. This, apart from stressing the plants will also exacerbate the problem of termites.

Summary and Recommendation

- Seven eRcane varieties are currently in closed quarantine
- Ten eRcane and five SASRI varieties are currently in open quarantine
- Fifteen varieties (R 10th batch, and N 5th batch) were released from open quarantine and are currently under multiplication in estates
- Five smut trials established at KATRIN
- Varieties N49, N47, Q220 and Q228 showed either higher TCHA or TSHA or both under irrigation scheme at KSC; recommended for further evaluation.
- Varieties N47, TZ93-KA-122 and R 570 have generally showed consistent performance under rainfed conditions at KSC.
- Varieties R 85/1334, N49, KQ228, and Q208 identified to be high yielding at TPC; therefore are recommended for further evaluation.
- Varieties N49 and MN1 have demonstrated high yield potential under irrigated scheme at KSL; however, MN1 is susceptible to white scale. It is recommended to further evaluate these varieties.
- Varieties N41 and N47 were identified to have high yield potential under rainfed conditions at KSL; further evaluation is recommended.

SUGARCANE AGRONOMY AND PHYSIOLOGY

Project title: Variety trial in OG fields

Project Code: **AP 2013/03/02**

Investigators: **Dr. Msita, H. B., H. F. Kalimba, B. P. Khafa, S. Kajiru.**

Collaborators: **LAO's, VAEO's**

Date of commencement: **2013/14**

Planned end date: **On going**

Reporting period: **2017/2018**

Introduction

Outgrowing is a type of contract farming (C. Oya, 2012), which refers to as an agreement between farmers and processing and/or marketing firms regarding the production and supply of agricultural products under forward agreements, frequently at predetermined prices. Sugarcane out grower (OG) schemes is central to several policy and donor strategies for driving agricultural growth. Outgrowing is seen as part of a generation of inclusive business models that combine the advantages of large-scale farming with opportunities for smallholder farmers (Vorley *et al*., 2008).

Kilombero mill area have about 7442 active registered out-growers who supply about 43% of sugarcane crushed at K1 and K2 factories (SBT, 2017). Average sugarcane yield in OG at kilombero is about 40 tons/ha (Chongela 2015). This is low compared to those attained by estates (70–90 tons /ha) and also below the attainable yield potential of more than 100 tons/ha. In Kilombero only one variety is grown by OG that is NCo376. This variety is known to be very susceptible to smut disease. This might be the factor contributing to low productivity. Other factors includes low level of field management particularly poor management of weeds, low level of fertilization, use of poor planting materials and sometimes moisture stress due to unreliable rainfall as OG cane production is entirely rain fed. The long existence of NCo376 is due to fact that most of the new varieties being evaluated do not exhibit wide adaptability like NCo376. During 2013/14, the experiment was designed to test the management package which was suited to NCo376 if can also do better to other promising varieties under rainfed conditions. The varieties N47, N12, and R 570 were

tested together with NCo376 as a standard check. The experiments were established in different micro-agro ecologies in Kilombero mill area.

This season we have started a second phase of experimentation in which the two selected varieties R 570 and N47 were planted in large blocks of one acre for each variety and compare with NCo376 so as to have viable variety recommendation.

The main objective of the project was to test new promising varieties under rainfed condition with the existing best management package (BMP) in OG fields.

Expected output:

- Varieties which can cope with the environment under farmer's fields would be determined after accruing data at minimum of four seasons (PCs, R1, R2 and R3).
- Performance of R 570, N12 and N47 with the BMP under and farmer's condition would be known after a minimum of four seasons.

Materials and Methods

Location

Kilombero mill area.

Design

Split block in RCBD with three replications and two main factors that are the management levels; the recommended practice (100 kg N ha^{-1} + 100 kg K ha^{-1} +25 kg P ha^{-1} and 4 lit Volmuron ha^{-1}) and farmers' practices which varies from farmer to farmer but usually averaged to 30 kg of nitrogenous fertilizer without Phosphate and potash. The test varieties were R 570, N12 and N47. NCo376 was used as a standard check. Each variety was tested against the selected management packages in different sites at KI and KII. Phosphate and Potash fertilizers were applied at planting and Nitrogen was applied two months later.

Plot size

Six rows of 10 m long spaced at 1.2 m, comprising two centre rows of test varieties and two guard rows of NCo376 varieties on each side.

2nd Phase Variety trial experimentation-Large block trials

Large blocks each comprising of three acres were established in which three varieties R 570, N47 and NCo376 were planted each variety occupying one acre at every location.

Data collected

The following data were collected during harvesting (10 – 12 months)

- Stalks number
- Stalks weight
- Quality parameters which were determined in the laboratory
- TCH and TSH were calculated using the above data
- Smut count

Data analysis

Data were analyzed using GenStat statistical package version 12.

Results

Experiments were conducted for four seasons consecutively, thus results of PC, RI, RII and RIII are presented as follows.

2017/18 Trials (PC)

Four trials were established in November 2017, at Sonjo, Nyange, Kitete and Bulima. Results presented are for tillers count.

Results presented in Table 3.1 reveals that tillering was good for all varieties in most of the locations except Nyange where tested varieties recorded very low number of tillers. The variety N47 had an average higher number of tillers compared to other tested varieties followed by N12 and R 570 was the least in FP. While in RT R 570 recorded average higher number of tillers, although all tested varieties counted less tillers compared to standard variety NCo376 both in FP and RT in all experimental locations.

Table 3.1: Response of tested varieties on two management levels on tillering in OG fields at Kilombero (PC)

	SONJO		KITETE		NYANGE		MFILISI	
Variety	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	101,944	178,333	79,166	105,000	42,778	56,944	138,888	144,444
N12	121,944	134,166	117,777	116,111	54,444	74,444	136,111	129,444
N47	139,722	109,444	104,166	84,722	46,944	72,222	162,222	158,055
NCo 376	217,499	225,555	120,833	135,277	115,277	116,944	159,722	134,166
CV	**23.2**		**22.4**		**34.9**		**19.1**	
LSDv	**44,865.9**		**30,385.5**		**31,826.1**		**34,944.6**	
LSDs	**88,030.2**		**32,497.2**		**61,896.6**		**96,052.4**	
LSDsxv	**73,259.3**		**40,068.3**		**51,698.8**		**73,619.3**	

2016/17 trials (PC)

Eight trials were established in January and March 2016, in the following locations Mang'ula (Ulanga cotton), Kitete mradini, Kitete mgudeni, Kungurumwoga, Msolwa station, Msolwa ujamaa, Nyange and Nyamamba. Trials at Mang'ula and Msolwa Ujamaa were destroyed by water logging and therefore were dropped. Trials at Msolwa station and Kitete Mgudeni were harvested before data collection, therefore we had data from four trials and results presented are for PC crop cycle (2016-17).

Tons of cane per hectare (TCH)

Results are presented in Table 3.2. During this season high TCH was observed in both FP and RT for all varieties and there was significant difference ($p < 0.05$) between varieties. Performance of each variety differed from one location to another. Generally N12 had higher TCH followed by N47. R 570 recorded the lowest TCH compared to other varieties and also less than the standard variety NCo376. The reason for this result is that R 570 has the tendency of low tillering ability during the plant cane (PC) stage of growth; this also affected the number of millable stalks and subsequent cane tonnage.

Sucrose Percent Cane

Results presented in Table **3.3** indicate that sucrose percent was almost the same within the location both FP and RT. Sucrose percent cane was different from one location to another. N12 had the highest sucrose percent of (**16.2**) at Nyamamba while Kitete had the lowest percent of (**7.2**). On average R570 recorded higher sucrose percent followed by 47 while N12 was the least.

Table 3.2: Response of tested varieties to the two management levels in OG fields at Kilombero on TCH (PC)

	KMWOGA		KITETE MRADINI		NYAMAMBA		NYANGE	
Variety	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	55.9	79.9	77.3	84.9	111.8	120.6	101.6	114.3
N12	60.7	105.3	127.8	139.6	115.8	144.4	136.1	122.5
N47	77.4	109.6	118.5	132.6	119.3	133.1	87.4	141.4
NCo376	75.4	81.7	121.9	116.0	136.3	147	121.6	158.8
CV	**23**		**21.4**		**23.5**		**31.3**	
LSD v	**23.32**		**59.87**		**38.42**		**48.44**	
LSD s	**39.55**		**38.91**		**33.43**		**68.85**	
LSDvxs	**35.28**		**75.07**		**49.25**		**68.42**	

Table 3.3: Response of tested varieties to the two management levels in OG fields at Kilombero on Sucrose percent cane (PC)

	KMWOGA		KITETE MRADINI		NYAMAMBA		NYANGE	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	14.3	14.8	8.6	7.9	15.2	14.9	10.7	10.3
N12	13.3	14.5	7.2	8.2	16.2	15.0	9.7	10.4
N47	14.4	14.8	8.1	7.5	15.3	14.9	9.5	10.0
NCo376	15.8	14.8	7.8	7.9	15.1	14.6	9.8	10.1
CV	**9.2**		**6.6**		**6.3**		**3.8**	
LSD v	**1.68**		**0.66**		**1.20**		**0.49**	
LSD s	**0.62**		**1.05**		**0.17**		**0.44**	
LSDvxs	**2.07**		**0.97**		**1.47**		**0.63**	

Tons of Sugar per Hectare (TSH)

Results presented in Table 3.4 indicated that R 570 recorded higher TSH compared to other tested varieties including the standard variety NCo376. N12 and N47 recorded almost the same. Significant different ($p < 0.05$) was observed at Kungurumwoga and Nyange trials in FP.

Table 3.4: Response of tested varieties to the two management levels in OG fields at Kilombero on TSH (PC)

	KMWOGA		KITETE MRADINI		NYAMAMBA		NYANGE	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	8.0	11.9	7.6	7.8	16.9	19.5	9.6	11.6
N12	7.8	15.3	9.1	11.2	18.8	21.7	13.3	12.8
N47	11.2	16.3	9.5	9.9	18.3	18.9	8.3	14.1
NCo 376	11.9	12.1	9.7	9.2	20.6	21.3	11.8	16.1
CV	**28.7**		**20.6**		**21.9**		**32.6**	
LSD v	**4.26**		**4.60**		**5.41**		**5.05**	
LSD s	**5.79**		**3.52**		**5.19**		**8.62**	
LSDvxs	**5.93**		**5.83**		**7.01**		**7.66**	

2015/16 trials

Eight trials were established in December 2015 in the following locations, Kielezo, Kitete, Mbwade, Mtakanini, Kungurumwoga, Msolwa, Miwangani and Mkula and results presented here are for R1. Msolwa and Miwangani trials were dropped due to flooding and water logging. Kielezo trials were harvested before data were taken. Results presented are for R1 crop cycle.

Tons of cane per hectare (TCH)

Results are presented in **Table 3.5.** During this season good yield in TCH was observed both for FP and RT for all experimental sites highest TCH of 149.9 was observed at Kitete in RT and the lowest was 50.5 at Kungurumwoga FP. Varieties N12 generally recorded higher TCH compared to other tested varieties, it was followed by R 570 and N47 recorded almost the same as standard variety NCo376.

Table 3.5: Response of tested varieties to the two management levels in OG fields at Kilombero on TCH (R1)

	MKULA		MBWADE		KITETE		KMWOGA		MTAKANINI	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	66.1	77.8	85.5	103.4	110.2	135.2	51.2	72.3	72.4	119.3
N12	60.4	91.6	103.6	98.9	121.3	149.9	51.4	71.7	79.7	126.5
N47	58.9	72.8	75.2	66.1	93.8	123.5	50.5	83.5	82.4	110.4
NCo376	60.1	74.9	75.0	92.9	114.8	126.1	54.4	68.3	61.9	99.0
CV	**19.9**		**22.7**		**21.0**		**26.9**		**27.5**	
LSD v	**17.61**		**25.05**		**32.13**		**21.27**		**32.49**	
LSD s	**22.91**		**21.34**		**121.86**		**17.29**		**28.64**	
LSDvxs	**24.23**		**32.02**		**94.70**		**27.09**		**41.71**	

Sucrose Percent Cane

Results are presented in **Table 3.6:** Sucrose ranged from 5.6 to 15.9. Comparing the tested varieties, N47 recorded higher sucrose compared to other varieties, R 570 was the second and N12 was the least. No significant difference ($p< 0.05$) observed between management options and within management option.

Table 3.6: Response of tested varieties to the two management levels in OG fields at Kilombero on Sucrose percent cane (R1)

	MKULA		MBWADE		KITETE MRADINI		KMWOGA		MTAKANINI	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	12.8	10.6	6.6	6.0	6.3	5.9	14.8	14.9	15.8	15.7
N12	10.7	9.5	8.35	6.6	7.1	5.8	14.3	14.4	14.9	15.2
N47	12.7	10.4	6.2	7.7	7.6	6.1	15.8	14.8	14.8	15.9
NCo376	10.6	12.14	6.5	7.4	5.8	5.6	13.0	14.8	13.9	15.0
CV	**20.8**		**17.6**		**15.3**		**8.4**		**4.8**	
LSD v	**2.92**		**1.53**		**1.21**		**1.54**		**0.91**	
LSD s	**2.30**		**1.10**		**1.89**		**0.62**		**0.17**	
LSDvxs	**3.71**		**1.94**		**1.76**		**1.90**		**1.12**	

Tons of Sugar per Hectare (TSH)

Results are presented in **Table 3.7**. RT recorded higher TSH compared to FP almost in all sites and N12 performed better compared to other tested varieties. R 570 was the second and N47 was the least but higher compared to standard variety NCo376

Table 3.7: Response of tested varieties to the two management levels in OG fields at Kilombero on TSH (R1)

	MKULA		**MBWADE**		**KITETE**		**KMWOGA**		**MTAKANINI**	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	8.5	8.1	5.6	6.3	6.9	8.0	7.5	10.8	11.5	18.6
N12	6.5	8.9	8.6	6.5	8.4	9.0	7.3	10.3	12.1	19.5
N47	7.5	7.9	4.7	5.2	7.1	7.4	7.9	12.4	12.3	17.7
NCo376	6.6	9.2	4.9	6.5	6.6	7.0	6.9	10.2	8.5	14.9
CV	**27.8**		**17.0**		**28.5**		**27.7**		**27.1**	
LSD v	**2.74**		**1.29**		**2.70**		**3.20**		**4.91**	
LSD s	**3.04**		**2.62**		**6.84**		**2.16**		**4.69**	
LSDvxs	**3.64**		**2.15**		**5.29**		**4.02**		**6.36**	

2014/15 Trials Second Ratoon (R2)

Eight trials were established in December 2014 in the following locations, Kungurumwoga, Mbwade (Mayunga), Mbwade (AKhaid), Mang'ula, Sonjo, Msolwa (Itefa) Msolwa (Nyamigadu) and Kidatu. Trial at Msolwa was dropped because the field was included in block farm, trial at Mbwade was harvested before data collection and that of Kidatu was destroyed due to social issues. For the remaining five trials results presented are for R2 crop cycle.

Tons of Cane per Hectare (TCH)

Results presented in Table 3.8 indicate that good yield in TCH was recorded in almost all sites both for FP and RT except at Mbwade, Kungurumwoga and Sonjo. Highest TCH of (**157.6**) was observed at Itefa in RT and the lowest (**39.2**) at Kungurumwoga. For FP R 570 performed better compared to other tested varieties followed by N12, N47 and NCo376 recorded the lowest.

Table 3.8: Response of tested varieties to the two management levels in OG fields at Kilombero on TCH (R2)

	MANG'ULA		**ITEFA**		**MBWADE**		**KMWOGA**		**SONJO**	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	111.4	134.3	138.8	**157.6**	44.4	64.8	56.5	68.8	76.8	81.4
N12	76.5	90.0	141.2	145.4	73.5	86.4	75.6	74.8	71.4	90.4
N47	118.1	125.0	105.8	148.3	53.8	71.0	50.6	60.0	54.6	48.9
NCo376	99.7	100.7	96.8	100.0	69.3	74.1	**39.2**	56.9	55.2	54.4
CV	**21.8**		**21.3**		**34.1**		**31.5**		**23.5**	
LSD v	**29.34**		**34.65**		**28.80**		**23.92**		**19.67**	
LSD s	**98.16**		**38.14**		**14.12**		**67.10**		**42.06**	
LSDvxs	**75.23**		**45.92**		**35.71**		**51.35**		**33.92**	

Sucrose Percent Cane

Results are presented in **Table 3.9**: Sucrose ranged from 7.5 to 11.8. Mang'ula and Sonjo sites were better compared to other sites. On average N47 was better compared to other varieties almost in all experimental sites.

Table 3.9: Response of tested varieties to the two management levels in OG fields at Kilombero on sucrose percent cane (R2)

	MANG'ULA		ITEFA		MBWADE		KMWOGA		SONJO	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	10.8	11.6	8.1	7.9	9.0	8.7	9.0	8.3	10.5	11.5
N12	11.3	10.3	8.1	8.5	8.3	8.9	8.4	9.3	10.7	11.2
N47	11.4	11.8	7.5	7.9	9.7	8.6	8.8	8.3	10.9	11.5
NCo376	11.3	11.2	8.6	7.6	9.2	9.2	8.9	8.7	10.8	11.4
CV	**6.1**		**8.3**		**10.3**		**7.9**		**7.9**	
LSD v	**0.86**		**0.84**		**1.16**		**0.87**		**1.10**	
LSD s	**1.27**		**0.19**		**1.60**		**0.65**		**1.94**	
LSDvxs	**2.23**		**1.03**		**1.62**		**1.10**		**1.70**	

Tons of Sugar per Hectare

Results presented in **Table 3.10** indicate that TSH ranged from 3.5 to 13.4 in FP and 4.9 to 14.7 in ratoon. On average R 570 performed better in many sites compared to other tested varieties.

Table 3.10: Response of tested varieties to the two management levels in OG fields at Kilombero on TSH (R2)

	MANG'ULA		ITEFA		MBWADE		KMWOGA		SONJO	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	12.3	15.5	11.3	12.6	4.0	5.6	5.1	5.6	8.1	9.3
N12	8.7	9.3	11.5	12.7	5.8	7.6	6.2	7.0	7.6	10.1
N47	13.4	14.7	8.0	11.7	5.2	6.1	4.4	4.9	6.0	5.9
NCo376	11.4	10.9	8.6	7.2	6.4	6.9	3.5	4.9	6.0	6.4
CV	**22.0**		**24.7**		**31.0**		**28.6**		**26.8**	
LSD v	**3.33**		**3.24**		**2.32**		**1.88**		**2.50**	
LSD s	**9.71**		**3.18**		**1.92**		**5.36**		**5.58**	
LSDvxs	**7.42**		**4.21**		**2.96**		**4.10**		**4.44**	

2013/14 trials

Ten trials were established in December 2013, in the following locations. Kitete, Msowero, Mang,ula, Mkula, Msolwa Ujamaa, Miwangani, Mbwade (2) and Matambiko. Trials at Msolwa Ujamaa, Miwangani,Nyange one trial at Mbwade Mkula and Matambiko did not do well due to poor cane establishment. Trial at Kitete was harvested before data collection. Results presented here are for R3 crop cycle in three sites only.

Tons of Cane per Hectare

Results presented in **Table 3.11** shows that TCH in R3 was still satisfactory. On average R 570 recorded higher TCH values compared to other varieties, significant different ($P < 0.05$) between and within management options was observed both in FP and RT.

Table 3.11: Response of tested varieties to the two management levels in OG fields at Kilombero on TCH (R3)

	MANG'ULA		MSOWERO		MBWADE	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	70.6	81.9	73.6	83.7	68.8	93.8
N12	57.4	86.3	56.0	71.5	74.2	93.1
N47	50.4	82.4	51.8	73.8	57.0	87.0
NCo376	54.5	85.2	39.5	59.7	67.2	83.8
CV	**25.6**		**35.4**		**26.5**	
LSD v	**22.89**		**28.41**		**25.65**	
LSD s	**37.76**		**23.71**		**18.14**	
LSDvxs	**34.21**		**36.27**		**36.28**	

Sucrose Percent Cane

Results presented in **Table 3.12** shows that N12 recorded the highest sucrose percent of 12.9 while R 570 was lowest sucrose of 10.9 in FP. Compare varieties N12 had higher sucrose followed by R 570.

