3.2. LAUTOKA TECHNOLOGY TRANSFER

3.2.1 LAUTOKA GROWER DEMONSTRATION

Improving Soil Health: Green Manure Trials
Green manure or cover crops play a major role in improving soil fertility and farm productivity. This type of manure refers to as cover crops or plants that are grown between the main crops and during fallow periods to improve the quality of the soil. Legumes such as urd, moong and cowpea are planted, to ensure adequate supply of good quantities of nitrogen into the soil. This is through fixation of nitrogen in the roots of these legumes. When ploughed back into the soil, the legumes ensure nitrogen and other nutrients are recycled (returned) into the soil. The nutrients are released slowly to the soil as the dead plants rot. Since legumes grow fast, they accumulate a lot of biomass within a short time that slowly improves soil organic matter content.

In 2018, 3 Green Manure trials were planted. Two in SRIF Drasa estate and one in Nadi district. Before planting soil samples was taken and analysed. Results showed that the soil from these three sites had very low organic matter content(less 2%). To achieve good yield and for sustainability, soils should have 4 to 10 % organic matter. Green Manure is one of the means to improve soil health, however subsequent practices such as Green Cane harvesting, trash conversation, and soil conservation needs to be aligned.

Grower Demonstration Trials and Field information's days

The following Topics was covered, in the 10 Grower Demonstrations trials and respective field days, which were held;

- Importance of improving Soil Health through Green Manuring
- Good Land Preparation and Soil Sampling
- Quality Seedcane.
- Sugarcane Varieties.
- Mechanical Planting of Sugarcane using whole stalk cane planter.
- Mechanical spraying (pre-emergence and Post emergence).
- Importance of Blend A and Blend B application.
- Importance of changing farm layout to suit mechanical harvesting.
- Benefits of using Mill mud.
- Integrated weed Management
- Timeliness of operations
- Benefits of intercropping
- Irrigation

Figure 1: Good Land preparation Demonstration in Raviravi, Drasa sector.

Figure 2: Quality Seedcane harvested from Hot water treated Mother Plot.

Figure 3: Demonstration of Mechanical Planter in farm # 10726 in Nawaicoba Sector.

Figure 4: Mechanically planted sugarcane in farm # 10726 in Nawaicoba sector at 6 months

Figure 5: Demonstration of pre-emergence application using a Boom Sprayer in farm # 8087 in Raviravi, Drasa Sector.

Figure 6: Growers observing a method of Green Manure incorporation using cotton King in Drasa estate

Figure 7: Growers witnessing Viwa variety during a field day in Qeleloa Sector, Farm # 2426

Figure 8: Demonstration of mill mud spreader in Drasa sector

Figure 9: Weed free farm achieved through Integrated weed Management (IWM) in Drasa sector

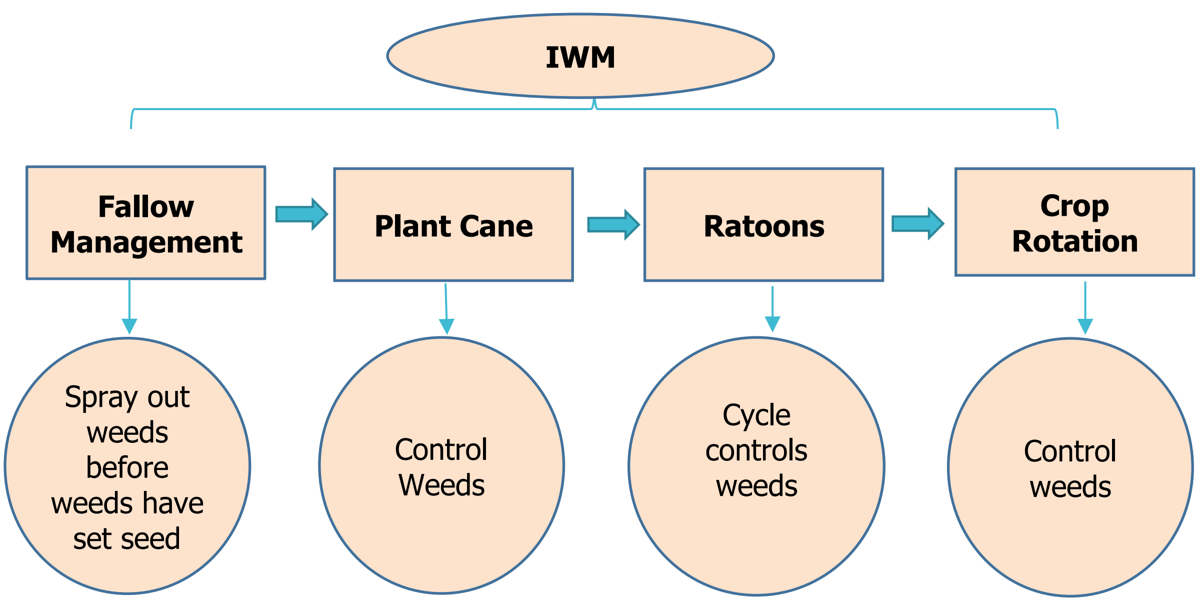

Figure 10: Integrated Weed Management Chart

Summary of Grower Demonstration Trials

The table below summaries the grower demonstration trials that was carried out in 2018:

- 10 trials conducted; in addition to this, 3 Green Manure trials were conducted.
- Approximately 400 growers attended the demonstration trial field days
- 6 technology transfer meetings were held in Lautoka and Nadi, a total of 108 growers attend during the evening meetings.

Table 1: Summary of grower demonstration trials

No	Sector /Location	Topic	Theme/attendance
1.	Drasa SRIF Estate	Green Manure Farm Mechanization	Importance of improving soil health, Farm Mechanization
2.	Drasa, Farm # 8087 Raviravi	Integrated Weed Management	Importance of Land preparation Timely weed control
3.	Meigunyah, Farm #: 2140 Nasau	Green Manure and Varietal Spread	Importance of improving soil health Varietal Spread 51 farmers attended the field day
4.	Qeleloa, Farm # 2426 Qeleloa	Farm Mechanization + Varietal Spread	Mechanical planting Varietal Spread Timely planting and operations 55 farmers attended the field day
5.	Nawaicoba Farm # 10726 Nawaicoba	Varietal Spread	Mechanical planting Weed control Varietal Spread 100 farmers attended the 2-field day organized on this farm.
6.	Olosara Farm # 5695 Nawamagi	Intercropping/ Sugarcane Varietal Spread	Field day pending, to be held in 2019
7.	Lomawai Farm # 11237 Tuva	Sugarcane Varietal Spread	Field day pending, to be held in 2019
8.	Olosara Farm # 5533	Intercropping/	Field day pending, to be held in 2019
9.	Lovu Farm # 19085 Vitogo	Farm Mechanization	Field day pending, to be held in 2019
10.	Lovu Farm #18162 Anjaan Road	Mill mud trial	Field day pending, to be held in 2019
11.	Natova Farm # 866	Intercropping	Field day pending, to be held in 2019

Trash Conservation

The depleting soil health and crop productivity in the sugarcane cultivating areas of Fiji is a major concern. This is evident from the national sugarcane productivity average being close to 44ton/hectare in the last couple of years compared to its potential yield of about 65 - 80 ton/hectare. Although soil fertility is closely linked to the physical and chemical characteristics of the environment, it is strongly, influenced by human management practices. One such detrimental practice followed by farmers in Fiji is burning of trash after harvesting of sugarcane.

It is estimated that about 7 to 12 tons (depending on Variety) of trash can be obtained from 1 ha of sugarcane. Every ton of sugarcane trash contains about 5.4 kg N, 1.3 kg P_2O_5, and 3.1 kg K_2O and small quantities of micronutrients. However, when sugarcane trash is burnt, most of the organic matter and nutrients in the trash are lost, leading to environment pollution. Farmers usually burn trash with the opinion that its management is laborious, trash will reduce germination, crop will be burned and it will hinder routine ratoon cultivation practices.