Table 3.12: Response of tested varieties to the two management levels in OG fields at Kilombero on sucrose percent cane (R3)

	MANG'ULA		MSOWERO		MBWADE	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	10.9	11.0	11.6	12.5	11.3	11.6
N12	11.1	11.5	12.9	12.0	12.3	12.3
N47	11.4	12.3	12.0	12.3	12.2	12.6
NCo376	**10.2**	11.5	11.2	**12.5**	11.4	11.9
CV	**7.4**		**9.2**		**7.8**	
LSD v	**0.89**		**1.40**		**0.85**	
LSD s	**2.02**		**1.16**		**0.67**	
LSDvxs	**1.60**		**1.79**		**1.12**	

Tons of Sugar per Hectare

Results for TCH are presented in **Table 3.13.** Their levels ranged from 4.4 to 10.6. Variety R 570 recorded higher TSH compared to other varieties; this is because R 570 seems to have maintained good yield in TCH up to third ratoon and this resulted into higher TSH.

Table 3.13: Response of tested varieties to the two management levels in OG fields at Kilombero on TSH (R3)

	MANG'ULA		MSOWERO		MBWADE	
Varieties	**FP**	**RT**	**FP**	**RT**	**FP**	**RT**
R 570	7.2	7.3	8.7	10.4	8.8	11.2
N12	5.9	8.2	7.2	8.9	8.3	12.3
N47	4.7	7.6	6.3	9.8	6.6	10.6
NCo376	5.6	8.1	4.4	7.9	8.1	10.1
CV	**29.9**		**36.8**		**27.7**	
LSD v	**2.57**		**3.68**		**3.25**	
LSD s	**4.18**		**2.44**		**2.30**	
LSDvxs	**3.82**		**4.62**		**4.60**	

Yield trends across seasons

Tons of sugar per hectare

Figure 3.1(a) and (b) shows the yield trend in TCH of varieties across crop cycles both FP and RT. The result shows that in FP there was a steep drop in yield (TCH) of R 570, N47 and NCo376 from PC to R1, but for N12 it remained almost constant. From R1 to R2 yields of N12, R 570 and NCo376 remained constant but that of N47 arose. From R2 to R3 yields of R 570 and N47 arose although for N12 and NCo376 it dropped. For RT yields of N47 and NCo376 dropped from PC to R1, but there was a slightly increase in TCH of R 570 and N12. From R1 to R2 TCH of all varieties dropped, from R2 to R3 TCH of N47, R 570 and NCo376 rose but that for N12 continued to drop. The drop in cane yield from plant cane to ratoon 2 might be attributed to long dry weather which was experienced during these seasons (2015/16). The dry weather may have affected the growth of sugarcane and subsequent cane yields (TCH).

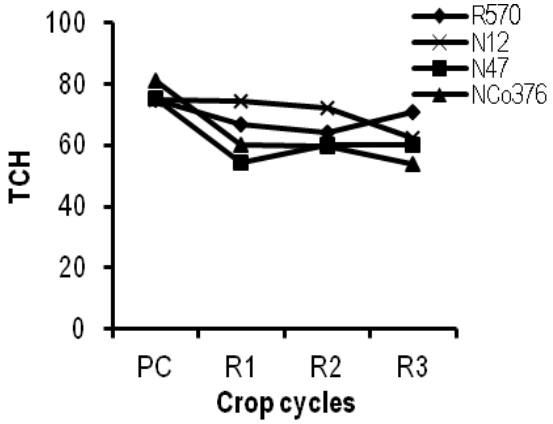

Fig 3.1(a). Yield trend (TCH) of tested varieties vs crop cycles (FP)

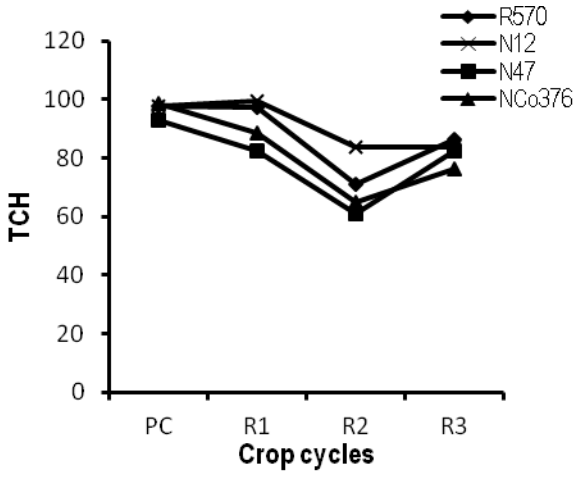

Fig 3.1(b). Yield trend (TCH) of tested varieties vs crop cycles (RT)

Sucrose Percent Cane

Result presented in fig 3.2(a) and (b) shows that sucrose for FP dropped throughout from PC up to R3 for varieties N12 and N47, R 570 and NCo736 experienced an up and down trend. In RT there was up and down trend that is from PC to R1 sucrose for N12, R 570 and NCo376 dropped, from R1 to R2 it raised and from R2 to R3 there was a drop, contrary to trend of N47 which went opposite of other varieties. Due to up and down characteristics more study is needed on the behavior of these varieties in relation to changes of weather condition. Almost all the tested variety performed above the standard NCo376.

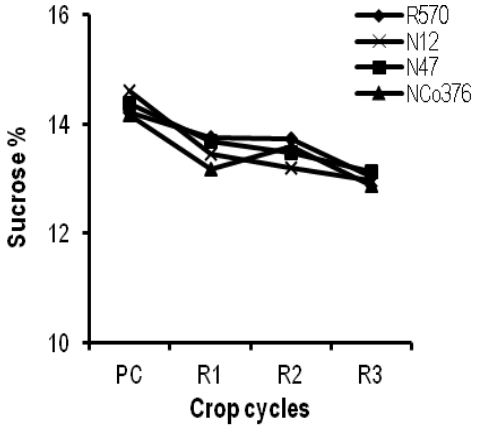

Fig 3.2 (a).Sucrose % of tested varieties vs crop cycles (FP)

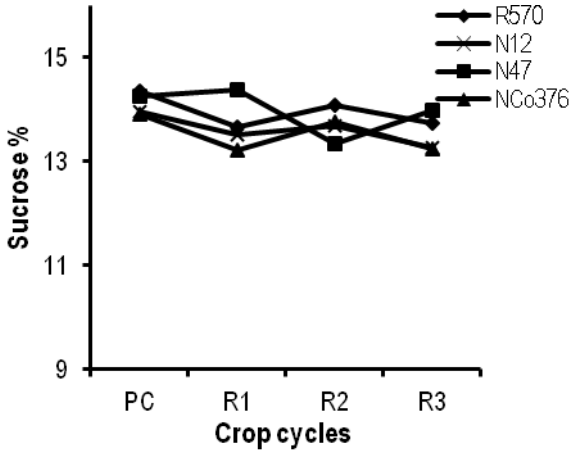

Fig 3.2(b). Sucrose % of tested varieties vs crop cycles (RT)

Tons of Sugar per Hectare

Results are presented in figure 3.3(a) and (b) TSH is the product of TCH and sucrose percent therefore the drop or rise of one or both these parameter automatically affect the TSH accordingly. In this study TSH of all the varieties dropped from PC up to R3 except N47 which had a slight rise in TSH from R2 to R3. Generally all the tested variety performed above the standard NCo376.

Smut infection trends

Results presented in figure 3.4 (a) FP and (b) RT shows that there was a linear increase in smut percent infection with increase in number of ratoons for varieties NCo376 and N12. For R 570 and N47 smut percent increased from PC to R2 and almost remained constant from R2 to R3. On average smut percent infection was higher for NCo376 (17.26 %), followed by N12 (12.12 %) and N47 and R 570 (4.49 %) each in FP. For RT NCo376 was also leading

with 16.3 %, N12 (9.1 %), N47 (4.5 %) and R 570 (3.3 %). For the tested varieties N12 had higher smut infection next to NCo376 which is known to be highly susceptible to the disease.

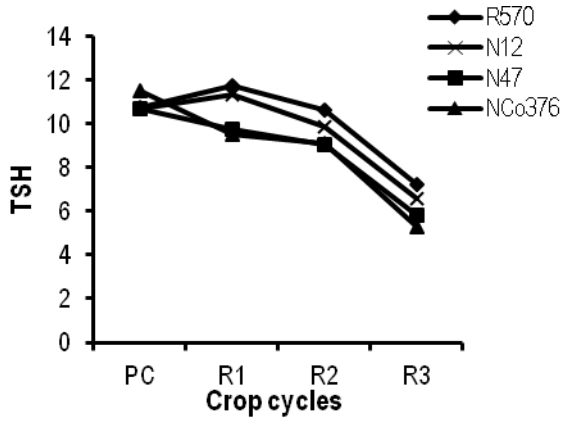

Fig 3.3(a). Yield trend (TSH) of tested varieties vs crop cycles

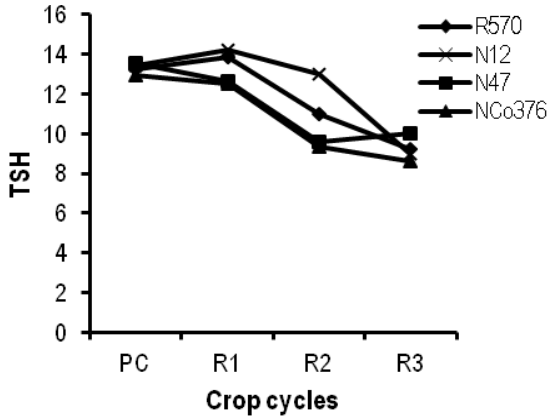

Fig 3.3(b). Yield trend (TSH) of tested varieties vs crop cycles

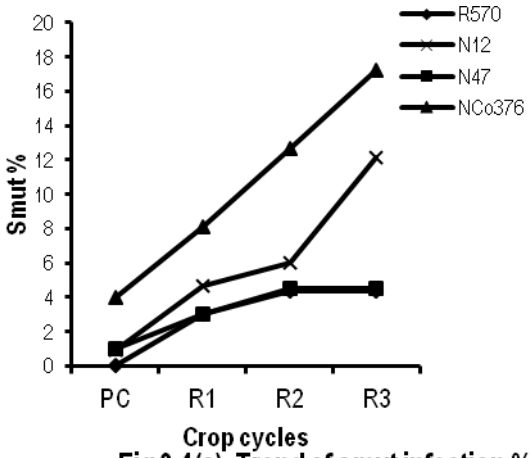

Fig 3.4(a). Trend of smut infection % across crop cycles (FP)

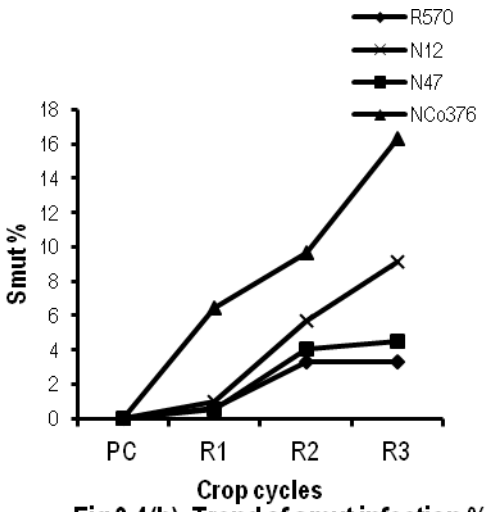

Fig 3.4(b). Trend of smut infection % across crop cycles (RT)

Conclusion

All tested varieties performed better in term of yields that is TCH, sucrose and TSH when compared to standard varieties NCo376. The variety N12 had high smut infection next to NCo376 which is referred to as very susceptible; therefore regarding to that characteristic the variety was discontinued for further evaluation. Varieties N47 and R 570 have passed to second phase of evaluation where they were planted in large block of evaluation and are being observed for Tonnage (TCH), Quality and subsequent TSH, so as to come out with appropriate and viable recommendation.

Large block trials

Four large blocks each comprising of three acres were established in this season at Mang'ula, Mbwade, Ruhembe and Mfilisi, three varieties that is R 570, N47 and NCo376 were planted each variety occupying one acre. Results presented in table AP 3.14 indicate that NCo376 had higher tillers count in almost all sites followed by R 570 except for Mfilisi site where N47 performed above other varieties.

Table 3.14: Tillers count in large blocks in four sites at Kilombero (PC)

Variety	**Mang'ula**	**Mbwade**	**Bulima**	**Mfilisi**
R 570	125,833	87,361	87,917	96,250
N47	117,917	74,722	70,278	100,417
NCo 376	127,917	120,694	111,389	116,111

Project title: Establishment of Fertilizers Trials at Kagera Sugar Mill Area

Project code: **AP 2016/03/03**

Investigators: **Dr. Msita H. B., Kalimba H., S. Kajiru and Lwiza L.M**

Collaborators: **Outgrowers, LAO, DAICO, YARA Fertilizer Company**

Start date: **2016-17**

Reporting time: **2017-18**

Planned end date: **2022-23**

Introduction

Sugarcane productivity in outgrowers' fields in Tanzania has remained low below the attained yield potential of more than 70-100 tons per Hectare (SBT, 2016). Among other factors poor soil fertility has lead to the decline in productivity in most of the outgrowers' field within the country.

It is for this case the fertilizer trials were carried out at Kagera mill area in Misenyi District (Nsunga, Kasambya, Bubale and Kyaka) in order to establish specific recommendation packages for sugarcane farming at Kagera mill areas. Results from these trials would provide the specific fertilizer recommendations hence establishment of cost effective recommended fertilizer packages affordable to small holder farmers could be made.

A total of 48 soil samples were collected in OG fields, 12 samples from each zone; these were sent to the laboratory for nutrient status analysis as reported in 2016/17 report.

Following the analysis of soil samples it was observed that most of the fields are deficient in major soil nutrients however, P was the most deficient nutrient among others. Seven (7) fields with the most limiting nutrients were selected for experimentation.

Objective of the project

- To establish specific fertilizer recommendation rates for plant crop and ratoon crop

Materials and Methods

Location

The experiments were conducted in OG fields of Kagera mill area in Misenyi District, between latitude S $1^0$13.06' and Longitude E $31^0$16.327 and about 1300 m asl. Rainfall in the area is bimodal (October-November and March-May) whereby the mean annual rainfall is about 1500 mm and the mean temperature is 20^0C. Misenyi District is one of the eight districts of Kagera Region in Tanzania. It is bordered to the north by Uganda, to the east by Bukoba Rural District, to the south by Karagwe District and to the west by Kyerwa District. Kagera Sugar Limited (KSL) is located in the extreme north west of district approximately 26 km from the border to Uganda and 70 km from Lake Victoria. According to 2012 Tanzania National Census, the population of Misenyi District is 202,632.

Experimental design and sites

2016/17 trials

Eight sites were selected for experimentation; seven (7) sites were planted in November/December 2016 but due to unavoidable circumstances like water logging and fire accidents three sites were dropped and data were collected to only four (4) sites at Kasambya (1), Nsunga (2) and Kyaka (1). RCBD with three replications, Plot size of 48 m^2 comprising of four rows of 10 m long spaced at 1.2 m was used.

2017/18 trials

Eight sites were selected for experimentation but only 7 trials were established in October/November 2017 at Nsunga (1), Kasambya (3) Bubale (1) and Kyaka (2).

Fertilizer application

Phosphate and Potash fertilizers were applied at planting and Nitrogen was applied in two splits at two and six months later.

Table 3.15: Treatments details

NO.	TREATMENTS	N	P	K	Ca	Mg	S	B
		Nutrients Levels (kg/ha)						
1	T1	100	25	100	7.5	1.25	17.5	0.03
2	T2	100	50	100	7.5	1.25	17.5	0.03
3	T3	100	75	100	7.5	1.25	17.5	0.03
4	T4	100	100	100	7.5	1.25	17.5	0.03
5	T5	125	25	125	7.5	1.25	17.5	0.03
6	T6	125	50	125	7.5	1.25	17.5	0.03
7	T7	125	75	125	7.5	1.25	17.5	0.03
8	T8	125	100	125	7.5	1.25	17.5	0.03
9	T9	150	25	150	7.5	1.25	17.5	0.03
10	T10	150	50	150	7.5	1.25	17.5	0.03
11	T11	150	75	150	7.5	1.25	17.5	0.03
12	T12	150	100	150	7.5	1.25	17.5	0.03

Data to be collected

- Number of stalks at 16 months of age
- Stalks weight at 18 months of age
- Quality parameters will be determined in the laboratory (KSL)
- TCH and TSH will be calculated using the obtained data

Data analysis

Data on stalks count were analyzed using GenStat statistical package version 14th edition.

Results

2016/17 trials

Stalk count

Results on the response of sugarcane to applied fertilizers (stalk counts) in experimental sites are presented in **Table 3.16**. Based on the results, treatment 7 performed better across all sites followed by treatment 12 then 5. Other treatments had average to low performances. On the other hand Nsunga performed better compared to the others sites while Kyaka was the least due to water logging conditions that was observed at some growth stages within the field.

Table 3.16: Response of sugarcane to applied fertilizer at Kagera (number of stalk)

Treatments	Evodius	Mugyabuso	Majura	Midelo
1	65833	86944	88889	100833
2	127222	88333	91944	117500
3	103611	96944	105833	108333
4	89722	98611	83055	113611
5	80555	91389	105833	147222
6	85277	96666	91389	91389
7	**128888**	**66363**	**91389**	**147777**
8	105000	102222	91111	122500
9	92500	95833	84444	109444
10	92500	72198	92222	101388
11	101944	86666	89444	114166
12	85277	105833	95555	121111
CV %	**21.6**	**20.9**	**17.6**	**29.9**
LSD (0.05)	**35241.4**	**32250.9**	**27558.3**	**58874.9**

Summary

These trials are still in the first season as it takes eighteen (18) months for the cane to mature at Kagera. . Therefore yield and quality data will be collected when the crop matures (July 2018).

2017/18 trials

Results on chemical characteristics as per carried soil survey and analysis in 2016 for the selected sites are presented in **Table 3.17.**

Table 3.17: Chemical characteristics of the selected fields for experimentation

Site	pH	TN	P	K	Ca	Mg	Mn	B	Cu	Mo	Fe	Zn	S	CEC	OC
		(mg/kg)						Ppm						meq/100g	%
Bubale(K)	4.7	754	5	52	456	57	7	0.41	1.2	1.59	2065	2.0	1.0	6.5	2.4
Kyaka(M)	5.2	1540	11	249	620	184	61	0.67	3.0	1.27	883	5.2	1.0	8.9	3.2
Kyaka(M)	5.2	1540	11	249	620	184	61	0.67	3.0	1.27	883	5.2	1.0	8.9	3.2
Kakindo	4.6	1330	11	89	474	96	158	0.79	4.1	1.18	820	8.4	1.0	7.0	2.9
Gabulanga	4.5	1660	10	135	657	195	182	0.51	3.1	1.31	896	6.3	2.0	10.1	3.8
Kasambya	5.6	1970	10	154	1260	205	31	0.91	3.6	2.20	1100	4.6	1.0	12.0	4.4
Nsunga	5.1	2950	14	308	2318	610	121	0.89	4.6	1.74	1065	2.5	7.0	28.3	7.1
Kabwoba	4.7	849	6	79	676	104	24	0.54	2.8	1.32	1037	1.5	1.0	9.2	2.1

Tillers count

The preliminary results on tillers are presented in Table 3.18. Based on the results treatment 7 performed better across all the sites, treatment 6 was the least. Productivity (tiller counts) was

good at Kasambya but it was least at Kyaka due to animal infestation (rodents). Other zones performed to average.

Table 3.18: Response of applied fertilizers on sugarcane tillers for 2017/18

	Tillers count/ha					
Treatments	**Kyaka(Mb)**	**Kyaka(M)**	**Bubale**	**Kasambya**	**Gabulanga**	**Nsunga**
1	109,166	97,777	98,888	118,611	105,555	118,333
2	109,166	70,555	116,944	130,555	110,833	112,222
3	102,222	73,333	116,944	120,277	117,777	133,055
4	94,444	57,500	105,277	126,666	110,277	121,666
5	94,722	71,389	100,833	118,055	109,166	110,555
6	98,055	65,833	122,222	101,666	95,277	118,055
7	106,388	78,611	106,388	129,999	129,444	129,166
8	117,500	71,389	117,777	121,388	105,000	118,611
9	123,611	73,055	91,389	131,111	98,055	130,277
10	109,166	83,055	107,777	120,000	118,333	125,555
11	103,055	88,611	104,722	129,722	115,277	112,500
12	110,000	66,944	98,055	111,388	110,277	125,000
CV %	**16.4**	**35.4**	**11.7**	**10.2**	**16.5**	**12.9**
LSD (0.05)	**29533.8**	**44887.7**	**21359.1**	**21018.1**	**30944.5**	**26485.4**

Summary

These are preliminary results stalks, yield and quality data will be given at maturity.