The trash/organic matter decomposition is mostly dependent on the carbon to Nitrogen ratio (C: N). When crop residues high in C: N ratio are added to the soil, extra N needs to be added to prevent immobilization in soil. This is known as Nitrogen factor. Nitrogen factor is, defined as the number of units of inorganic N that has to be supplied to 100units of organic material in order to prevent net immobilization of N from the soil (Source: University of New Castle). A trial was conducted in SRIF Drasa estate on trash conservation using urea to enhance the decomposition of trash using two different treatments. In treatment 1, 300 kg of Urea was applied in 600 litres of water per hectare.

This treatment was based using N factor as 2.29kg per every 100kg trash. Estimated amount of trash per hectare was estimated to be around 6000kg (6 tonnes). N content of Urea fertilizer is equal to 46% N. The second treatment was, based on a recommendation, from a farmer from New South Wales in Australia, Mr. Robert Quirk. According to him, in Australia there has been lot of studies done to ascertain the correct amount of Urea to be applied in sugarcane trash to enhance decomposition.

His recommendation was 5kg Urea in 300 Litres of water per hectare, the rate that he has been using on his farm for last 10 to 15 years. Three months after application, a physical observation was done, in the field to see the results of the two different treatments. Both treatments had similar outcomes, in terms of trash decomposition, however based on economics and risk of losing excess Nitrogen into the environment, 5kg Urea in 300 Litres of water per hectare is recommended, which is sufficient for enhancing trash decomposition.

Figure 10: Spraying of Urea in sugarcane trash immediately after harvest in Lovu sector

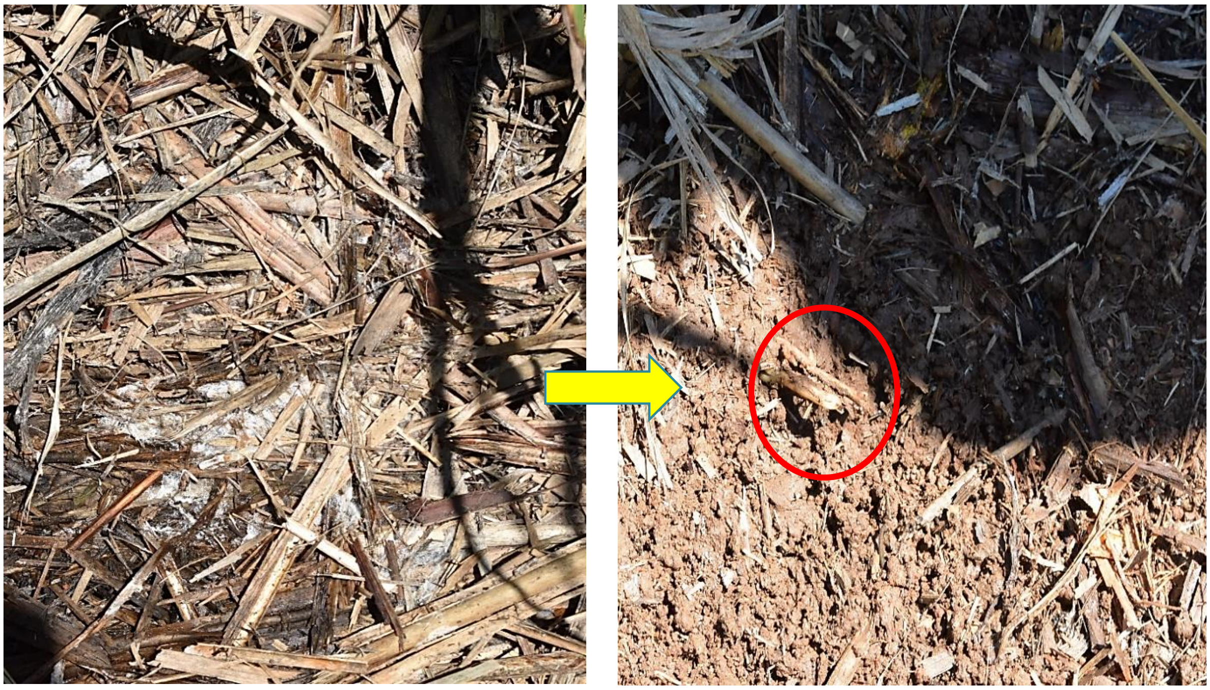

Figure 11: Trash decomposition (LEFT: Before & RIGHT: After)

Drip irrigation trial

In sugarcane, germination and grand growth phase are the two important periods, which requires more water. It needs about 1500-2500 mm of water throughout its growing period. In Fiji, we receive adequate rainfall during the **grand growth phase** of sugarcane as it falls between November, to April annually. Normally we receive 1800mm to 2200mm, of which 65 to 70 % is received between the months of November to April, which is simultaneous to the grand growing phase of sugarcane.