Project title: YARA Fertilizer trials in outgrowers' fields at Kilombero

Project code: **AP 2014/03/05**

Investigators: **Msita, H. B., Maranga, K. M., Kalimba and Kajiru, S.**

Collaborators: **LAO, VAEOs**

Date of commencement: **2014/15**

Planned end date: **2018**

Reporting period: **2017/18**

Introduction

Sugarcane in Tanzania is the main cash crop for production of sugar and ethanol as byproduct and this is produced mainly for domestic consumption and industrial purpose (SBT, 2016). The area under rainfed sugarcane production is about 60% of the total area under sugarcane production at Kilombero. In most cases rainfed sugarcane production is practiced by out growers (OG). Sugarcane productivity in out-growers' (OG) fields has remained low, below the attainable yield potential of more than 70-100 tons per hectare (SBT, 2016). Among the reasons for low yields is less adoption of good agronomic practices, particularly the use of fertilizers at recommended rates (Mtunda *et al* 1998). The problem of not using fertilizers is attributed to high cost of existing fertilizers products and unavailability of different fertilizer products. Consequently, the YARA Fertilizer Company has introduced new products of fertilizers that suit sugarcane production to smallholder farmers. These products have been tested in Brazil and being used by Brazilian smallholder farmers for sugarcane production. The products have combination of macro- and micro-nutrients. These products are proposed to be used in three categories including basic (low), mid (medium) and advanced (high) nutrient levels of fertilizer. The introduction of these new products to smallholder farmers initiated the needs of information on these crop nutrient rate combinations that can give the greatest return from farmers' investments.

Therefore the study was carried out to compare the fertilizer recommendation rate established by Sugarcane Research Institute (SRI) of Tanzania with products of YARA Fertilizer Company.

Material and Methods

Location of experiments

The experiments were conducted at Kilombero in outgrowers' fields. Kilombero is situated in Morogoro region, between latitudes $7^0$31' and $7^0$50' south and longitudes $36^0$50' and $37^0$01', east at about 300 m above sea level. The rainfall in the area is bimodal with pronounced wet and dry seasons. Mean annual rainfall at Kilombero is about 1500 mm and the mean monthly temperature is 29.9 ^{0}C.

Soil Analysis

Soil samples were analyzed in the Lancrop Laboratories in UK of which several methods were used to analyze the provided soil samples: The following methods were used for analysis of different nutrients: Ca, and Mg were digested by 1M ammonium acetate (NH_4AO_C) through an atomic absorption or ICP while for Manganese 1M NH_4AO_C in 2g/l quinol was used in an Atomic absorption or ICP. Boron was digested in hot water (80˚C) in solution spectrometry with Azomethine. Cu, Zn and Fe were digested in 0.05 EDTA disodium salt under atomic spectrometry while Mo was digested in NH_4AO_C and oxalic acid in an atomic spectrometry. Phosphorus followed Bray method in solution spectrometry potassium followed frame emission spectrometry after being digested in 1M NH_4NO_3. Total nitrogen was determined following micro kjedahl distillation method after being digested in orthophosphoric acid. Organic matter was determined using Olsen method (sodium hydrogen carbonate) in spectrophotometry while CEC was through calculations.

Field Experiments

The on-farm demonstration plots were set in out-growers' fields. Three plant cane (PC) fields and three ratoon (R) fields in different micro-climate of Kilombero Sugar Company (KSC) mill areas.

Four treatments (SRI recommendation (1), Basic (2), Mid (3) and Advanced (4)) were applied in both PC and adjacent ratoon fields where it was possible to get the field with ratoon crop.

Six experiments; three plant cane and three ratoon crops were established during the short rains (December, 2015) in the following sites; Kungurumwoga, Msolwa Ujamaa and Mang'ula, these experiments were under rainfed conditions.

Table 3.19: Location of the experimental sites

No.	Local Name	Plant Circle	Coordinates
1	Kungurumwoga	PC	37M, UTM 280817, 9156672
3	Msolwa Ujamaa	PC	37M, UTM 274387, 9141224
5	Mang'ula	PC	37M, UTM 268412, 9129284

Experimental layout

Each experiment was laid out in a randomized complete block design (RCBD) with three replications. Individual experimental plots were 9.6 m x 10 m comprising 8 sugarcane rows of 10 m long spaced at 1.2 m apart. Adjacent plots and replications were separated by 1 m path. Four treatments were applied in the following rates per hectare (ha): SRI-Recommendation ($N_{100}P_{25}K_{100)}$, Basic ($N_{39}P_2K_{6.2}Ca_{1.9}Mg_{1.25}S_{0.63}B_{0.13}$), Medium ($N_{105}P_7K_{25}Ca_{7.5}Mg_5S_{2.5}B_{0.5}$) and Advanced ($N_{120}P_{16}K_{40}Ca_{14}Mg_6S_1B_{0.02}$).

Fertilizers used

1. YARA fertilizers: -YaraMila tobacco (10% N, 18 % P_2O_5, 24 % K_2O, 3 % CaO, 0.5 %MgO, 7 % S and 0.012% B)
2. YaraVera Amidas: - (40 % N and 5.5 % S)
3. SRI recommendation: - Urea 46 % N, TSP 46 % P_2O_5 and Muriate of Potash (MOP) 61 % K_2O.

Phosphate containing fertilizers were applied at planting other fertilizer were applied in single split three weeks after planting for plant cane crop and after harvesting for ratoon crop. The complete set of treatment is given in Table 3.20. The test sugarcane variety used was NCo376.

Table 3.20: Details of treatments

Treatments	**Nutrients Levels (t/ha)**						
Ratoon Cane	N	P	K	Ca	Mg	S	B
SRI Recommendation	100	25	100				
Basic	39	2	6.2	1.9	1.25	0.63	0.13
Medium	105	7	25	7.5	5	2.5	0.5
Advanced	120	16	40	14	6	1	0.02

Data collected

All data were collected from four center rows in each plot. Data collected were soil sample before experimental layout, germination performance, tillers number, plant height, number of

millable stalks, and cane yield at maturity and quality parameters (Brix % cane, Pol % cane and Purity % cane at maturity. The Analysis of variation variance (ANOVA) and Multiple Range Test were done to determine the variations among treatments.

Sugarcane tillering

Cane tillering were assessed three months after experiments establishment by counting the number of cane shoots from four center rows in each plot and number of tillers per hectare was calculated.

Plant height

Twenty stalks were selected randomly from four center rows in each plot and marked. Heights were measured from the ground level to the top visible dewlap using a graduated metal rod and were expressed in centimeter.

Number of millable stalks

Millable stalks refer to the stalks that have attained their physiological maturity and were ready to be harvested for processing. This was done by counting all cane stalks in the two center rows in each plot at maturity before harvesting and number of stalks per hectare was calculated.

Sugarcane yield tons ha^{-}TCH)

Twenty canes from center rows in each plot were cut to the ground level, trash removed, chopped at the top visible dewlap, bundled and then weighed. Tons of canes per hectare (TCH) were obtained through calculations. This was done at harvesting.

Sugarcane quality parameters

Quality parameters (Brix % cane, Pol % cane and Purity % cane) were determined at harvesting, cane sample were taken for quality parameter analysis, and the sucrose content were calculated.

Sugar yield tons ha^{-1} (TSH)

Tons of sugar per hectare will be calculated using the following formula after receiving quality parameter from Kilombero Sugarcane Laboratory.

Tons of sugar/ha) = [Yield (tons of cane/ha) x Sugar Recovery (%)] /100.

Soil Results

The soil results on chemical characteristics are presented in Table 3.21, including pH, total N, organic carbon, available P, K, Mg, Ca and Na. General the soils are predominant alluvial soils, with low to medium level of soil fertility levels, indicating that the soils have been cultivated for long time.

Soil reaction (pH)

The optimum soil pH range for the sugarcane crop is 5-8.5 (IPN, 2013). It is evident that all soils in the experimental sites have favourable reaction. Therefore, optimum sugarcane production with adequate soil condition which is required for maintaining sustainable sugarcane production.

Total nitrogen and organic matter

The levels of organic matter, presented as total N and organic C are medium to low in most of the soils. This can be attributed to rapid mineralization of organic matter. The quality of organic matter is low due to high C/N ratios with mean value of 13. Hence, there is a need to apply nitrogen containing fertilizers and enhance the buildup of organic matter. Nitrogen is important for high cane yields, needed in large quantities and helps to maximize cane production and yield.

Available phosphorus

All soils have low levels of available P (<10ppm). For optimum growth of sugarcane it is necessary to apply P containing fertilizers as sugarcane responses are expected to be high. Phosphorus is important for root development, early shoot growth and tillering. Poor phosphorus supply reduces tillering, internodal length and root area.

Exchangeable bases

The levels of K, Mg and Ca in the experimental sites are intermediate for K, adequate for Mg and Ca. In order to make sugarcane production sustainable the supplement of K, Mg and Ca is important since the levels here are not very high enough (Wood et al., 2003).

Potassium helps photosynthesis and important to productive growth, stronger stalk development with less lodging. Potassium also boosts strong cane development, long

internodes growth, wider cane girths and sugarcane yield. In order to improve cane production potassium and nitrogen need to be in balance.

Magnesium is involved in transpiration. Unlike calcium, magnesium is more mobile in plants and can also be translocated from mature to new leaves for active growth. Low levels of magnesium during peak periods of growth result in poor cane growth.

Calcium facilitates physiological stability of plant tissue. It helps forming strong cell walls and cell membrane integrity. Good calcium supply maintains good plant structure and health, minimizing stem and leaf cracking. Calcium ensures good plant strength, protecting root, leaf and stalk production, while maintaining early sugarcane architecture and yield (Wood et al., 2003).

The amounts of sodium in the experimental sites are reasonable. The Exchangeable sodium (ES) is the degree of saturation of the soil exchange complex with sodium. The ES is a good indicator of the structural stability of a soil and of the physical response that may be anticipated when water is applied. Sugarcane has low tolerance to high ES levels. At ES levels above 10% stunted growth occurs even though the physical condition of the soil may be good (Lunt, 1963).

Table 3.21: Soil Chemical Characteristics

Identity	TN %	OC %	Na (meq/100 g)	K (meq/100 g)	Av. P (Bray-1) (mg/kg)	Ca (meq/100 g)	Mg(meq/100 g)	pH
Kunguru mwoga	0.16	2.49	0.22	0.24	5	11.99	2.87	5.6
Msolwa	0.13	1.56	0.17	0.42	6	12.49	2.51	5.6
Mangula	0.34	4.23	0.43	0.33	6	10.79	4.20	5.5

Yield Tons Cane per Hectare (TCH)

Based on unavoidable circumstances data were only recorded in two sites (Mang'ula and Msolwa-Itefa). The results presented in Table 3.22 revealed that there was significant difference of sugarcane to different rates and types of fertilizer applied. However, on average treatment 4 (Yara advanced) performed better followed by treatment 1 while treatment 2 and 3 performed on average.

Table 3.22: Response of sugarcane to different rates of fertilizers (TCH)

Treatments	Itefa	Mang'ula
SRI Recommendation (1)	128	129
Basic (2)	98	119
Medium (3)	108	108
Advanced (4)	122	145
CV	**23.9**	**18.8**
LSD(0.05)	**54.3**	**47.1**
F(pr)	**0.55**	**0.63**

Tons of Sugar per Hectare (TSH)

Based on unavoidable circumstances data were only recorded in two sites (Mang'ula and Msolwa-Itefa). The results presented in Table 3.23 revealed that there was no significant difference of sugarcane to different rates and types of fertilizers applied. However on average treatment 4 (Yara advanced) performed better followed by 1 while treatment 2 and 3 performed on average just like on TCH.

Table 3.23: Response of sugarcane to different rates of fertilizers (TSH)

Treatments	Itefa	Mang'ula
SRI Recommendation (1)	11	11
Basic (2)	8	11
Medium (3)	9	10
Advanced (4)	10	13
CV	**24.1**	**19.5**
LSD(0.05)	**4.6**	**4.5**
F(pr)	**0.3**	**0.44**

Project title: Baseline survey on the status of Striga in sugarcane fields in Tanzania

Project Code: **AP 2017/03/04**

Investigators: **Kalimba, H. F, Ngailo, S, Kajiru, S**

Collaborators: **Estate Agronomists**

Date of commencement: **2017/18**

Planned end date: **2018/19**

Reporting period: **2017/18**

Introduction

Striga, commonly known as **witch weed** or **witchers weed**, are root parasitic flowering plants that occurs naturally in sub Saharan Africa and Asia, attacking a wide range of crops. Striga spp are amongst the world's worst weeds (Nail et al., 2014), reducing the value of grain crops particularly in Africa. Striga *spp* are prolific seed producers. The fine dust-like seed can last more than 15 years, and consequently, eradication and control attempts are extremely difficult and prolonged. Striga *spp* reduces crop yields by extracting water, nutrients (particularly nitrogen), and affect photosynthetic process from the root system of its host plant, resulting in stunting and yield reduction (Parker and Riches., 1993). The attack of this weed causes a lot of economic losses. In Tanzania, the weed has been reported mainly in cereal crops such as sorghum, maize and finger millet.

Three species: S. hermonthica, S. gesnerioides, and S. hermonthica have been reported to cause the serious damage to crops. The symptoms of attack by *Striga* may be apparent, sometime before the weed emerges. At early stages, symptoms are indistinguishable from those caused by drought, i.e. wilting and curling of the leaves, but they are strong indicators if they occur when the soil is still moist. The infected plant may also show stunting from quite an early stage and pronounced scorching of the leaf borders and finally of the whole leaf area may occur at a later stage.

Crop yield loss due to *Striga* attacks can vary depending on density, soil fertility, rainfall distribution, host species and variety grown. It has been reported that *Striga* can cause yield loss between 20 – 80% and thus farmers are obliged to abandon highly infested field (Altera and Itoh, 2011).

In recent year *Striga* has been observed in some sugarcane fields. Infestation area and levels are likely to increase in future because of continued monoculture. Therefore this study aimed to provide the baseline information on species and level of *Striga* infestation in sugarcane fields in Tanzania so as to advice on appropriate control strategies.

Material and methods

Location

The survey was conducted at Kilombero in estate and outgrowers farms. Kilombero is situated in Kilosa (K2) and Kilombero (K1) districts in Morogoro region.

Survey method

Extensive surveys method was employed where by transects along the road were used. Observations were done at an interval of 200m and fields in vicinity after each stop was observed for presence or absence of *Striga*. Species identification was done in collaboration with Estate agronomists.

Results

A total of 217 fields were surveyed (100 fields at the estate and 117 fields in OG). Out of 100 fields surveyed at estate 74 fields were infested by *Striga* while for out growers out of 117 fields surveyed only two fields were infested. Higher infestation at the estate's fields could be associated with machinery movements during normal fields operations, application of contaminated filter mud, negligence of management, monocropping system as well the effluent from the upstream. Common *Striga* specie found was *S. hermonthica*. *S. asiatica was found in only one farm in OG at Kidatu*. At K1, 86% of the observed blocks were found to be infested by *Striga* and K2 62 % blocks was found with *Striga* infestation. In outgrowers fields both K1 and K2 only 2% of the observed fields was found to be infested by *Striga*. At Mfilisi none of the observed fields was found to be infested by *Striga*. Results are summarized in **Table 3.24.**

Table 3.24: Status of Striga infestation at Kilombero

S/N	Location	No of fields surveyed	Field found with Striga	Percent of fields with infection
1	Estate K1	50	43	86%
2	Estate K2	50	31	62%
3	OG K1	48	1	2%
4	OG K2	45	1	2%
5	Mfilisi	24	0	0
	Total	217	76	

Figure 3.5. Left Young Striga before flowering: Right Striga asiatica

Figure 3.7. Left Striga hermonthica: Right Matured Striga with seeds

Conclusion

Striga infestation was serious in the estate compared to out growers. Results indicated that *Striga* is now becoming serious weed of sugarcane crop as infestation area and levels is likely to increase in future because of continued monoculture. Therefore control strategies should be considered and implemented. This study will be carried out in other estate during 2018/19 season, so as to have proper overview on the status of *Striga* infestation in sugarcane fields in Tanzania and come out with appropriate recommendations on control strategies.

Project title: Evaluation of different herbicide for use in sugarcane fields at Kagera

Project Code: AP 2017/03/06

Investigators: Kalimba, H. F, G. Mwasinga, S. Kajiru, L. Lwiza and Dr. H. B. Msita

Collaborators: Estate Agronomist

Date of beginning: 2017/18

Reporting period: 2017/18

Introduction

Sugarcane is grown in well drained fertile soils, with good supply of moisture and nutrients. In addition sugarcane receives dressing of nitrogen, phosphorus and potassium. Such condition favors an intense and rapid growth of wide range of weed species. Weed competition in the initial stages of crop growth can be so severe and that plants remain stunted and final yields are a mere fractional of the true potential (Fute, 1990). Losses up to 45% have been reported in sugarcane fields when weeds were not controlled within the first six weeks (Isa and Kalimba, 2000). This is due to the fact that emergence and early growth of sugarcane is inherently slow and considerable time elapse between planting and development of foliage cover, hence the crop competes very poorly with weeds (Isa and Kalimba, 2000; Fute, 1990). For these reasons weed infestations is considered a major constraint in the achievement of yield potentials in sugarcane production.

Hand hoe weeding, mechanical weeding and use of herbicides are common methods used in controlling weeds in sugarcane fields. The use of herbicides is considered as an effective and quick method of weed control.

Experience gained at Mtibwa and Kilombero emphasize the problems encountered in using the current weed control methods. In all estates during the rainy season weed growth is vigorous and intense which require constant application of control measures. Manual weeding during this period has also many limitations including labour availability due to high labour demand for planting and weeding of annual crops (Mtunda *et al*, 1998). Moreover, some weed species such as *Cyperus, Commelina* and many other are not easily killed by

tillage alone due to high soil moisture. Therefore tillage operations, manual or mechanical, are rendered ineffective and costly.

Objective

- To evaluate effectiveness of different herbicides used alone or in combinations and use the results as a basis for recommendation for use in sugarcane fields

Expected output

- Herbicide to be used by OG farmers at Kagera will be determined after three seasons

Materials and methods

Location

Kagera mill area Estate and OG

Design

Randomized Complete Block Design (RCBD), with three replication and four rows spaced at 1.2 m making a plot size of 48m2. Herbicide was applied as early post emergence

Table AP 3.25: Treatments details

Treatment	Acetochlor	Metribuzine	Chlorimuron	Paraquat	Surfactant
	Litres/ha	Litres/ha	Kilograms/ha	Litres/ha	Litres/ha
T1	4.0	1.6	0.250	1	0.2
T2	0.0	1.6	0.250	1	0.2
T3	0.0	1.6	0.250	1	0.0
T4	4.0	1.6	0.375	1	0.2
T5	0.0	1.6	0.375	1	0.2
T6	0.0	1.6	0.375	1	0.0
T7	4.0	2.4	0.250	1	0.2
T8	0.0	2.4	0.250	1	0.2
T9	0.0	2.4	0.250	1	0.0
T10	weed free check				
T11	Weed check				

Results

These trials were established late during the season results are still in progress, therefore will be reported during the next meeting.

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SUGARCANE ENTOMOLOGY SECTION

Project Title: Monitoring of Insect Pests of Sugarcane

Project Number: CPE2017/01

Investigators: J. M. Katundu, A. Yusuph, M. Mwinjummah and F. A. Urassa

Collaborators: Estates Agronomists, SBT

Reporting Period: 2017/2018

Project Duration: YEARLY

Introduction

A large variety of insects feed on sugarcane. The key insect pests in Tanzania being Eldana stem borer, sugarcane whitescale, sugarcane white grubs and Yellow Sugarcane Aphid which has invaded since 2016. Other insects are usually classified as occasional or sporadic pests.
Factors which determine insect population and level of damage caused on the crop include weather, varieties, natural enemies, agronomic practices and new invasions by exotic insect pests. It is therefore important to study seasonal insects' population and changes in pest status and their relationships and interactions between the different abiotic and biotic environmental factors every year. Results of insect pests monitoring are useful for growers in making necessary management actions.