In recent years, Fiji has experienced some severe meteorological drought that affects the sugarcane during germination and tillering phase. As a result, it had a drastic impact on sugarcane yield.

Considering the average rainfall for the last 10 years for each mill area and National average, it is evident that we received adequate rainfall during the grand growth period (November to April). However, a lot of time, insufficient amount of rainfall is received during the planting and germination period, which is from May to October. This is one of the main reasons, desired yields are not achieved, which was planted through cane planting grants in previous years. A project on drip irrigation trial was initiated through partnership between Sugar Research Institute of Fiji, Fiji Sugar Corporation and Rivulis Australia. Rivulis is a global company and has a rich history in the irrigation industry with more than 50 years of expertise developing, manufacturing and deploying micro irrigation products and solutions. Rivulis Australia agreed to finance a 4ha drip irrigation trial in FSC Drasa Estate Farm.

Drip irrigation around the globe enables to double the yields (especially in India) while saving 20-40% water, 30% fertilizers compare to furrow irrigation. Furthermore, drip irrigation accounts for the improvement in sucrose content compared to conventional furrow and Overhead sprinkler irrigation. Drip system can be above surface or as sub-surface drip irrigation (SDI). The SDI is gaining more popularity as it is more suitable for ratoon crop and mechanical harvesting (Source: NaanDanJain Irrigation). However, it's noted that India receives half the quantity of annual rainfall, which Fiji receives. Supplementary irrigation is needed during planting and germination phase which falls in the dry months from May to October annually.

A four-hectare drip irrigation in FSC Drasa Estate, which was, established in early November, comprised of the following treatments:

- 1.5 ha Plant cane on 1.5 m T-Tape spacing using 715-30-250 (one tape per row of cane).
- 1.5 ha Plant cane on 3m T-Tape spacing using 715-20-500 (one T-Tape / 2rows of cane).
- 1 ha Ratoon cane on 1.5 m T-Tape spacing (one T-Tape / row cane).
- 0.12ha plant cane on Gravity system with 1 tape per 2 rows.

Figure 12: Drip irrigation in plant sugarcane at the FSC Estate Drasa.

The sugarcane from this trial will be harvested in the coming year and a detailed report will be prepared together with cost benefit analysis, to ascertain the Return on Investment. Once the report is finalized, SRIF will be in better position to make further recommendations regarding adoption of Drip irrigation system for Fiji Sugar Industry.

3.3 CANE DEVELOPMENT PROGRAMME

A collaboration project with the Fiji Sugar Cooperation (FSC) started in October, 2017. Meetings were conducted between stakeholders to discuss the way-forward of the joint project. It was discussed that FSC will provide SRIF with 4 nil producers per sector. Activity started with sector level introductory visits. Gang and locality meetings were also attended with FSC extension team. Any issues/queries/questions raised by the grower were noted and addressed immediately. The main objective was to increase sugarcane production from the present 40 tons/ha to at least 70tons/ha. Of all the farms selected and monitored by both FSC and SRIF, only 29% of the farmers succeeded in establishing cane on their fields. These nil producers had other factors that affected the uptake of advice given, such as dispute over land, lack of labour and the diversion of tenants to other industries.

3.3.1 LAUTOKA

A total of 24 farms have been visited within Lautoka District, comprising of Drasa, Lovu, Lautoka, Saweni and Natova sectors. Five farms have completed land preparation and planting through the help of Sugarcane Development and Farmer Assistance Grant. The common observations amongst farms visited is summarised in the table below;

Table 1: Common observations amongst farms visited
Farmer is not interested in cane farm.
Farmer is elderly but has shown interest in mechanical cultivation of cane.
Farmer has planted cane and has been advised on weed control measures.
Gap filling and appropriate weed control will be communicated to the farmer.
Farmer has joined cooperative and would be utilizing contractor to plant cane in her farm.
Farmer does not have access to labours.
Cane is damaged by animals from neighbouring farm
Farmer works full time and is unable to look after farm.
Farmer has no access to farm machinery.