Objectives

- Surveys and Monitoring of sugarcane stem borer *Eldana saccharina*, White scale *Aulacaspis tegalensis*, and surveillance and Scouting of the Yellow Sugarcane Aphid (YSA), *Sipha flava* Forbes.
- Assessment of damage and crop losses of Eldana, White scale and YSA.

Materials and Methods

Surveys were conducted in selected fields to assess Eldana and White scale populations and their extent and intensity of damage on sugarcane in the estates and out grower's fields. A total of fifty stalks were sampled in each field except in some OG fields or multiplication blocks and variety trials in which twenty five or less stalks were taken.
In scouting of YSA the sampled Fields were divided into five sections where by two sampled stools from each section were randomly selected for assessment of YSA damage and presence of predators.

Results and Discussion

The information and data contained in this report generated in surveys conducted between August, 2017 and April, 2018 in TPC, MSE, KSC, and KSL estates and OG fields. The results have been summarized in Table 4.1, Table 4.2 and Table 4.3 to indicate the pest status and risk potential of Eldana, White scale and YSA in MCPs and OG fields, respectively.

Insect Pests Infestation in MCP Fields

TPC

Eldana infestation

A total of 47 fields (Table 4.1) were surveyed for Eldana infestation at TPC between August 2017 and March 2018. Only 4 fields had Eldana infestation above economic threshold of 4% internode bored. Two fields were planted with N30 variety located at North area (N74 and P4S) and the other two fields were planted with variety R 579 (BO5) and variety M700/86 (G3).

White scale infestation

Fifteen (15) fields were surveyed for white scale damage at the TPC estate (Table 4.2). Only one field out of 15 fields recorded high infestation of white scale. The field was planted with N25 variety which is susceptible variety for white scale infestation. However general field observations have shown low incidence of the pest in the estate this year.

In this season TPC has experienced too low incidence of white scale infestation that it has prompted the need to review the pest infestation data for the previous years to explain the current situation.

YSA infestation

About 23 fields surveyed for YSA infestation at TPC estate and only 5 fields were infested above economic threshold (30%). Four fields located at South area (10C, 10K, Q2N, and Q2S) all planted variety N25 and one field located at North area (N70) planted with variety R 575.

KSL

Eldana infestation

At Kagera Sugar Limited 37 fields were surveyed for Eldana incidence and only 2 fields had infestation above economic thresholds. One field (KP2A) planted with variety Co 617

surveyed twice in October and December 2017 and recorded infestation of 4.8% internodes bored and another field DP2B planted with N19 variety had infestation of 4.4 % internodes bored. The fields were surveyed two times and the technical advice given was to harvest them immediately in order to avoid crop loss.

White scale infestation

In a survey for whitescale incidence a total of 37 fields were surveyed for white scale infestation. The results show that 23 fields had no whitescale infestation and the remaining fields had low whitescale incidence. This implies that the problem of whitescale infestation at KSL was not at alarming state. However the estate should avoid as much as possible to promote varieties which are susceptible to white scale.

YSA infestation

Survey for YSA infestation was conducted in 44 fields (Table 4.3) and all fields had infestation, but below economic threshold of 30%. At KSL chemicals are used intensively in affected fields to reduce the infestation rate.

Kilombero

Eldana Infestation

In this season surveys done for *Eldana* infestation at Kilombero indicated that out of 42 fields surveyed only one field located at Ruembe Farm had infestation above economic thresholds (4.8% internodes bored). The field was planted with variety N41.

White scale infestation

Generally whitescale infestation in assessed fields were relatively low, but for the survey conducted in August 2017 a maximum infestation of 70.5 % infested stalks was recorded in Field 647 planted with susceptible variety NCo 376.

YSA infestation

YSA invaded in Kilombero Mill area in November 2017. The first incidence was observed in Kilombero Growers fields neighboring the estate. Out of 59 fields scouted for YSA infestation between November 2017 and January 2018 only 4 fields had YSA infestation above economic threshold of 30%. However, the pest situation in Kilombero is changing rapidly. At the moment more fields are reportedly to have been infested by YSA at different levels of attack to the extent that chemical control is inevitable in some of the damaged fields.

Mtibwa

Eldana Infestation

At Mtibwa there were no fields infested with Eldana above economic threshold of 4% internodes bored out of 15 fields surveyed in August 2017.

White scale infestation

Fifteen (15) fields were surveyed for white scale infestation and the results shows zero to low white scale infestation.

YSA infestation

A total of 21 fields were surveyed for YSA infestation in July 2017 and January 2018. Out of those, 8 fields were recorded to have infestation above economic threshold of 30% infested stools.

Mkulazi Farm (Mbigiri)

A couple of visits were made to the Farm during October, 2017 to March, 2018. A few incidences of Eldana and white scale were noticed.

YSA infestation seems to double within the period of one month and this suggests a higher risk in the new fields which are being planted in case of inadequate rainfall in the coming months.

Insect Pests Infestation in OG Fields

Eldana infestation

A total of 33 fields were surveyed for Eldana infestation in all estates. Only two fields from Kagera had Eldana infestation above economic thresholds. The fields belong to Edward Robert and Henry Mchunguzi which had 6.5% and 7.6% internode bored respectively. The farmers whose fields were infested were advised to harvest the crops immediately so as to minimize the economic loss.

White scale incidence

There were no incidences of whitescale infestation observed in surveyed OG fields in Kagera. In Kilombero and Mtibwa the surveyed OG fields had relatively low white scale infestation.

YSA infestation

A total of 41 fields surveyed for YSA infestations at Kagera (13) and Kilombero (28) was made. Twenty five fields, (8 in Kagera and 17in Kilombero) had infestation above economic threshold (30%) and they were accordingly advised to apply insecticides immediately.

The YSA inversion in Kilombero Growers fields was initially noticed in Sonjo and Sanje areas but within a short period the insect was able to spread to several locations in both K1 and K2.

Moreover, in collaboration with SBT training and sensitization on YSA recognition damage on sugarcane and control methods was conducted for Kilombero Growers and MCP cane growers between the months of December 2017 and March 2018. A total of 1362 growers and 24 supervisors were sensitized from 39 different villages, 30 from K1 (Kilombero) and 9 from K2 (Kilosa).

For the control of YSA the Kilombero Growers (KG) need the support of SBT and other parties to acquire suitable insecticides, spray equipment, and logistics of field spraying.

Table 4.1: Eldana Infestation in MCP and OG Fields 2017/2018

SURVEYED DATE	TPC	KSL	MSE	KSC	TOTAL
Aug-17	15		15	12 (1)	42 (1)
Oct-17		28(1)			28(1)
Dec-17	32(4)	9(2)			41(6)
Mar-18				30	30
TOTAL	47(4)	37(3)	15	42(1)	**141(8)**
Aug-17			9	15	24
Oct-17		9(2)			9(2)
TOTAL					**33(2)**

Table 4.2: Whitescale Infestation in MCP and Growers Fields 2017/2018

MCP FIELDS						
		Number of fields in each category of infestation				
Date	**Estate**	**Total**	**None (0%)**	**Low (0%-25%)**	**Medium (26%-50%)**	**High (51%-75%)**
Aug-17	KSC	12	2	8	2	0
	MSE	15	10	5	0	0
	TPC	15	9	1	4	1
Oct-17	KSL	28	18	10	0	0
Dec-17	KSL	9	5	4	0	0
Mar-18	KSC	30	23	7	0	0
TOTAL		**109**	**67**	**35**	**6**	**1**
GROWERS FIELDS						
Aug-17	KSC	15	2	10	3	0
	MSE	9	4	5	0	0
TOTAL		**24**	**6**	**15**	**3**	**0**

Table 4.3: YSA Scouting in MCP and Growers Fields 2017/2018

SURVEYED DATE	TPC	KSL	MSE	KSC	Mbigiri Farm	Bagamoyo Sugar	TOTAL
MCP FIELDS							
Jul-17		1	10(8)	14			25(8)
Nov-17				45(4)			45(4)
Dec-17	23 (5)	29					52(5)
Jan-18			11	14	7		32
Feb-18		14					14
Mar-18					11		11
Apr-18						7	7
TOTAL	23(5)	44	21(8)	73(4)	18	7	**186 (17)**
GROWERS FIELDS							
Nov-17				28 (17)			28(17)
Dec-17		13 (8)					13(8)
							41(25)

Generally, in this season the infestations of the common sugarcane insect pests namely Eldana and white scale have not been very serious in all MCP and OG sugarcane fields. However, more time was spent in research activities related to the YSA Scouting, surveillance, and development of control methods.

Recently a new brown soft scale (Coccidae) insect has been found feeding on young sugarcane nursery at SRI and Kilombero. Specific identification and studies on the insect have to be conducted.

Project Title: Evaluation of White scale damage and sugar loss in selected varieties

Project Code: CPE 2017/02

Investigators: J. M. Katundu, A. Yusuph, M. Mwinjummah and F. A. Urassa

Collaborators: Estate Agronomist at KSC

Start date: 2015

Reporting period: 2017/2018(R1)

Project Duration: 3 years

Introduction

This is an ongoing trial to validate the inoculation technique and evaluate new varieties for white scale resistance.

Objectives

The main objective is to provide quantitative data on risk potential of white scale in the new test varieties before release.

Specific objectives

- To ensure establishment of white scale on test varieties by artificial inoculation.
- To estimate reduction of sugar in test varieties at different levels of white scale cover.
- To estimate sugar loss per ton of cane per unit white scale cover index (WSCI) as a measure of tolerance of each variety to pest infestation.

Materials and Methods

Location

The experiment was conducted at KSC.

Treatments

Selected sugarcane varieties with different morphological and maturity characteristics were used as treatments.

The test varieties included R 583, N12, N47, R 581 and EA70-97 as a tolerant standard and MN1 or N25 as susceptible controls.

White scale inoculum source

White scale eggs were collected from infested fields and sieved. A weighed, spatula full, amount of eggs were inoculated and covered with a screen or netting material on four stalks of each variety per plot.

The design of the experiment:

Latin square design (LSD) with seven treatments and seven replications, Plot size: 4 row by 10m.

Results and Discussion

White scale establishment

Data on white scale establishment on test varieties, R 581, R 583, N12, N47, MN1, N25 and EA70-97 have been collected and analyzed in July, 2017.

The results in Table 4.4 indicate that only 23.5% of stalks were naturally infested by the white scale at a very low level on test varieties. In the inoculated stalks (Table 4.5), however, the establishment was successful in 86.8% of the stalks. Assessment of the white scale cover (WSC) on the ten top most internodes of sampled stalks showed relatively very low infestation of 0.4% WSC to a maximum of 3.4 % WSC in varieties R581 and N25, respectively.

It appears that variety R581 had greater white scale infestation on the lower part than in the top ten internodes of the stalk on which WSC is estimated. On variety N25 the white scale was distributed on the whole stalk, with high intensity found in the top ten internodes. In other words upward movement of white scale from the inoculated internodes was slower in variety R581 as compared to N25. Otherwise on the basis of white scale establishment varieties R581, N12 and R583 could be classified as resistant and variety N47 as susceptible to white scale.

Table 4.4: Mean Percentage of Stalks in Different Categories of Natural White Scale Establishment on Test Varieties

VARIETIES	**CATERGORIES**		
	None (0%)	**Low (<50%)**	**High (≥ 50)**
R 581	71.4	28.6	0
N25	85.7	14.3	0
N12	85.7	14.3	0
EA 70-97	89.3	10.7	0
R 583	64.3	35.7	0
N47	71.4	28.6	0
MN1	67.9	32.1	0
Mean	**76.53**	**23.47**	**0.00**

Tabl 4.5: Mean Percentages of Stalks in Different Categories of White Scale Establishment and Infestation on Inoculated Test Varieties

VARIETIES	CATEGORIES					
	None	**Low**	**High**	**% white scale infestation**	**WSCI**	**% WSC**
R 581	10.7	21.4	67.9	71	0.04	0.4
N25	14.3	64.3	21.4	100	0.34	3.4
N12	25	42.9	32.1	85	0.09	0.9
EA 70-97	10.7	53.6	35.7	64	0.11	1.1
R 583	10.7	46.4	42.9	85	0.12	1.2
N47	14.3	39.3	46.4	100	0.33	3.3
MN1	7.1	28.6	64.3	100	0.26	2.6
Mean	**13.26**	**42.36**	**44.39**	**86.43**	**0.18**	**1.84**

Juice quality analysis

In October, 2017 samples of sugarcane stalks at three levels of white scale infestation (clean, low and high) in each of the seven test varieties (R 583, R 581, N12, N49, N25, EA70-97 and MN1) were taken to the laboratory for juice quality analysis. At the time of sampling the sugarcane was about ten months old.

The data in Table 4.6 indicate that variety EA 70-97 maintain to be tolerant to whitescale infestation, showing a lower reduction of sucrose percent of 1.7% compared to susceptible varieties N25 and MN1 which had reduction in sucrose percent of 5.2% and 9.5% respectively.

Variety N47 responded as a susceptible variety with sucrose reduction of 9.3% at high whitescale infestation level.

Table 4.6 Mean Sucrose Percentages of Test Varieties and Estimated Reductions At Three Levels of White Scale Infestation.

	White scale infestation and sucrose percent					**Mean**	
Varieties	**None**	**Low**	**% Reduction**	**High**	**% Reduction**	**Sucrose %**	**% Reduction**
R 581	11.28	11.82	-4.79	10.99	2.57	11.36	-1.11
N25	10.3	10.1	1.94	9.76	5.24	10.05	3.59
N12	11.36	11.34	0.18	11.92	-4.93	11.54	-2.38
EA 70-97	11.27	11.71	-3.90	11.08	1.69	11.35	-1.11
R 583	10.74	11.56	-7.64	11.91	-10.89	11.40	-9.26
N47	12.38	13.44	-8.56	11.23	9.29	12.35	0.36
MN1	11.42	11.07	3.06	10.33	9.54	10.94	6.30
Mean	**11.25**	**11.58**	**-2.82**	**11.03**	**1.79**	**11.29**	**-0.51**

Sugar and Cane Yields

At harvest, representative stalk samples of each variety were taken to the laboratory for final juice quality analyses. Table 4.7 represents the final sugar and cane yield data of the test varieties. The new varieties (R 583, R 581, N12 and N47) have got high purity content range from 78.73 to 81.93 compared to susceptible varieties (MN1 and N25) which have low purity content of 76.27 and 76.49 respectively. The highest purity and sucrose contents were obtained from variety N47. The unexpected decline in TCH in this variety was due to low stalk population in some of the plots in this trial.

New varieties have high sucrose content ranging from 8.35% to 9.51% compared to susceptible varieties which have low sucrose content of 7.15% and 7.75 %.

The standard check variety EA70-97 has got relatively higher purity and sucrose content of 77.69 and 8.00% respectively than the susceptible varieties MN1 and N25.

Table 4.7: Juice Quality and Cane Yield of Test Varieties at Harvest

Variety	Brix	Pol (%)	Purity	Sucrose (%)	Weight (Kg per plot)	TCH
R 583	14.48	11.4	78.74	8.35	736.86	102.35
N12	14.66	11.54	78.73	8.45	782.00	108.62
R 581	14.41	11.36	78.86	8.62	680.00	94.45
N25	13.15	10.05	76.49	7.15	674.57	93.70
MN1	14.35	10.94	76.27	7.75	716.00	99.45
EA 70-97	14.61	11.35	77.69	8.00	550.43	76.45
N47	15.06	12.35	81.93	9.51	498.00	69.17
Mean	**14.39**	**11.22**	**78.46**	**8.29**	**662.55**	**92.03**
SE	**0.51**	**0.55**	**2.04**	**0.63**	**102.26**	**14.21**
CV (%)	**3.6**	**4.9**	**2.6**	**7.6**	**15.43**	**15.44**
LSD (p =0.05)	**0.91**	**0.982**	**3.63**	**1.11**		

The ranking of new varieties as shown in Table 4.8 below places variety N12 as the most tolerant to white scale followed by R581, R583 in that order. The reaction of variety N47 to white scale damage can be regarded as intermediate / susceptible.

Table 4.8: Ranking

Varieties	% Establishment	Sucrose %	% Sucrose loss	% WSC	TCH	Total	Overall ranking
R 581	3	2	3	1	4	13(7)	2
N25	2	7	6	7	5	27(15)	6
N12	1	3	2	2	1	9(5)	1
EA 70-97	3	5	4	3	6	21(10)	4
R 583	3	4	1	4	2	14(8)	3
N47	2	1	5	6	7	21(13)	5
MN1	4	6	7	5	3	25(16)	7

() Rank totals of establishment, sucrose loss and white scale cover

Project Title: Production of White scale predator, *R. lophanthae,* in screen house for field releases

Project code: CPE 2017 /03

Investigators: J. M. Katundu, A. Yusuph, M. Mwinjummah and F. A. Urassa

Collaborators: Estate agronomists at KSC, TPC and MSE

Reporting Period: 2017/2018

Project Duration: Three years

Introduction

In Tanzania the control of whitescale has mainly achieved by use of host plant resistance (self-trashing varieties) and biological control. In biological control the ladybird beetle, Rhyzobius *lophanthae* has been the most efficient predator since its introduction at TPC in early 1970's.

There is a need to introduce this predator in other places where whitescale has been a problem.

Objectives

The main objective of the project is to produce *Rhyzobius lophanthae* in screen house for release in sugarcane fields infested with white scales.

Specific objectives

- To study suitable conditions for population build-up of the predator, Rhyzobius *lophanthae* (Coleoptera: Coccinalidae) in screen house and release sites.
- To study the influence of pugnacious ant, *Anoplolepis custodiens* (Hymenoptera: Formicidae) on establishment of white scale predator, *R. lophanthae* for control of the white scale in release sites.

Materials and Methods

Screen house has been constructed at SRI for rearing of whitescale predators. **The host plant,** sugarcane varieties for whitescale infestation N25, MN1 and R 579 have been planted in February 2018 in pots as food for the whitescale as **prey insects.** After six months (August 2018**)** the potted sugarcane plants are expected to be at a suitable growth stage for whitescale inoculation.

After establishment of whitescale on the sugarcane in the screen house, *Rhyzobius lophanthae* (**Predator)** in the adult or pupal stages will be introduced to start mother culture

of the predator for future multiplication. When predators will be reproduced in large number they will be released to the highly infested fields in Kilombero and Mtibwa.

Results and Discussion

- Meanwhile rapid propagation techniques of suitable varieties for establishment of white scale colonies have been investigated. William's (1971) technique for rearing white scale has been tested for adaptation at laboratory level.
- The surveys were conducted in February and April 2018 to investigate the availability of white scale predators *Rhyzobius lophanthae* at TPC when needed for use in the project. Unfortunately predators were not available in the fields surveyed at that time. This was probably due to heavy rains, use of tolerant varieties and normal seasonal fluctuations of white scale populations in sugarcane fields' but have low infestation of white scale at TPC.
- Another survey will be conducted in July/August 2018. This is a period for high infestation of white scale on sugarcane and therefore predators are also expected to be found in large numbers.

Project title: The control of *Eldana saccharina* in sugarcane fields by habitat management: "Push-Pull" approaches

Project code: CPE 2017/04

Investigators: J. M. Katundu, A. Yusuph, M. Mwinjummah and F. A. Urassa

Collaborators: TPC Agronomist

Reporting Period: 2017/2018

Project Duration: 3 yrs.

Introduction

In Tanzania, research on habitat management in the form of Push – Pull was conducted and recommended for control of cereal stem borers like *Chilo partellus* on maize; silverleaf desmodium (*Desmodium uncinatum)* and Napier grass (*Pennisetum purpureum*) were used as push (repel) and pull (attractant) crops, respectively (Pallangyo).

In the proposed experiments, therefore, various test plants in different combinations, and their architecture/arrangement in space and time in sugarcane fields or rows will be evaluated for practical push-pull recommendation for Eldana management.

Main objective:

To develop and recommend sustainable Eldana control by using habitat management in the "push-pull" approach.

Specific objectives

- To identify the potential "push-pull" plants and to study their compatibility under the sugarcane growing environment at TPC.
- To monitor the Eldana population dynamics in the sugarcane crop and "push-pull" plants in the field.
- To study and evaluate the usefulness and management of the selected "push-pull" plants in the sugarcane agro-ecosystem at TPC and other sugarcane growing areas.
- To evaluate the benefits of using the "push-pull" plants in controlling Eldana and other uses.

Project Status

The project was postponed due to logistical problems of acquisition and multiplication of planting materials (eg; molasses grass).

Project title: The effectiveness of prophylactic soil treatments of Imidacloprid and augmentative foliar applications of Thiamethoxam, Abamectin, Pirimicarb and Acetamiprid for YSA control

Project code: CPE 2017/05

Principal Investigator: J.M. Katundu, F. A. Urassa, A. Yusuph and M. Mwinjumah

Collaborators: KSL, KSC and TPC Agronomists

Reporting Period: 2017/2018

Project Duration: 3 yrs.

Introduction

The Yellow Sugarcane Aphid (*Sipha flava*) has become one of the most damaging pests of sugarcane in all the major sugarcane growing areas of Tanzania. This insect causes damage to sugarcane by direct feeding on the sap and injection of a toxin which causes leaf discoloration, necrosis and death, thereby reducing the photosynthetic area of the plant. Early YSA infestation on the sugarcane crop may cause reduction in tillering.

Chemical control has been recommended in most countries of southern Africa and other areas where YSA has been a major problem on sugarcane. In Tanzania during the last two years, with special permit, three insecticides have been used in TPC, Kagera and recently, Kilombero, MCP sugarcane. Typhoon 350 SC (imidacloprid), Thoxam 250 WG (thiamethoxam) and Drone 222 SL (acetamiprid) are undergoing field testing for their efficacies against YSA for registration in Tanzania. However, since these insecticides belong to the same group of neonicotinoids, it is necessary to test the efficacy of other groups of insecticides and application methods as well which may delay development of resistance and to minimize detrimental effects on predators.

This report presents preliminary results of one insecticides trial which was conducted at KSL in collaboration with the Chief Agronomist, Mr. A. Nassoro. The treatments in this trial included soil application of Imidacloprid as prophylactic treatmentat planting and two foliar applications of Thoxam, Drone, Abamectin and Pirimicarb at eight weeks after planting (8 WAP) and at 12 WAP.

Typhoon 350 SC at 2.0 liter per ha; was applied in soil at planting. Then foliar application of Thoxam 250 WG at 800 g per ha, Drone 222 SL at 1. 35 liter per ha, Abamectin 18EC at 300 ml

per ha and Prirmicarb 396 g per ha were done at 8 weeks. Acetamiprid, Abamectin and Pirimicarb were applied again at 13 weeks after planting.

Objective

The main objective of this trial was to find suitable prophylactic and augmentative insecticides to be used in soil and foliar applications for sustainable YSA management that have reduced impacts on natural enemies.

Materials and Methods

A trial was established at field D23B. This is a rainfed area with high incidences of YSA infestation, (KSL). At TPC the trial was established at field L3N. Randomized Complete Block Design was employed with four replication containing nine treatment at Kagera and twelve treatments at TPC. The plot size was four rows by ten meter and space between plots was two meter.

Treatments and Application Rates

Imidacroprid formulation of Typhoon 350 SC at 2.0 liter per ha was applied in soil at planting. In all plots except untreated control (T1). Then foliar applications of Thiamethoxam as Thoxam 250 WG at 800 g per ha (T3), Acetamiprid as Drone 222 SL at 1. 35 liter per ha (T4), Abamectin 18EC as Abanil at 300 ml per ha (T2) and Pirimicarb 396 g per ha (T5) were done at 8 weeks after planting (WAP). Second foliar application of Acetamiprid, Abamectin and Pirimicarb were done at 13 weeks after planting. After germination sampling in trial plots was done bi-weekly up to 6.5 months after planting. The data captured included: Number of Predators per stool, Number of Leaves per stalk, Number of damaged leaves per stalk, Number of YSA colonies per stalk, Estimated Level of damage on leaves per stalk and yield parameters at harvest.

Results and Discussion

Data on YSA Insecticide trial has been collected from 1.5 to 6.5 months and analysis has been done for this period. The trial is still on progress and the trend for these insecticides has shown good results for this period. The report on these data will be reported.

SUGARCANE PATHOLOGY AND NEMATOLOGY SECTION

Project Title: Monitoring of Ratoon Stunting Disease on sugarcane fields

Project Number: CPP 2017/01/01

Investigators: M. Masunga, M. Mziray, R. Polin and Y. Mbaga

Collaborators: Kilombero Sugar Company Estate Agronomists and LAO's

Reporting Period: 2017/2018

Remarks: On-going

Introduction

Ratoon stunting disease (RSD) of sugarcane is caused by *Leisfonia xyli* subsp. *xyli* a gram-positive bacterial that colonizes the xylem vessels of the plant (Pan et al., 1998). The pathogen produces gel like materials that plug the vessels resulting into stunting of the plant and causes a yield loss from 5-60% depending on the susceptibility of the variety and weather conditions (Gao et al., 2008). The disease is transmitted from field to field in systemically infected seedcane and infected knives and other farm implements during planting and harvesting operations (Grisham et al., 2006). Since the disease does not show external symptoms rather than stunting, regular monitoring followed by laboratory test using microscopy is necessary to diagnose its presence or absence in sugarcane fields.

Objectives:

1. To study and establish the status of RSD in sugarcane fields
2. To device necessary control measures to reduce its effects for improved productivity.

Materials and Methods

A total of 70 samples were collected, 60 and 10 for estates and out-growers' fields, respectively for vascular sap extraction at KSC laboratory. Samples were collected from fourteen varieties aged eight to twelve months. Extraction was done by positive pressure air method and each sample divided into two parts for detection of bacteria *Leisfonia xyli* subp. *xyli*. First part of sample was used for laboratory detection on phase contrast microscope at Kilombero Sugar

Company laboratory under 100x magnification and phase ring Ph3. The duplicate was shipped to SRI for confirmation using Immuno-Fluorescence Microscopy (IFM).

Results and discussion

The results from phase contrast microscopy showed that the screened samples were negative for the disease; none of 60 fields had the disease (Table 5.1). This implies that KSC have managed to control the disease in their fields though these results will be confirmed with IMF results. Also 10 out growers' fields were also checked and all were negative for the disease.

Table 5.1: RSD PC results for KSC

SN	Field Name	Variety	Age (Month)	Crop cycle	PC Results
1	239	N41		0	Negative
2	110	N12	9	3	Negative
3	125	N47	9	3	Negative
4	236	N19	9	4	Negative
5	107	N14	9	3	Negative
6	235	MN1	9	5	Negative
7	228	N25	9	6	Negative
8	647	NCo376	10	11	Negative
9	459	N25	10	2	Negative
10	614	R 570	10	2	Negative
11	416	N14	8	5	Negative
12	610	N12	11	3	Negative
13	322	N19	8	3	Negative
14	529	N25	8	3	Negative
15	601	N12	11	3	Negative
16	420	N25	11	8	Negative
17	416	R 579	8	5	Negative
18	321	N25	12	8	Negative
19	435	MN1	9	4	Negative
20	502	N25	12	9	Negative
21	551	N25	8	5	Negative
22	615	N12	12	2	Negative
23	554	R 570	10	2	Negative
24	550	N25	8	5	Negative
25	503	N41	8	4	Negative
26	333	R 579	9	1	Negative
27	307	N25	11	9	Negative
28	552	MN1	8	5	Negative
29	364	MN1	11	4	Negative
30	306	N19	9	0	Negative
31	306	R 570	8	0	Negative

32	362	R 579	8	1	Negative
33	363	N25	11	4	Negative
34	344	R 579	9	0	Negative
35	481	N41	9	0	Negative
36	377	R 570	8	6	Negative
37	306	N41	9	0	Negative
38	351	N25	12	3	Negative
39	368	MN1	9	6	Negative
40	485	N41	8	1	Negative
41	464	MN1	11	4	Negative
42	682	N41	10	4	Negative
43	483	N12	13	2	Negative
44	671	N41	8	6	Negative
45	463	N41	8	6	Negative
46	463	N25	11	4	Negative
47	455	MN1	11	4	Negative
48	683	N14	12	0	Negative
49	302	R 570	9	0	Negative
50	684	N41	12	0	Negative
51	204	R 579	10	3	Negative
52	105	R 583	8	2	Negative
53	150	N41	9	3	Negative
54	142	N41	8	3	Negative
55	154	N41	9	2	Negative
56	206	N36	8	2	Negative
57	208	N25	10	5	Negative
58	155	N14	8	3	Negative
59	244	N30	9	0	Negative
60	222	N25	10	9	Negative

Table 5.2: PC results for out-growers' fields at Kilombero

SN	Variety	Age	Crop Cycle	Results
1	NCo376	12	5	Negative
2	NCo376	11	3	Negative
3	NCo376	10	2	Negative
4	NCo376	11	3	Negative
5	NCo376	8	3	Negative
6	NCo376	10	6	Negative
7	NCo376	9	3	Negative
8	NCo376	9	4	Negative
9	NCo376	9	3	Negative
10	NCo376	8	2	Negative

Conclusion and Recommendations

From this study, all the surveyed fields were free from Ratoon stunting disease subject to laboratory confirmation using advanced technique (immunofluorescence microscopy). For 2017/18, IFM test was not performed due to difficulties in obtaining antiserum but the efforts have been made until now the procurement procedures are underway and expecting to get the reagents by July 2018.

For the coming years it is advised to train SRI staff on the antiserum preparation and the use of molecular tools to facilitate diagnostic activities using serological techniques for different diseases such as smut.

Project title: Smut assessment in sugarcane fields
Project Number: CPP 2017/01/02

Investigators: M. Masunga, M. Mziray, R. Polin and Y. Mbaga

Collaborators: Estate Agronomists and LAO's

Reporting Period: 2017/2018

Remarks: On going

Introduction

Sugarcane smut is caused by fungus *Sporisorium scitamineum* which leads to a considerable yield and quality losses in sugarcane (Yohannes et al., 2010). The disease is transmitted aerially by wind-blown spores and by planting infected setts. The large terminal whips produce millions of spores daily which can spread long distances as well as locally infecting sugarcane through the lateral buds (Comstock, 2000). The disease is systemic and can be controlled through the use of resistant varieties, clean seedcane, regular monitoring and roughing infected stools and avoidance of ratooning of smut infected field (Wankuan et al., 2012)

Objective

To assess and establish the status of smut on estate and out-growers' fields and advise necessary management measures.

Materials and Methods

On 2017/2018, a total of 34 fields were assessed for smut infection at TPC (10), Mtibwa (7) and Kilombero (17). The fields were selected randomly but for each site different zones were covered. Percentage of infestation were calculated based on the formula below;

$$\text{Percentage of infection} = \frac{\text{Total of smutted stools}}{\text{Total number of stools}} \times 100$$

Results and discussion

The results for surveyed fields for both estates and out-growers' fields are presented in Tables 5.3 and 5.4 hereunder.

Table 5.3. Smut assessment at TPC Estate

Field	Variety	Age (m)	Crop cycle	% Infestation	Remarks
6F	R 585	3	1	0	No smut
6D	N19	4	0	0	No smut
D28	R 575	1.2	1	1.6	Roughing
E6	R 575	1.2	6	1.2	Roughing
E1	N41	1.3	6	0.4	Roughing
KH 23	R 579	2	4	0	No smut
KH25	N41	2	4	0	No smut
81	R 575	3	0	0	No smut
L1N	N41	3	5	0	No smut
P1N	N25	4	1	0	No smut
B05	N25	4	4	0	No smut

Smut management at TPC

Out of ten fields assessed, only three fields (D28, E1 & E6) had smut infestation between 0.4-1.6 percent which is below the economic threshold level for commercial fields as indicated in Table 5.3. This implies that TPC have effective smut management strategies and the weather conditions could be contributing to low level of smut infestation.

Association of sugarcane varieties, crop cycle and smut incidences

The high smut infestations were observed on variety R 575 in fields D28 and E6 with percentage of infestations 1.6 and 1.2 in second and sixth crop cycle, respectively. Alternatively, field E1 planted with variety N41 in sixth crop cycle had low smut infestation. Therefore, close monitoring of these two varieties on other fields in the estate is vital.

Smut assessment on out-growers' fields at Mtibwa and Kilombero

Results from the surveys conducted in out-growers' fields indicated high smut infestation levels. At Mtibwa, all fields had smut infestations with two fields having infestations above economic threshold (>4%) (Table 5.4).

At Kilombero, 88.2% of the fields assessed had smut infestation though below economic threshold level and 11.8% of the fields had smut (Table 5.4). The high levels of smut infestations in out growers fields could have been attributed to either use of infected planting materials which they spread the disease from one field to the next or not practicing phytosanitary measures such as disinfecting cutting knives during harvesting and planting and rogueing of smutted stools.

Table 5.4. Smut assessment on out growers' fields at Mtibwa and Kilombero

Location	Field	% infestation	Remarks
Mtibwa - OG	1	1.4	Roughing
	2	1.6	Roughing
	3	5.5	Ploughing out
	4	4.7	Ploughing out
	5	0.8	Roughing
	6	0.4	Roughing
	7	1.5	Roughing
OG- Kilombero	1	0.3	Roughing
	2	1.7	Roughing
	3	3	Roughing
	4	2.1	Roughing
	5	0.5	Roughing
	6	0.8	Roughing
	7	2	Roughing
	8	3	Roughing
	9	1.9	Roughing
	10	0.7	Roughing
	11	0.4	Roughing
	12	0	No smut
	13	0	No smut
	14	0.9	Roughing
	15	2.6	Roughing
	16	0.7	Roughing
	17	0.2	Roughing

Inadequate reliable sources of clean planting materials could be another reason that is accelerating the problem. Moreover, lack of awareness on the importance of using disease free planting materials and dependence on only one smut susceptible variety (NCo376) could have attributed to the current situation in out-growers' fields.

Conclusion and recommendation

Smut can result into significant yield losses to sugarcane industry if not managed. For TPC, expansion of R 575 is cautioned as the variety is susceptible to smut and could be a principal source of smut inoculum in the estate. On other hand, most of the fields surveyed in out-growers' field were infested by smut.

It is recommended that awareness creation and training of farmers on smut management is vital and could lead to increased cane and sugar yields. The use of resistant variety is one of smut management therefore breeders should find a variety (ies) to replace NCo376.

First Report on Sugarcane White Leaf Disease (SCWL)
Team: SRI staffs (Minza Masunga, S. Ngailo, George Mwasinga and Yeremia Mbaga), Collaborators: estate agronomist (MSE and KSL) and LAOs

Introduction

Sugarcane white leaf disease (SCWL) is caused by phytoplasma pathogen which is localized within phloem tissues in sugarcane vascular bundles (Wongkaew, 2012). The disease is systemic and it is easily spread through the use of infected cane setts whereas secondary spread is accelerated by the vector-leafhopper *Matsumuratettix hiriglyphicus* that rapidly distributes SCWL phytoplasma from field to field (Wen-Feng Li et al., 2013). The incidence of SCWL is apparently correlated with the population dynamics of the vector, the higher the vector the higher the disease spread and vice versa. According to (Chen and Kusalwong, 2000), soil type also plays a great role for the disease spread; usually females of the vectors prefer to lay eggs in sandy soil, and this may be one of the reasons why the disease often occurs more severely in sugarcane grown areas. The Sugarcane White Leaf Disease can cause severe yield losses, particularly when the planting material is obtained from infected sources, or when disease transmission occurs during the early stages of plant growth.

Initial symptoms consist of streaks along one side of the younger leaves and some mottling – as these develop, whole leaves may turn white. Generally, the younger leaves are affected first and diseased stools may show white leaves in the spindle area, while older leaves remain green (Figure 5.1). An important characteristic feature of the symptomatic plants is on and off masking behaviour of symptoms masking of symptoms hiding the pathogen inside and when the disease is severe, stools become markedly stunted and yield losses can be as higher as100%.

Diagnosis based on visible symptoms for the disease, microscopy observation using light and immunofluorescence. Diseased tissue stained with DAPI (DNA-specific fluorochrome, 4-6 diamidino-2 phenylindole). Staining of tissue with DAPI is a sensitive and reliable technique for rapid and precise localization of phytoplasma in phloem sieve of the infected sugarcane. Also PCR based method has been widely used in many laboratories due to its higher sensitivity and specificity (Wongkaew, 2012)

Planting disease-free cuttings through use of healthy nurseries, hot water treatment of cuttings, micro propagation of disease-free plantlets, strict quarantine regulations and various soil amendments (bagasse, filter mud, green manure etc.) are practices that could reduce disease incidences. Also rouging of diseased plants and the prohibition of ratooning in infected fields are, therefore recommended to control the disease.

In Tanzania, the suspected symptoms for Sugarcane White Leaf Disease (SCWL) was first noticed on variety R 570 and later N12 at KSC and MSE, respectively during disease monitoring work in 2017.

Objective

To establish the status of SCWLD in sugarcane fields in Tanzania

Methodology

Survey for SCWL in estates and out growers' fields

A total of 165 field were surveyed in all estates, 87 and 78 in estates and out-growers' fields, respectively. Eight fields at MSE and TPC (18) and KSL (139). At KSC, the symptoms were observed one field planted variety R 570. The 78 out-growers' fields were for KSL mill area only.

Results

At TPC none of the field had the symptoms for the disease, for MSE one field J5 (A) planted with variety N12 had several stools with symptoms of SCWLD and leaf samples were collected for laboratory confirmation. For KSC one field planted with variety R570 the symptoms were observed.

Figure 5.1 SCWL symptoms as observed at MSE

SCWL disease incidences at KSL and out-growers at KSL mill area

At Kagera estate and out-growers, SCWL disease was observed in many fields. Hence, a wide coverage of fields and varieties were done compared to other areas. Below are results and different parameter assessed at Kagera.

The disease incidences were 7 and 28% for out-growers' and estate's fields, respectively (Figure 5.2).

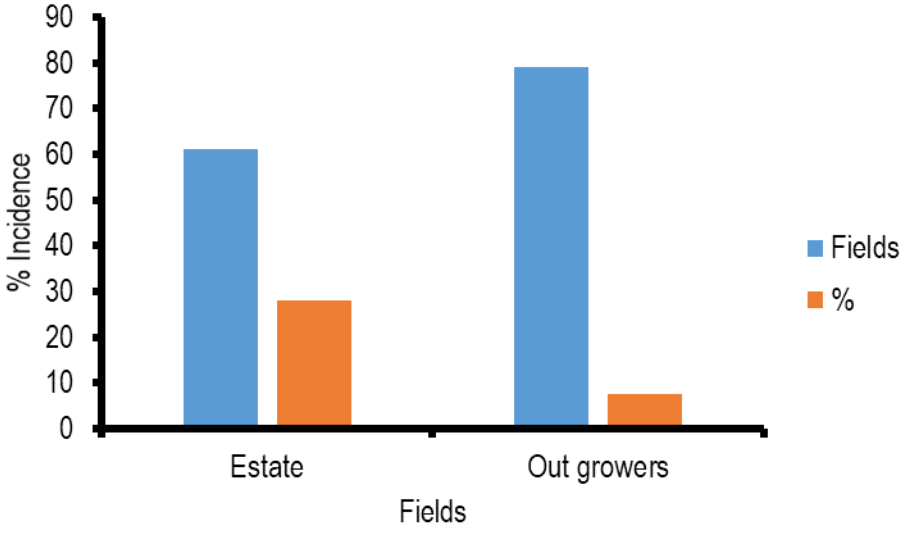

Figure 5.2: SCWL incidences at KSL Mill Area

The disease symptoms were revealed on eighty varieties namely N25, Co617, N49, N41, MN1, R 579, N19 and N46. Four fields planted with variety N25 had highest incidences followed by variety Co617 and N49 both observed in 3 fields each. Variety MN1, N19 and N46 had one field each with symptoms for SCWL (Figure 5.3 below). The symptoms were higher on younger plants and many were two months old and few were 5 months old the situation observed in both estate and out growers (Figure 5.4).