3.3.2 LABASA

SRIF was involved in giving technical advice together with FSC staffs and follow-up was done with the farm's operation. Nil producing farmers in Labasa have either abandoned their land and settled elsewhere or have considered sugarcane farming a secondary source of income. It is challenging for both SRIF and FSC to bring these farmers into production. FSC has started a joint venture program to bring the farms into production where possible. The common observations amongst farms visited is summarised in the table below;

Table 2: Common observations amongst farms visited
Farmer carrying out harvesting
Farmer has planted cane and has been advised on weed control measures & fertilizer application
Neither planting nor harvesting carried out
Farmer committed to planting but waiting for favourable weather

3.3.3 PENANG

Five farms were identified under the crop development program in Penang district. During the visits, the farmers were advised on quality seed cane, timely fertilizer application, weed management, soil health management and varietal spread. The common observations amongst farms visited is summarised in the table below;

Table 3: Common observations amongst farms visited
Farmer carrying out harvesting
Farmer has planted cane and has been advised on weed control measures & fertilizer application
Joint venture farming

4.0 SRIF ESTATES

4.1 DRASA ESTATE

The total cane produced in 2018 was 1808 tonnes from an area of 26.5 hectares giving an yield of 68.2 tph. Harvesting was carried out mechanically. 96.7% of cane was harvested green. 3.28% cane was sent burnt due to accidental fire. The following table summarises the harvesting carried out in Drasa Estate from 2016-2018.

Table 1: Harvesting summary – Drasa Estate

Year	Total tons	Burnt	%Burnt	Green	%Green	Rail	%Rail	Lorry	%Lorry	Area (ha)	Tph
2016	1219	17	1	1202	99	0	0	1219	100	33	36
2017	1565	0	0	1565	100	0	0	1565	100	31	50
2018	1808	59	3	1749	97	236	13	1572	87	28	65

5.7 hectares of cane was planted for seed cane nursery comprising of Qamea, Viwa, Kaba and Mana varieties. 0.6 hectares were utilized for planting variety research trial.

4.2 LABASA ESTATE

The major objective of the Labasa estate land is to produce hot water treated seed cane for the farmers. By establishing seed bed that will ensure no unapproved and mixture of the varieties are planted by the farmers. Labasa has an area of 13 hectares of land for research trials and hot water treated seed cane, out of which 8 hectares was fallowed and has been used for hot water treated seed bed planting for the year 2018 – 2019 season. Total of 405 tonnes of cane was sent to mill for crushing.

Table 2: Harvesting summary – Labasa Estate

Year	Total tons	Burnt	%Burnt	Green	%Green	Rail	%Rail	Lorry	%Lorry	Area (ha)	Tph
2016	773	505	60	267	40	-	-	-	100	10	77
2017	654	218	30	437	70	-	-	-	100	8	82
2018	405	148	30	257	70	-	-	-	100	7	58

The growth of the seed cane was affected by drought but recovered during the rainy season. Hot water treated seed cane should be available to the farmers in the coming planting season. An area of 3.7 ha has been fallowed for the establishment of the hot water treated seed bed with a further 3.0 ha that has been cultivated for 2nd ratoon which will be used for seed cane in the March – April planting window of 2019. An estimated 150 tonnes of seed cane will be available from this area. A total area of 6.7 ha was fallowed for seed bed that was planted during Oct - Nov, 2018 season with the hot water treated seed cane.

Batanikama farm

During 2018, 0.5 ha of hot water treated seed bed had been established. The rest of the land is used for stage 4 seed bed and stage 4 trials when required. Around 2 ha of land is under commercial cane.

Outsource

SRIF provided services in Land preparation and cutter planting. In 2018, fifteen farmers acquired the services from SRIF and 27.15ha was planted.