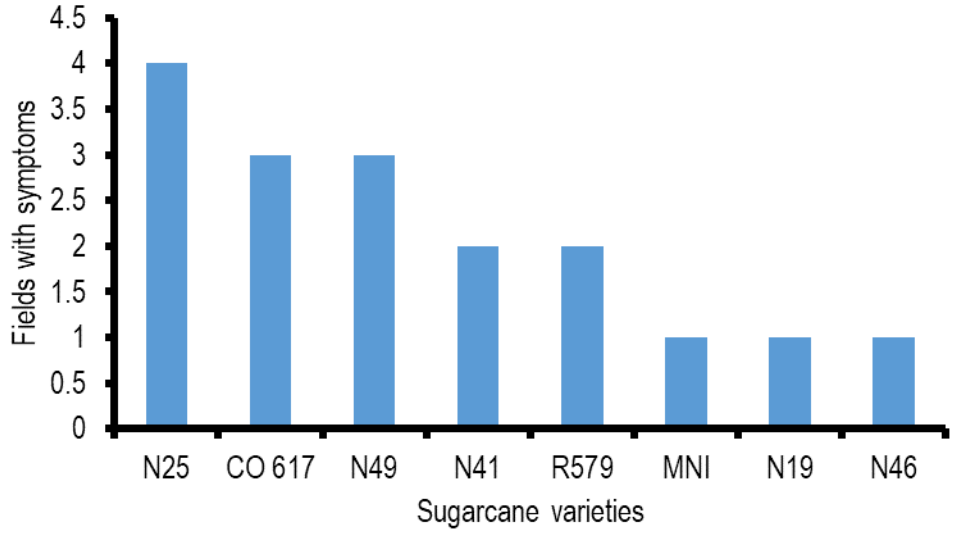

Figure 5.3: Fields and Varieties with SCWL symptoms at KSL estate

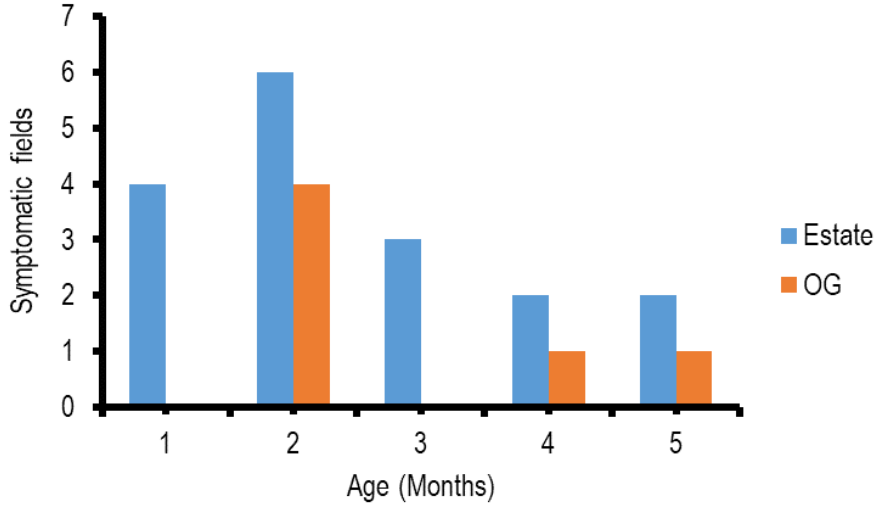

Figure 5.4: SCWL symptoms in relation to age of sugarcane plant

Generally, the symptoms were observed much on plant cane and at 6th ratoon as indicated in Table 5.5. Estate has fields under irrigation using centre pivot and rainfed and more symptoms were observed for fields under rained condition as indicated in Figure 5.6 below.

Table 5.5: SCWL symptoms in relation to sugarcane crop cycles

Crop cycle	Number of fields	
	Estate	Out growers
0	4	0
1	3	3
2	4	1
3	2	1
4	3	1
5	0	0
6	1	0

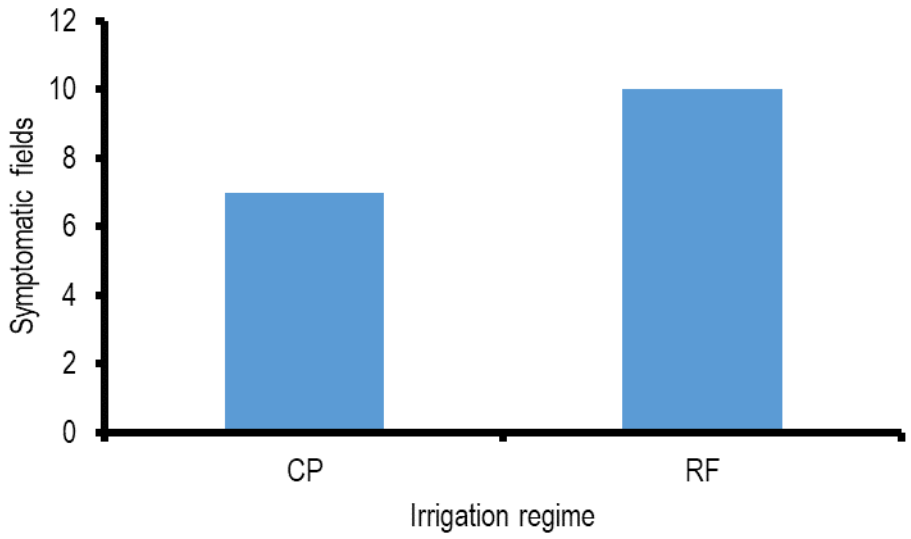

Figure 5.6: SCWL development in different irrigation regime

With regard to zones, the higher number of disease symptoms were observed more on the western zone as compared to eastern zone as indicated in Figure 5.6.

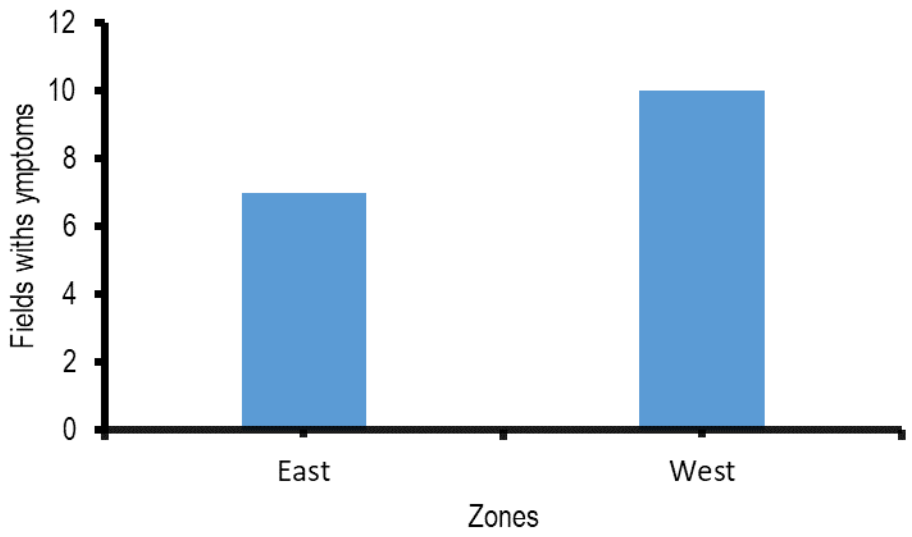

Figure 5.7: Comparing disease symptoms in two different zones

Discussion

The typical white leaf disease symptoms can be obviously seen since the first emergency of the sugarcane shoot if the field is transplanted with infected setts (Chen and Kusalwong, 2007). During the survey, the symptoms were observed highly on plant cane and first ratoon crops; this could suggests that the planting materials were infected with the pathogen because the primary transmission method is through infected setts and build-up of the pathogen on the ratoon crops as the crop is vegetative propagated. Also, plant growth and management conditions are likely to influence SCWL disease development as reflected in Figure 5.5 and 5.6 whereas the symptoms were wide spread to fields under rainfed conditions compared to irrigated ones. The fields on western part of the estates showed more symptoms as compared to eastern zone of the estate this could be attributed to different soil condition since the vectors for secondary transmission lay eggs on sandy soil thus increases leafhopper population (Chen., 2000).

Conclusion and recommendations

This report is not conclusive because it is based on visible disease symptoms. Laboratory confirmation for SCWL is vital. Also identification, collection and sequencing of vector (leaf hopper) is necessary for further studies and management.

Assessment of disease management practices by sugarcane small-scale farmers in Tanzania: Case study of KSC and MSE Mill Areas

Introduction

Sugarcane is a vegetative propagated crop and its cultivation is through continuous monoculture which accelerates build-up of the disease from one ratoon crop to next. For many years' sugarcane yields for out-growers are lower (for many farmers) as compared to estate and one of the reason is higher disease infestations.

Objectives

To assess phytosanitary practices in management of diseases affecting sugarcane by small-scale farmers

Materials and Methods

The assessment was done in out-growers within Kilombero and Mtibwa Mill areas. The survey team consisted of SRI pathology team and local agricultural officers (LAOs) from each site. Farmers were randomly selected depending on their availability during planting activities. The survey was done in November 2017 and a total of 30 farmers were interviewed.

During the survey three parameters were assessed by observation and personalized interview using a checklist; source of planting materials (estate, own or neighbours), quality of seedcane and farmers were also asked on their awareness on sanitation measures and importance of using good quality planting materials.

Farmers were advised on the importance of using disease free planting materials and practicing good sanitation measure during planting to prevent spread of disease within and from field to field.

Results

Source of seed cane

Results for both sites shows that large number of farmers obtains seedcane from their own source or from neighbours as it indicated above in Table 5.6 & 5.7. For Mtibwa 100 % of farmers were using seedcane from their own sources. At Kilombero, only 5% of farmers acquired planting

materials from estate. The rest 15 and 80% got the seedcane from their neighbours and own sources, respectively.

Quality of seed cane

Most farmers were using planting materials which were not clean; a lot had smut with smut whips, white scale infestation and some with YSA of which were spreading the pest and diseases to their fields. This could be attributed to unreliable source of seed cane and farmers use the easily available seed cane without considering the issue of diseases as indicated in table 5.5 & 5.6.

Awareness of using clean planting materials

Large number of farmers is not aware on the importance of using planting materials. Therefore, a plan for awareness creation to out growers' farmers is needed to avoid continuous spread of the diseases.

Adherence to sanitation measures

Farmers do not follow sanitation measures during planting because they don't know if it is necessary. Some of them were said they can't afford to buy the chemicals and it is difficult to practice it. The problems that were observed during the survey were the casual labours that were doing farm operation don't have any idea on sanitation and the owners of the farmers did not get training on that.

Table 5.6. Adherence to sanitation measures during planting in Mtibwa Out growers

Parameter	Criteria	Percentage
Source of seedcane	Estate	0
	Self	100
	Neighbour	0
	Total	**100**
Seed cane quality	Clean	0
	Not clean	100
	Total	**100**
Awareness on using clean seed cane	Yes	15
	No	85
	Total	**100**

Table 5.7. Adherence to sanitation measures during planting in Kilombero Out growers

Parameter	Criteria	Percentage
Source of seed cane	Estate	5
	Self	80
	Neighbour	15
	Total	**100**
Seed cane status	Clean	6
	Not clean	94
	Total	**100**
Awareness on using clean seed cane	Yes	12
	No	88
	Total	**100**

Conclusion and recommendation

Generally, most out-growers use planting materials which are not disease-free but also not adhering to effective sanitation measures hence increasing disease spread. In order to increase sugarcane yield, minimizing disease spread is crucial. This study showed that small-scale farmers do not practice sanitation measures due to lack of awareness, do not using clean planting materials for different reasons such as expensive, distance and unavailability.

Therefore, training of farmers on sugarcane diseases, sanitation measures and use of clean seedcane is vital. Further, establishment of a seedcane production schemes closer to beneficiaries could be advantageous to farmers and ultimately contribute to increased sugarcane productivity.

Project Title: Monitoring and Management of Plant Parasitic Nematode (PPN)
Project Number: CPP 2017/01/03

Investigators: N. Luambano, M. Mziray, Y. Mbaga, R. Polin and M. Masunga,

Collaborators: Estate Agronomists and LAO's

Reporting Period: 2017/2018

Remarks: Ongoing

Diversity of plant parasitic nematodes (PPN) in sugarcane out growers' fields at Kilombero, Mtibwa and Kagera.

Introduction

Nematode diversity on sugarcane is greater than most cultivated crops, with more than 310 species and 48 genera of endo-and ectoparasitic nematodes reported from root and rhizosphere of the plant (Spaul and Cadet, 1991). Root Knot Nematode *(Meloidogyne spp.)* and Lesion nematode *(Pratylenchus zeae)* are the two species of PPN frequently reported to be as highly pathogenic to sugarcane world-wide (Michel et al., 2005). According to Yoshida *et al*. (2014), sugarcane yield loss due to Root Knot Nematode (RKN) is about 30%. Damage is due to the feeding activities of PPN causing stunting of the plants with fewer mature tillers which appear to be wilting and plants with very patchy appearance thus leading to a great reduction in quality and quantity of harvested sugarcane (Schenck and Holtzmann, 1990).

Currently there is little information on the diverse species and population density of plant-parasitic nematodes associated with sugarcane in Tanzania.

Objective

The aim of this study therefore, was to assess the diversity and population densities and distribution of plant-parasitic nematode associated with sugarcane in out-growers' fields which will be useful for nematode management plan.

Materials and methods

Location

The survey was conducted in three out-growers' fields at Kagera, Kilombero and Mtibwa. The sites differ in ecological conditions; Kagera is on highland while Kilombero and Mtibwa located on mid-lowland.

Soil and root sampling

A composite soil and root sample were collected from the same location, packed in sample bags, labelled with necessary information, kept in cool box. All samples were sent to SRI laboratory and kept in the fridge at about 10^{o}C before being processed. Roots were assessed by lifting a whole plant from the soil using a spade (Coyne et al., 2007) so that galls and lesions could be observed from the roots.

Nematode extraction from root samples

In the laboratory, the roots were separated from soil and washed with tape water to remove soil. The roots were cut transversely with blade into about 5cm long and mixed carefully. A 5g sub-sample of roots was macerated using blender for 30 seconds. The suspension was then poured onto plastic sieve with tissue paper in it to allow nematodes settling for 24 hours. Nematodes were then collected into falcon tubes for counting and identification.

Nematode extraction from soil samples

Nematodes were extracted from 100g of soil from each sample using the modified Baermann funnel technique (Hooper, 1990). One hundred gram of soil sample were placed on filter paper ensured that the soils were remaining on the tissue paper without spilling over the edge and water was carefully poured into the plate down the gap between the plate and sieve. The extracts were then incubated for 48 hours followed by collection into glass universal bottles for counting and identification.

Nematode counting and identification

From the extract, 2mls were used to count genera of different PPN using counting slide on a GX compound microscopes at magnification of 20X. The identification was done to genus level based on morphological characters such as stylet, length, stylet length, position of vulva, position of dorsal gland orifice, lateral lines, tail shape and others (Seesao *et al*., 2017). Morphological

images were captured using GXCAM HiChromo-S camera connected to LEICA DM2500 microscope and recorded in laboratory data book.

Data analysis

Data were analyzed by ANOVA using GenStat package.

Results and discussions

A total of 122 (40 –Kagera, 40-Kilombero and 42-Mtibwa) composite soil and root samples each were collected from root rhizosphere of sugarcane in OG fields.

Figure 5.8 Micrographs of key plant parasitic nematodes found on sugarcane out-growers' fields

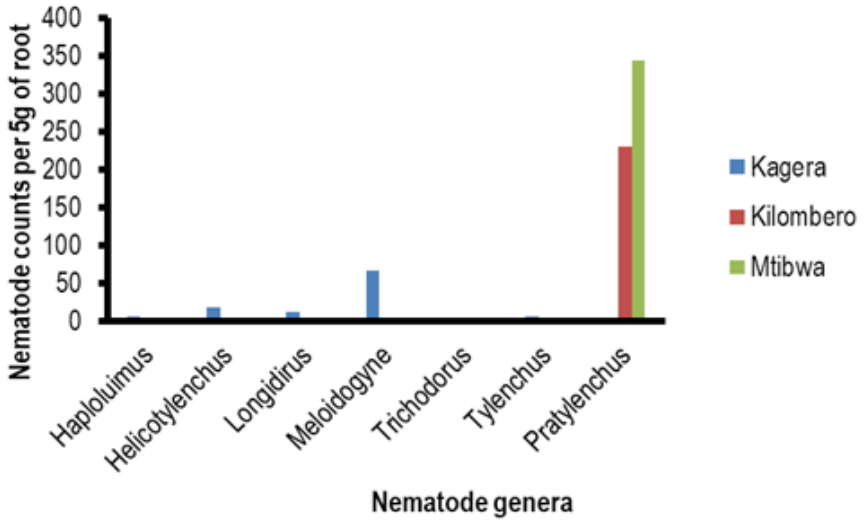

Figure 5.9: Nematode distribution from out-growers root samples at KSL, KSC and Mtibwa

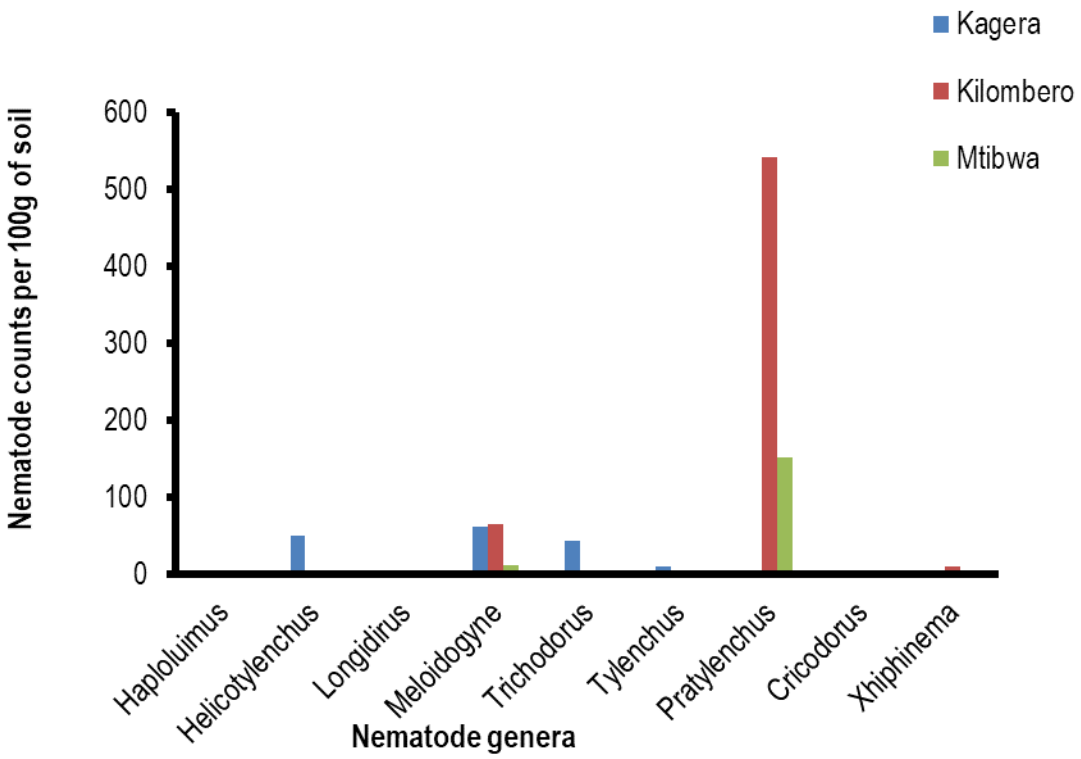

Figure 5.10: Nematode distribution from soil samples of out-growers at KSL, KSC and Mtibwa

Nematode species isolated from soil and roots of sugarcane

A total of nine species of parasitic nematodes were found associated with the root and soils of sugarcane in out-growers' fields of Kilombero, Kagera and Mtibwa. They include *Pratylenchus, Meloidogyne Helicotylenchus, Longidorus, Trichodorus, Tylenchus, Xiphinema, Criconema* and *Haploluimus* (Figure 5.9 and 5.10). These nematodes have been associated with yield reduction in sugarcane worldwide (Severino, 2010).

Nematode population density

From this study, high populations of nematodes were found in soil samples compared to root samples. Alternatively, more nematodes genera were identified in Kagera compared to Kilombero and Mtibwa. High populations of lesion nematodes (*Pratylenchus spp*) (Figure 5.8) were also observed in soil samples compared to root samples for both Kilombero and Mtibwa fields. This population could probably be due to its sandy-silt soil type which is more favourable

for nematodes occurrence and spread. According to Sterling 2000, *Pratylenchus* spp cause a huge loss in sugarcane fields even if they are in low number.

The Root knot nematode (*Meloidogyne*) (Figure 5.8) which is one among the two important nematodes of sugarcane were also observed at Kagera out-growers' fields. The prevalence of this nematode even though at a low number might build up in the next seasons and cause an economic damage. On the other hand, Dagger nematodes ***(****Xiphinema* spp.*)* were also observed in Kilombero soil sample only. These nematodes cause economic damage even if occur in low number.

Conclusion and recommendations

This study revealed that there is wide diversity of nematode species with varying population densities to out-growers' fields of Kilombero, Kagera and Mtibwa. There is a need to create awareness programme to educate farmers on the damage potentials caused by nematode associated with sugarcane. Nevertheless, the ultimate goal of farmer is yield, which unfortunately affected by these nematode. Therefore, managing parasitic nematodes in sugarcane fields is important for improved crop yield to boost local sugar production in the country.

Surveillance and monitoring for plant parasitic nematodes associated with sugarcane at KSC and KSL fields

The objective of this study was to determine the suitable stage of nematode population density for maximum protection but also predicting nematode outbreak which needs control measures.

Specific objectives

1. To assess nematode population density on sugarcane varieties at KSC and KSL
2. To evaluate effect of nematode on plant growth

Materials and methods

The study sites were KSC and KSL estates and a total of 22 (14-KSC & 8-KSL) fields were selected based on age of the plant and fields with nematode symptoms like patchy and stunt growth. Data on different parameters were recorded; plant data (age, variety, crop cycle), number

of tillers, stalk height, season and GPS data. Also soil and root samples were collected as per nematode sampling protocol then nematode were extracted, counted and identified at SRI following the protocol. Therefore, the first survey was done during dry season on September and October, 2017 for KSC and Kagera respectively. Lesion nematode (*Pratylenchus* spp) were isolated on all sugarcane varieties that were assessed on both estates

Results and discussion

Nematode population density on different sugarcane varieties at KSL and KSC

Results indicated higher nematode population density on variety N25 at KSL and three varieties (N41, N36 & R 579) at KSC and were not found on variety R 579 at Kagera. Also variety N 25 indicates to be susceptible to nematode infestation as it favours all the three nematode and variety R 579 is more tolerant for Kagera. On other hand, for KSC variety N41 implies to more susceptible as it is indicated on Figure 5.11 below. At KSC, three varieties (N41, N36 and R 579) have higher population density of lesion nematode.

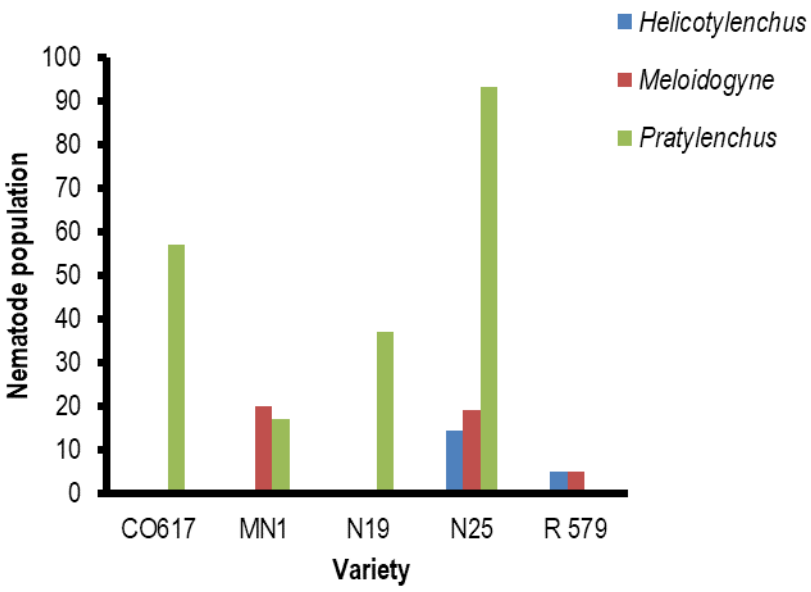

Figure 5.10: Nematode population density on different sugarcane varieties at KSL

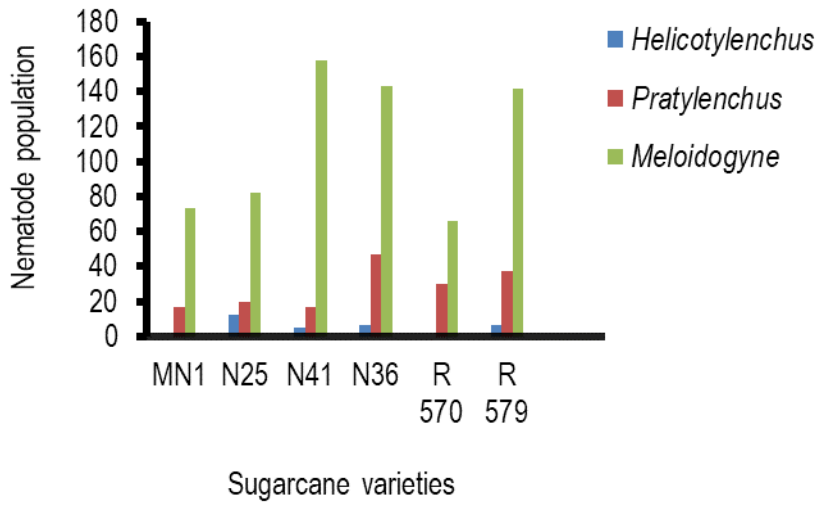

Figure 5.11: Nematode population density on different sugarcane varieties at KSC

Effect of nematode population on stalk height on sugarcane varieties

At KSL, *Pratylenchus spp* were most abundant to all sugarcane varieties especially on variety N25 with stalk height of 25.7cm and lowest counts were on variety MN1with stalk height of 115.8 (Table 5.7).

At KSC- *Meloidogyne* spp were most abundant to all sugarcane varieties as compared to other nematodes. Variety N41 harbours large number of *Meloidogyne* spp with nematode counts of 158 with stalk height of 97 (Table 5.8)

Table 5:7: Effect of nematode population on stalk height at KSL

Varieties	Average stalk height (cm)	Nematode count		
		Helicotylenchus	*Meloidogyne*	*Pratylenchus*
Co617	25	0.0	0.0	57.0
MN1	115.8	0.0	20.0	17.0
N19	110.8	0.0	0.0	37.0
N25	25.7	14.4	18.9	93.0
R 579	140.9	5.0	5.0	0.0

Table 5:8: Effect of nematode population on stalk height at KSC

Varieties	Stalk height (cm)	Nematode counts		
		Helicotylenchus	*Pratylenchus*	*Meloidogyne*
MN1	20	0.0	16.7	73.0
N25	33	12.2	20.0	82.0
N41	97	5.0	16.7	158.0
N36	34	6.7	46.7	143.0
R 570	119	0.0	30.0	66.0
R 579	23	6.7	37.5	142.0

Conclusions and recommendation

The population of lesion nematode is wide spread to all varieties except one variety R 579 and highest nematodes counts were encountered on variety N25 for KSL and for KSC three varieties (N41, N36 and R 579) were found to have higher population of lesion nematodes. Therefore, this first data shows that for Kagera, lesion nematode is more abundant compared to other nematodes. For KSC, *Meloidogyne* spp is most abundant than other nematode.

These are preliminary results. Data collection for three different seasons is necessary to derive meaningful conclusion for suitable control measures to provide maximum protection of the crop against plant parasitic nematodes.

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TECHNOLOGY TRANSFER PROGRAMME

Project Title: **Establishment of Demonstration plots and FFS at Kilombero and Mtibwa Sugarcane Mill Area**

Project No.:	**TT 2017/01**
Investigators:	**Diana S. Nyanda, John Msemo, Magreth Kinyau**
Collaborators:	**Farmers, VAEO's, DAICO, Local Area Officer, KSC Estate and Farmers' Organizations**
Location:	**Kilombero**
Date of commencement:	**2009-10**
Reporting Period:	**2017/2018**

Introduction

Three extension approaches were used by technology transfer to disseminate technologies to sugarcane farmers; these are Farmer Field School (FFS), Demonstration plots and radio broadcasting program. All these three tools were used by technology transfer section for promotion of improved technologies in sugarcane areas.

Progress of Farmer Field School (FFS)

The Farmer Field School (FFS) is group-based learning process. During the FFS, farmers carried out experiential learning activities that helped them understand the ecology of their sugarcane fields. These activities involve simple experiments, regular field observations and group analysis. The key purpose of FFS was to:

- Provide an environment in which farmers acquire knowledge and skills to improve sugarcane production and income from their agricultural field crops through application of good agricultural practices.
- Empower farmers to become experts on their own farms.

It involves farmer experimentation and non-formal training to a group of 20-25 farmers during a sole crop-growing season. Through group interactions, participants improve their decision-making abilities and are empowered by learning; leadership, communication and management skills. It relies on participatory training methods to deliver knowledge to farmers to make them

confident in crop husbandry practices, pest and disease experts, self-teaching transformation and effective trainers of other farmers.

The main objective of FFS approach to sugarcane out-growers is to

- Transfer technologies on "Best Management Practice" (BMP) through participatory approach so as farmers would increase knowledge on improved sugarcane production practices.
- Adoption of the recommended technologies in order to improved yields.

During 2017/18 two FFS groups and fields were established at Mtibwa mill area, Kisala and Mzambarauni villages with a total of 42 farmers where 18 males and 24 females. Planting was done in January and gap filling was done in March (Table 6.1).

Table 6.1: FFS established in 2017/2018 at Mtibwa mill area

No.	Site	Group name	Number of farmers.	Male	Female	Planting date
1	Mzambarauni	Upendo	10	8	2	09/01/2018
2	Dunduma-Kisala	Jikomboe	32	10	22	09/01/2018
TOTAL			**42**	**18**	**24**	

The implementation of FFS began with a diagnostic and development of a baseline of the village and land where the activities would be carried out. The formation of a group of 20-25 farmers who meets once a week under the guidance of an extension officer was done. In groups of 4-5 they observed and compared two plots over the course of an entire cropping season. They investigated and observed crucial elements of the agro-ecosystem by assessing plant development, taking samples of insects, weeds and diseased plants and comparing characteristics of different soils. One plot follows local conventional methods while the other considered "best management practices". At the end of the week they presented their findings in a meeting session, followed by discussion and plan activities for the next week.

Figure 6.1: Planting of FFS - Mzambarauni and Dunduma at Mtibwa mill area

Follow-up of the FFS for 2016/17

Follow-up of the FFS for 2016/17 was done and the results showed that four FFS fields were harvested. One FFS field (Iwemba) was not harvested due to bad weather condition (excessive rainfall) which cause water logging and death of the sugarcane crop. Farmers who participated were able to compare the performance of improved practice (IP) and farmer practice (FP). Cane yield (TCH) of FFS ranged from 70-120 TCH, whereas FP yields ranged from 44-65 TCH, the average yield increase by 86.2% (Figure 6.1). This indicates that the best management practice has an impact in increase production to farmers.

Figure 6.2: FFS follow up (2016/17) at Nyange village – Kilombero

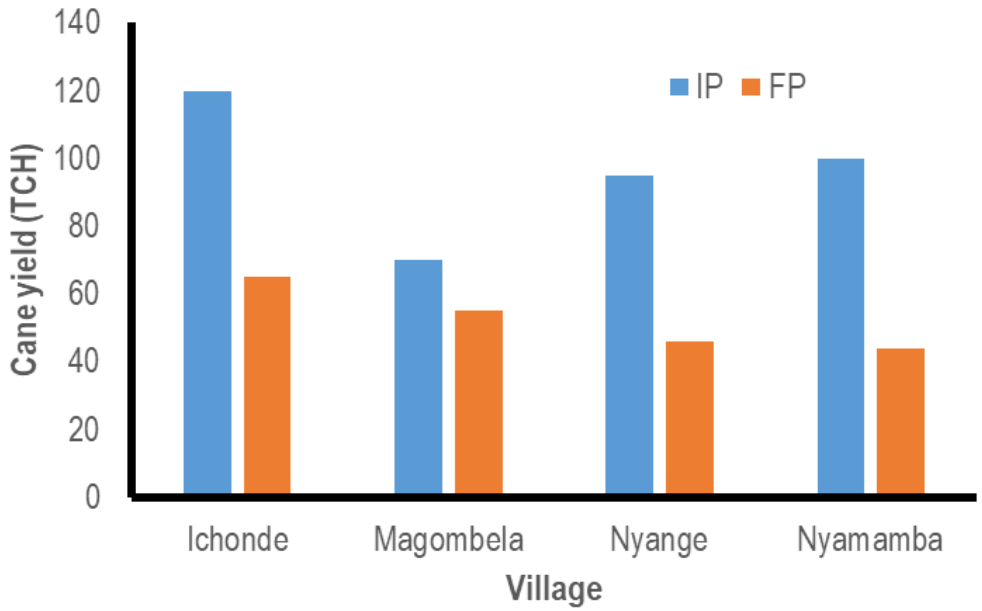

Figure 6.3: Yields (TCH) of FFS - 2016/2017 at Kilombero

Progress of Demonstration Plots

Demonstration plots are used to display the results of adopting a new practice and give the farmer an opportunity to practice new and improved technologies from research. It was used to teach agricultural techniques and technologies that can help accelerate the adoption of sugarcane innovations in management practices. Farmers can learn new ways of doing things without having to do it on their farms. They also serve as a venue to research and test new methods alongside traditional ones. The main purpose of demonstration plots was to demonstrate the best cane management practices including:

- Display and demonstrate the use of clean and high quality seedcane for increased productivity as well as
- Build the capacity of farmers in identifying and control the major sugarcane pests and diseases in their fields.

The year 2017/18 nine (9) demonstration plots were established; Kitete, Mbwade, Lumango, Mang'ula (Ulanga cotton), Nyange and Sonjo at kilombero mill area. Furthermore, Kilimanjaro, Kwadori and Kidudwe villages at Mtibwa mill area. Planting was done on November 2017 and gap filling was done in January (Table 6.2).

Table 6.2: Demonstration plots established in 2017/2018 at Kilombero and Mtibwa mill area

NO.	SITE	DATE ESTABLISHED
KILOMBERO		
1	Lumango	14/11/2017
2	Mbwade	19/01/2018
3	Kitete	23/01/2018
4	Sonjo	17/11/2017
5	Nyange	17/11/2017
6	Ulanga cotton/Mang'ula	18/11/2017
MTIBWA		
1	Kwadori	02/11/2017
2	Kilimanjaro	02/11/2017
3	Kidudwe	03/11/2017

Figure 6.4: Left: Planting of demonstration plot at Mtibwa, Right: Fertilizer application in demo plot at Kilombero

Follow-up of Demonstration plots for 2016/17

Follow-up of demonstration plots for 2016/17 was done and the results showed that four fields were harvested. One demonstration plot was carried over/deferred. The cane yield of demonstration plots ranged from 87.5-101.5 TCH, whereas FP yields ranged from 42.2-51.0 TCH average yield increase by 140.5% (Figure 6.2). This indicate that best management practices demonstrated cane growers can achieve higher level of productivity and ensure their cane farming enterprises are sustainable.

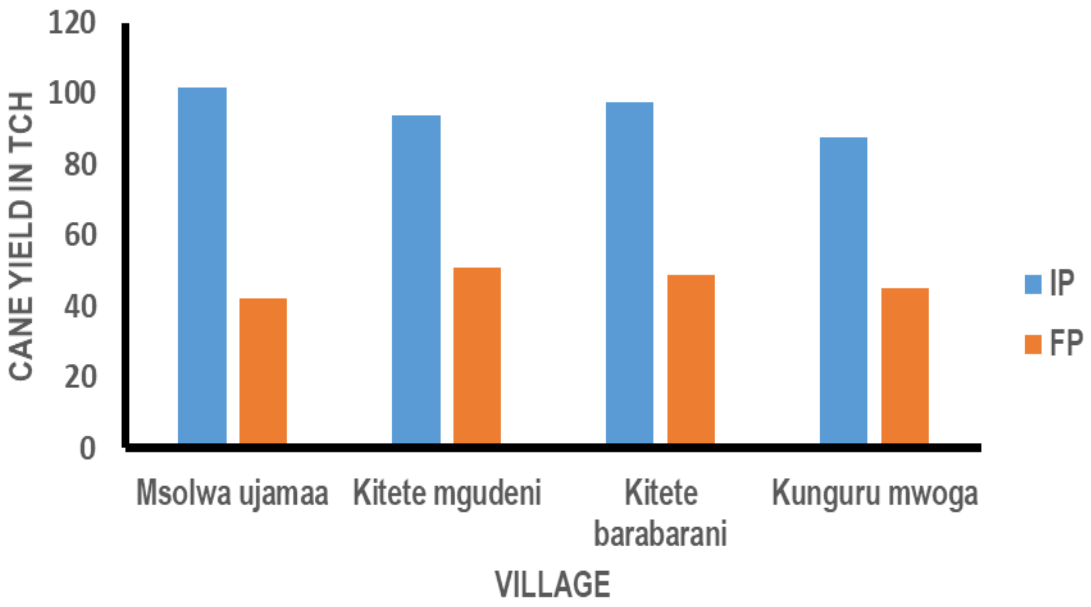

Figure 6.5: Yields (TCH) of Demonstration plots - 2016/2017 at Kilombero

Project Title: Establishment of Nursery B at Kilombero and Mtibwa Mill Area

Investigators:	**AWF, Diana S. Nyanda, John Msemo, Magreth Kinyau, Dr. S. Ngailo**
Collaborators:	**Farmers, VAEO's, DAICO, Local Area Officer, KSC Estate and Farmers' Organizations**
Location:	**Kilombero and Mtibwa**
Reporting Period:	**2017/2018**

Assessment of B nursery for 2016/17

The sugarcane sector involves large-scale and small-scale farmers. Small-scale farmers contribute forty percent of total cane crushed per annum. However, their contribution is likely to decrease due to low productivity caused by several factors including prevalent of pests and diseases resulting from use of poor quality planting materials. Thus, a large proportion of the farmers use poor quality seeds resulting in poor yields. Use of sugarcane seedcane from the commercial crop has been responsible for rapid multiplication of a large number of diseases and pests such as smut, ratoon stunting, stalk borers and white scale which adversely affect cane yield and quality. Many economically important diseases are caused by systemic pathogens which spread rapidly by planting of infected seedcane; the procurement of healthy seedcane is a prerequisite for successful production of sugarcane. Many sugarcane diseases are managed through the use of disease-free planting materials in combination with good management practices.

Hot water treatment is commonly used to disinfect sugarcane planting materials. Therefore, profitable sugarcane production largely depends on the quality of the seedcane planted.

To address the problem of shortage of clean seedcane, SUSTAIN project funded by African Wildlife Fund (AWF) in collaboration with SRI, OG's office at KSC and extension workers came with initiative to assist farmers to produce clean seedcane (establishment of B-nurseries) by adopting a farmers' field approach. A total of twenty fields were established at Kilombero mill area, seventeen germinated well. The fields were planted in June, 2017. SUSTAIN project, SRI, KSC and OG – KSC visited the nurseries to ascertain the performance of the nurseries and smut infection levels. The result shows that 11 fields fitted for seedcane nursery. Kielezo - Game bridge, Ulanga cotton – 1, Kidatu B, Sanje, Mang'ula "A", Ulanga Cotton - 2 (Barabarani),

Sonjo, Msolwa station, Lumango, Kifinga and Kidogobasi. Others fields were not fitted due to poor management particularly timely weeding and rogueing of smutted stools, uneven growth and gaps due to poor crop establishment resulting from untimely planting and some fields infested with yellow sugarcane aphids.

Figure 6.6: Assessment of B nursery at Kilombero mill area

The small scale sugar growers face many problems in attaining the potential yields. The main factors leading to low potential yields include the use of the poor quality seedcane, transportation cost from B-nursery which is far from out grower's fields, high price of estate's seedcane and inadequate seed cane multiplication schemes nearby out growers fields. These make most of the farmers depend on the seed cane from neighbours which are not free from pests and diseases. Furthermore, the diseases of economic importance such ratoon stunting diseases and sugarcane smut are transmitted through diseased seedcane which lead to adversely low sugarcane productivity.