5.0 MEDIA & PUBLICATION

5.1 MEDIA

Media department is responsible for marketing SRIF's activities to all stakeholders. This involves updating SRIF's website with current research, developing videos and pamphlets. Information packages involving videos and pamphlets are provided to growers during the information day. Information packages are also given to school students during educational tours to the institute. Two videos were developed on leaf sampling and improving soil health through green manuring. Videos on cane diseases including Smut, cane grub and Fiji Disease are being complied and will be published to the website. The institute has a Facebook account that provide updates on a daily basis.

Figure 1: Sample social media platform presence of SRIF

6.0 APPROVED VARIETIES FOR 2019 PLANTING

The list of sugarcane varieties approved for planting has been revised to include maturity trends. Varieties that are no longer planted have been removed from the approved varieties list. The varieties are recommended to growers on their soil type. The growers have a choice of at least three varieties to plant on their farms as laid down in the Master Award.

Mill/Sectors	Soil types	Varieties recommended on maturity trends	
		Early – mid maturing	**Mid – late maturing**
Lautoka/Olosara	Rich alluvial soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Cuvu	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Viwa
Lautoka/Lomawai	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Lautoka/Yako	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Lautoka/Nawaicoba	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Lautoka/Malolo	Flat Fertile soil	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Qeleloa	Rich alluvial soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Meigunyah	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Legalega	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Natova	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Lautoka/Lautoka	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa

Mill/Sectors	Soil types	Varieties recommended on maturity trends	
		Early – mid maturing	Mid – late maturing
Lautoka/Lautoka	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Saweni	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
Lautoka/Saweni	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Lautoka/Lovu	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Lautoka/Drasa	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Sandy soils	LF91-1925	Kaba, Mana, Galoa
Rarawai/Varoko	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Mota	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Naloto	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Koronubu	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Veisaru	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Rarawai	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Varavu	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Tagitagi	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Mana, Kaba, Vatu, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Saline areas	Naidiri, LF91-1925	Kaba, Mana, Galoa
Rarawai/Yaladro	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa

Mill/Sectors	Soil types	Varieties recommended on maturity trends	
		Early – mid maturing	Mid – late maturing
Rarawai/Yaladro	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
Rarawai/Drumasi	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Mana, Kaba, Vatu, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Saline areas	Naidiri, LF91-1925	Kaba, Mana, Galoa
Labasa/Waiqele	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Mali, Viwa
Labasa/Wailevu	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Mali, Viwa
	Saline soils	Naidiri, LF91-1925	Galoa, Vatu
Labasa/Vunimoli	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Mali, Viwa
Labasa/Labasa	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
Labasa/Labasa	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Mali, Viwa
	Saline soils	Naidiri, LF91-1925	Galoa, Vatu, Mali
Labasa/Bucaisau	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Waya, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Waya, Mali, Viwa
	Saline soils	Naidiri, LF91-1925	Galoa, Vatu, Mali
Labasa/Wainikoro	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Waya, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Waya, Mali, Viwa
	Saline soils	Naidiri, LF91-1925	Galoa, Vatu, Mali
Labasa/Daku	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Waya, Viwa
	Poor soils	Naidiri, LF91-1925, Qamea	Kaba, Waya, Mali, Viwa
Labasa/Natua	Poor soils	Aiwa, Naidiri,LF91-1925, Qamea	Ragnar, Kaba, Mali, Viwa
Labasa/Solove	Poor soils	Aiwa, Naidiri, LF91-1925, Qamea	Ragnar, Kaba, Mali, Viwa
Labasa/Bulivou	Poor soils	Aiwa, Naidiri, LF91-1925, Qamea	Ragnar, Kaba, Mali, Viwa
Penang/Nanuku	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa

Mill/Sectors	Soil types	Varieties recommended on maturity trends	
		Early – mid maturing	**Mid – late maturing**
Penang/Nanuku	Salt affected areas	Naidiri, LF91-1925	Galoa
	Viti Vanua area	Naidiri, LF91-1925, Qamea	Mana, Kaba, Kiuva, Mali, Viwa
Penang/Malau	Rich alluvial soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Mali, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Salt affected areas	Naidiri, LF91-1925	Galoa
Penang/Ellington	Flat Fertile soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Kiuva, Viwa
	Medium soils	Aiwa, Beqa,Naidiri, LF91-1925	Ragnar, Kaba, Vatu, Kiuva, Mali, Viwa
	Poor soils	LF91-1925, Qamea	Kaba, Mana, Viwa
	Salt affected areas	Naidiri, LF91-1925	Galoa