The purpose of this project is to change those circumstances and put the cane growers' productivity on an equal stability with major estates' productivity, therefore the objective is:

- To facilitate the use of high quality/clean seedcane increases productivity to reduce pest and disease to the farmers' fields.
- To ensure that seed cane supplied to growers obtained from clean seedcane.

During 2017/18, six acres of seedcane nursery were established at Kilombero and Mtibwa mill area. The implementation was done by SRI in collaboration with Extension officers and LAOs in recognizing the reliable farmers with the ability of observing and tracking record in cane growing, an attitude of cooperation involving close follow-up on recommendations made under specific procedures/ guidelines developed by SRI for seedcane multiplication.

Land preparation and planting was done in March 2018 under the supervision of SRI, LAO and Extension personnel. The main source of seedcane was nursery "A" which was established Kilombero and Mtibwa estates. The varieties selected were NCo376, N 47 and R 570.

Table 6.3: Seedcane nursery B established 2017/2018 at Kilombero and Mtibwa mill area

Location	Area planted (Acres)	Planting date
Bulima farm- Ruhembe	3	27/03/2018
Contour 11E - Mtibwa	3	30/03/2018

Figure 6.7: Left: Planting of seedcane nursery B – Kilombero and Right: Mtibwa mill area

***Project Title*: Backstopping for Training of Trainers**

Project No.: **TT 2017/02**

Investigators: **Diana S. Nyanda, John Msemo, Magreth Kinyau**

Collaborators: **AWF, VAEOs, LAOs**

Location: **Kilombero and Mtibwa**

Date of commencement: **2009-10**

Reporting Period: **2017/2018**

Backstopping of Village Agricultural Extension Officers and association leaders

The training was done in collaboration of SRI team and SUSTAIN project. Forty-two (42) participants (15 extension workers and 27 association leaders) were trained on assessment of seedcane. Then 500 sugarcane growers were trained in better seedcane husbandry practices through FFS. Furthermore 2475 farmers (618 women, 1857 men) were trained on sugarcane climate smart agriculture and farming as a business at kilombero mill area.

Figure 6.8: Participants during training of trainers at Kilombero

Preparation and Printing of Training Materials

During 2017/18 season 7 banners were prepared and printed. Moreover 600 posters, 3400 flyers and 1400 brochures were prepared, printed and distributed to farmers at Kilombero and Mtibwa mill area, nanenane exhibition, TSSCT and TAWLAE annual meeting. Furthermore, a total of 50

posters of yellow sugarcane aphid were prepared, printed and distributed to outgrowers in all 17 associations in collaborations with Sugar Board of Tanzania (SBT).

Dissemination of Training Materials

Nanenane Exhibition

Technology transfer section in collaboration with other section of sugarcane program and sugar board of Tanzania (SBT) attended Nane-nane exhibition at Morogoro where by a total of more than 5059 attended SBT pavilion and 400 attended Ministry of Agriculture pavilion (sugarcane crop area) and got the explanation and advice on sugarcane production. A total of 7 banners were exhibited, 1200 flyers, 200 posters and 2000 brochures were distributed to visitors of different cadre include political leaders, Government leaders, councilors and other stakeholders in sugarcane subsector. With a great hope most of them were very interested with how the subsector is running in the properly arranged, its contribution to local contents and even further instructing others to come and learn.

Tanzania Association of Women Leaders in Agriculture and Environment (TAWLAE)

The group of women scientist from SRI attended a TAWLAE meeting which was held in Dar es Salaam where by representative exhibit sugarcane technologies of which a total of 150 participants attended and a total of about 100 flyers and 70 brochures were distributed to participants who attended the TAWLAE exhibition.

Tanzania Society of Sugar and Cane Technologist (TSSCT) annual meeting

TSSCT annual meeting was held at Kibaha Sugarcane Research where by different 70 scientists and cane technologist attended the meeting. SRI exhibits the sugarcane technologies through banners, flyers and brochures/leaflets. A total of 7 banners were displayed, 60 flyers and 40 brochures were distributed to some participants of meeting.

Preparation of training manual for senior staff

The training manual (English language) for senior officers and other sugarcane technologists is under preparation. First draft was prepared and reviewed. The preparation started with internal workshop for grounding of zero draft, external workshop which took place in Morogoro, whereby associates stakeholders from estates, SUSTAIN project, SBT, and SRI Team were

attended. This was done to prepare first draft, compiled and send to reviewer for further corrections.

Figure 6.9: Members during preparation of training manual atNanenane Morogoro

Project Title: **Monitoring and Evaluation for Technology Transfer activities**

Project No.:	**TT 2017/03**
Investigator:	**Diana S. Nyanda, John Msemo and Magreth Kinyau,**
Collaborators:	**SIDTF chair, Members of SBT Borad, Farmers, VAEO's, DAICO, Local Area Officer, KSC and MSE Estates and Farmers' Organizations**
Location:	**Kilombero and Mtibwa**
Reporting Period:	**2017/2018**

Monitoring and Evaluation (M&E) is a process that helps improve performance and achieve results. Its goal is to improve current and future management of outputs, outcomes and impact. The purpose is to track implementation and output systematically and measure the effectiveness of the activities. It helps determine exactly when a program is on track and when changes may be needed.

During 2017/18 M&E was done at Mtibwa mill area in collaboration with SRI researchers, key stakeholders including FFS group members, farmers' organization leaders, Estate agronomist, TASGA and SIDTF representatives and extension officers who participated on FFS and demonstrations plots at Mtibwa mill area.

A total of 45 farmers who are participating in FFS and demonstration plots were visited and evaluated by M & E team and showed how they are conducting activities of sugarcane production in collaboration with SRI team and agriculture extension officers of a particular place.

Figure 6.10: Monitoring and Evaluation team at Mtibwa mill area

Issue Raised During Monitoring and Evaluation

A team of M & E were suggested to SRI and agriculture extension officers to prepare joint training to farmers, to establish nursery B which will enable farmers to use clean seedcane from B nursery rather than use from neighbours.

Monitoring and evaluation team had the following perceptions regarding farmer field school:

- It helps to brings the group members together,
- Helps to create confidence among the group members as each of them presents AESA results in turn; thus they can share the information learned with other farmers,
- Creates a conducive learning atmosphere,
- Provides encouragement in carrying out agricultural activities due to comments received from visitors who come to learn from their activities,
- The process generates new knowledge and participants learn new skills e.g. applying the combination of fertilizer and herbicide,

- Provides a platform for exchange of views among participants who learn from one another as well as from extension staff.

At Kilombero M & E was not done due to bad weather condition (excessive rainfall). It is expected to be done if the weather condition will be favourable.

Project Title: **Radio Broadcasting Programme**

Project No.:	**TT 2017/04**
Investigator:	**John Msemo, Diana Nyanda, Magreth Kinyau, Dr. H. B. Msita**
Collaborators:	**Farmers, VAEO's, DAICO, Local Area Officer, KSC, MSE Estates and Farmers' Organizations, Radio Abood**
Location:	**Kilombero and Mtibwa**
Reporting Period:	**2017/2018**

Introduction

Radio has been considered as the most important and most preferred tool of mass communication in Tanzania. Statistics have shown that radio receivers are at least ten times more common than Television (TV) set in developing countries and is the means of information for two third of people living in rural areas. In addition, radio is listened to many people living in developing countries every week, reaching people isolated by language, geography, since majority of the farmers live in the rural areas, it is necessary therefore, to include radio in disseminations of sugarcane technologies.

The objectives

- To provide information relating to aspect of sugarcane production by providing relevant technical evidences in agro-ecological context
- To share and learn experiences of adopting improved technologies through radio and scaling up sugarcane technologies
- To provide a platform for different farmers to share their experiences and knowledge on sugarcane production

Methodology

Focus groups discussion (FGD) and Participatory Rapid Appraisal (PRA) were conducted at Madizini village in Mvomero district, Kitete village in Kilosa district and Nyange village in Kilombero district. The aim was to identify gap information before transferring technologies, collect the views and the ideas of the listeners of radio from different segment of the society who involved in awareness creation through radio. Tools used were transect drive, crop calendar, Venn diagram, pairwise ranking and score. Thereafter two workshops were held for preparation

of radio program one was internal which was involved sugarcane staff at Kibaha. Second workshop was held at Morogoro where by representatives from sugarcane stakeholders (farmers, representative from radio, associations, millers from Kilombero and Mtibwa) were involved and selection of episodes was done.

Results

The PRA and focus discussion results showed that the popular radio across the intended audience of outgrowers of Kilombero valley and Mtibwa is Abood FM radio. The other radios mentioned were TBC FM, Planet FM, Uhuru FM and Cloud FM.

The results revealed that most radio preferred by many people in Mtibwa areas were Abood FM followed by planet and Uhuru, the least were TBC FM (Table 6.4). The most preferred time for listening radio was 6:00 pm as many people are in leisure to this time.

Table 6.4: Pairwise and ranking of radio preferred by farmers in Mvomero District

	TBC	**Abood**	**Planet**	**Uhuru**	**Cloud**	**Total**	**Rank**
TBC		Abood	Planet	Uhuru	Cloud	**0**	**4**
Abood			Abood	Abood	Abood	**4**	**1**
Planet				Planet	Planet	**3**	**2**
Uhuru					Uhuru	**2**	**3**
Cloud							

The focus group discussion from Kitete village which represented Kilosa district showed that the most frequency and popular radio was ULANGA FM followed by Abood FM radio and others were TBC, RFA and Radio One stereo which ranked the same (Table 6.5). It is worth to note that radio Abood carter for both Mtibwa and Kilombero mill areas.

Table 6.5: Pairwise scoring and ranking on most frequency radio Kitete (Kilosa District)

	Abood	Ulanga	RFA	TBC	Tumaini	Radio 1	Score	Rank
Abood		Abood	Ulanga	Abood	Abood	Abood	4	2
Ulanga			ulanga	ulanga	Ulanga	ulanga	5	1
RFA				TBC	RFA	RFA	2	3.5
TBC					TBC	R1	2	6
Tumaini						RI	0	3.5
Radio 1							2	3.5

The results reveal that the most frequency radio around Kilombero mill area are Abood followed by Ulanga and Pambazuko, the least among mentioned radio was Kilombero FM (Table 6.6). Therefore, the radio selected was Abood radio to start with.

Table 6.6: Pairwise ranking and scoring of radio at Nyange village (Kilombero District)

	Ulanga	Aboud	TBC 1	Pambazuko	Kilombero	Score	Rank
Ulanga		Abood	Ulanga	Ulanga	Ulanga	3	2
Abood			Abood	Abood	Abood	4	1
TBC 1				Pambazuko	TBC 1	1	4
Pambazuko					Pambazuko	2	3
Kilombero						0	5

The second workshop arranged a series of episodes following the crop calendar and aired by Abood radio FM in the term of ***TAJIRIKA NA MIWA***. The series started in January with 13 episodes and so far a total of 8 episodes have been aired covering all agronomical practices, environment and harvesting of sugarcane.

The recording of radio was done at Nyange, Kitete, Msolwa ujamaa and Mkula village at Kilombero and Kilosa District. Also Kisala, Kilimanjaro and Madizini in Mvomero district using farmers on their views on sugarcane production and productivity. The experts from SRI, KSC and MSE were involved. Preliminary results show that a radio was covered to larger areas from Dodoma, Simiyu, Kongwa, Kilosa, Mbeya and most of the people were demanding to have sugar factory. A total of 996 messages were received from the listeners of radio from different places in Tanzania where Abood radio covered (Figure 6.3).

It was worth to note that the most area covered was Morogoro region especially Kilombero (33%), Mvomero (28%) and Kilosa (27%). These are areas intended to be covered for intervention and adoption of agronomical practices, environmental, harvesting and safety management to sugarcane farmers. This showed that the radio covered the audience as expected (Figure 6 4). This indicates that Mass media constitute the key vehicle for wide and rapid transmission of information to farmers.

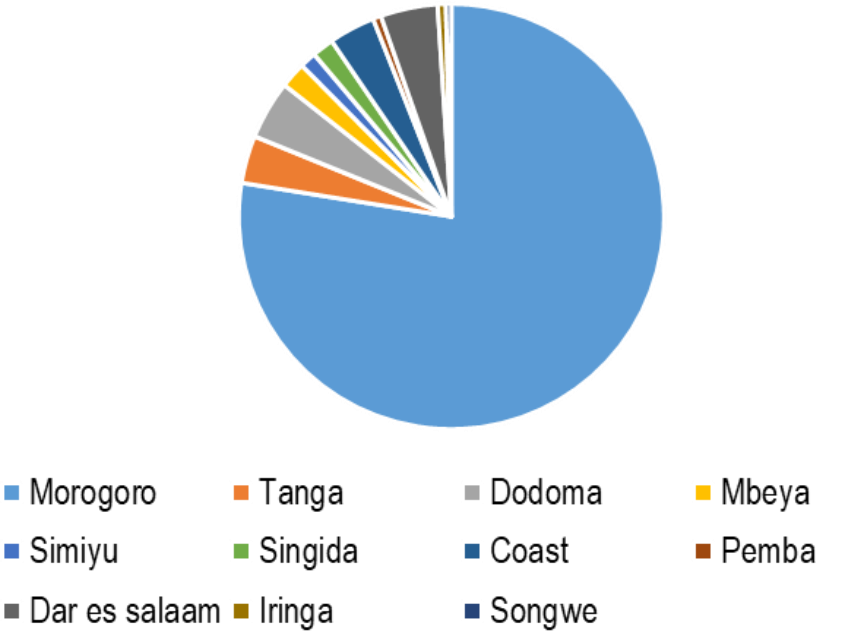

Figure 6.11: Coverage of Abood radio in Tanzania

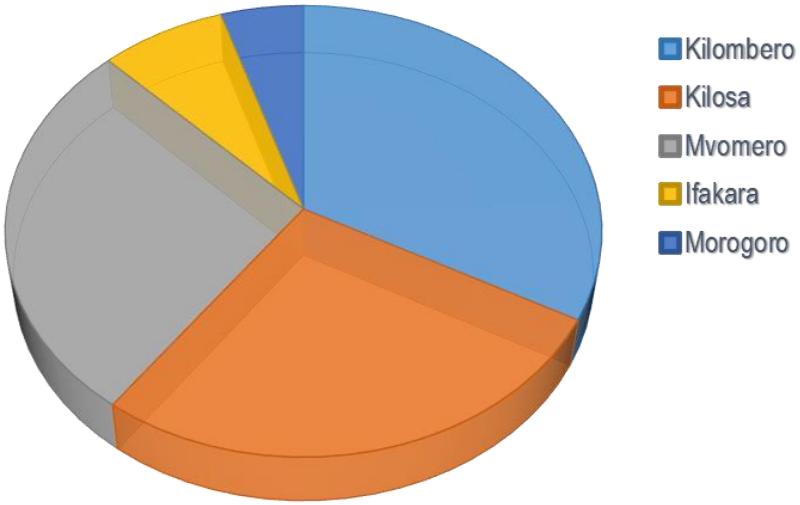

Figure 6 12: Coverage of Abood radio in Morogoro region

Information Communication Technology (ICT) questions

In response to questions on the various purpose for which respondents listened programs on the mass media, results show that (92%) of respondents were conscious on smut diseases (Table 6.7).

Table 6.7: Distribution of Farmers to their view on how Mass Media affect their Farming Practices (N37)

Awareness on smut	Frequency	Percent
yes	34	91.9
No	3	8.1
Total	37	100.0

The results show that the perception on the use of fertilizer; (54%) farmers used Urea; (46%) used Urea and TSP. This indicate the evident that radio approach as the means of technology transfer, can be used to train the sugarcane farmers to use other fertilizers which found in their localities (Table 6.8).

Table 6.8: Distribution of farmers to their views on type of fertilizer used

Variables	Frequency	Percent
Urea	20	54.1
Urea & TSP	17	45.9
Total	37	100.0

According to the time of sugarcane maturity, the result showed that 43% of respondents said that sugarcane crop matures at the age of 10-12 month, which is as suggested by researchers (Table 6.9).

Table 6.9: Sugarcane maturity and ready to harvest (N 42)

Variables	Frequency	Percent
6-7 months	10	24
8-9 months	14	33
10-12 months	18	43
Total	42	100.0

According to ICT questions on source of planting materials, results showed that at Kilombero majority of farmers still depend on neighbors 15(63%) and only 3(15%) of respondents obtained seedcane from estate. 6(25%) attained seedcane from nursery B established from the community. At Mtibwa 47% obtained from Estate and this is due to Mtibwa program of promoting out growers' scheme, however 10(53%) depends seedcane on neighbors (Table 6.10).

Table 6.10: Source of planting material (N 43)

Location	Neighbour	Estate	Nursery B	Total
Mtibwa area	10(53%)	9(47%)	0(0%)	19(100%)
Kilombero area	15(63%)	3(12%)	6(25%)	20(100%)
Total	25(58%)	12(28%)	6(14%)	43(100%)

According to difficult topic to farmers during listening of radio episodes in adopting best sugarcane farming technologies, 43% reported difficult in implementing practices topic of rouging smut, 16% said difficult on fertilizers and disease topic (Table 6 .11).

Table 6.11: Topic which was difficult to farmers during listening of radio episode

Variables	Frequency	Percent
Smut roguing	16	43.2
Fertilizer topic	6	16.2
Diseases	6	16.2
Planting pattern	4	10.8
Seedcane production	5	13.6
Total	**37**	**100.0**

Figure 6.12: Recording of radio episodes at Nyange village – Kilombero

At the end of the farming season, the impact of the radio programme will be measured again, this time by going to the field, to see if the farmers had actually applied the knowledge gained through the program to their crops.

The studies show that radio can be used to improve the sharing of agricultural information to remote rural farming areas through participatory communication techniques therefore support extension effort in disseminations of technologies. It can be concluded that radio programme was well received by target audience, and format in which they were presented was easily understood, that is using the experience from farmers to explain how they know certain topic and summarized by expect by showing how it is was supposed to be, however, sustainability and continuity of these programme must be taken into consideration.

Appendix I: Proposed Research Activities for 2017-18

	PROJECT CODE	**TITLE/ACTIVITIES**
1	SCB2017/00	Materials and equipment
2	SCB 2017/01	Plant Quarantine activities
3	SCB 2016/02	Smut screening nurseries
4	SCB 2017/03	Preliminary variety trials
5	SCB 2016/04	Advance variety trials
6	SCB 2016/05	National Performance Trials (NPT)
7	SCB 2017/06	Advanced fuzz evaluation and selection
8	AP2017/03/02	Twelve large blocks experiments (OG) at KSC
9	AP2016/03/02	3 varieties (under rainfed) in OG fields 10 experiment at KSC
10	AP2015/03/03	3 varieties (under rainfed) in OG fields 8 experiments at KSC
11	AP2014/03/04	3 varieties (under rainfed) in OG fields 8 experiments at KSC
12	AP2013/03/05	3 varieties (under rainfed) in OG fields 8 experiments at KSC
13	AP2016/03/03	7 Fertilizer trials (under rainfed) in OG fields at KSL
14	AP2017/03/03	Fertilizer trials (under rainfed) in OG fields 8 experiments at KSL
15	AP/2016/03/05	YARA Fertilizer trial in Outgrowers' Fields - KSC)
16	AP2017/03/04	Baseline survey on the status of *Striga* in sugarcane fields in Tanzania
17	AP2017/03/06	Evaluation of different herbicide for use in sugarcane fields at Kagera
18	TT2017/01	Establishment of demonstration plots
19	TT2017/02	Capacity Building for Training of Trainers
20	TT2017/03	Monitoring and Evaluation for demonstration plots and on-going FFS
21	TT2017/04	Radio broadcasting
22	CPE 2017/01	Study of seasonal insects' population fluctuations influenced by weather changes and crop management practices
23	CPE 2017/02	Evaluation of white scale damage and sugar loss in selected varieties at KSC and TPC
24	CPE 2017/03	Production of whitescale predators, R.lophanthae in cage for field releases
25	CPE 2017/04	Control of *Eldana saccharina* in suagrcane fields by habitat management "push-pull" approaches
26	CPE 2017/05	Insecticides trial for control of YSA in TPC and KSL
27	CPP 2017/01/01	Monitoring and diagnosis of Ratoon Stunting Disease (RSD)
28	CPP 2017/01/02	Smut monitoring, assessment and evaluation in Sugarcane fields (OG& estates)
29	CPP 2017/01/03	Monitoring and Management of PPN