7.0 ABBREVIATIONS

SRIF	-	Sugar Research Institute of Fiji
FSC	-	Fiji Sugar Corporation Ltd
SIT	-	Sugar Industry Tribunal
SCGC	-	Sugar Cane Growers Council
SCGF	-	Sugar Cane Growers Fund
MoS	-	Ministry of Sugar
SPF	-	South Pacific Fertilizers
FMS	-	Fiji Meteorological Services
EU	-	European Union
CIRAD	-	Centre de coopération internationale en recherche agronomique pour le
POCS or pocs	-	Pure obtainable cane sugar
SUC or Suc	-	Sucrose
NPK	-	Nitrogen, Phosphorus, Potassium
N	-	Nitrogen
P	-	Phosphorus
K	-	Potassium
RCBD	-	Randomized Complete Block Design
Rep	-	Replication
Trt or Trts	-	Treatment(s)
Tph or Tpha	-	Tonnes cane per hectare
Tsh or Tsha	-	Tonnes sugar per hectare
TC/TS or tc/ts	-	Tonnes cane per tonnes sugar (tonnes of cane required to produce 1 ton of sugar)
AVG./Avg.	-	Average
LF[YEAR]	-	Lautoka Fiji [year in which the fuzz was planted], e.g. LF2014
G x E	-	Genetic by Environment
FFE	-	Farmer Feel Effect
QBPS	-	Quality Based Payment Scheme
FSI	-	Fijian Sugar Industry
ASPAC	-	Australian Soil and Plant Analysis Council
LBC	-	Lime Buffering Capacity
FTIR	-	Frontier Transform Infra-Red
CQD	-	Cane Quality Department
IMG	-	Industry Management Group
UV-VIS	-	Ultra violet visible light spectrum
RMSECV	-	Root Mean Square Error of Cross validation
SOI	-	Southern Oscillation Index
ENSO	-	El Niño Southern Oscillation
IWM	-	Integrated Weed Management
BAF	-	Biosecurity Authority of Fiji

8.0 GLOSSARY

Clones / Varieties	The distinct individual sugarcane type that can be identified by numerous attributes or a combination of it, such as stalk color, stalk shape, leaf type, etc.
Series	When used in the context of plant breeding, it refers to a set of clones or varieties distinguished by the year in which those clones or varieties were initially planted from fuzz (seed) stage.
Germplasm	A collection of clones that has recorded desirable traits such as high fiber, disease tolerant, etc.
Fuzz	Sugarcane seeds, not to be confused with seeds commonly referred to in the sugar industry as the stalks of sugarcane used for planting. Seeds in this case are all different varieties, much like seeds of beans, cucumbers or chilies.
Ratoon	Commonly referred to the sugarcane crop that established or grew after the initial plant crop was harvested.
Breeding Plots / Flowering Beds	Small areas planted with sugarcane for the purpose of harvesting flowers from.
Gene Pool	Basically, referring to the Germplasm from a genetics point of view.
Standards	Sugarcane varieties that have already been released to growers to plant for commercial use.
Brix	Measure of dissolved solids in sugar juice, liquor or syrup using a refractometer.
G X E trials	Genetic by Environment trials to test the interaction of the genetic attributes of varieties against environmental conditions.
Supply	The term is normally used when "supplying" seedcane referring to sugarcane field that have
Phytotoxic	Poisonous to plants.
Farmorganix/Stand Up SummaGrow	Brand names of new organic fertilizers being tested at SRIF.
Spectra-Cane	High-speed fully automated sugarcane analyzer that uses Near-Infrared (NIR) to monitor the sugar content upon analyzing disintegrated cane. The instrument requires minimal intervention from the operator once the sample has been fed into the disintegrator at the start of the process.
%brix	Total soluble solutes in cane juice
Polarization (or Pol)	The apparent sucrose content expressed as a mass percent measured by the optical rotation of polarized light passing through a sugar solution.
%pol	Percent total sucrose in cane juice
Fiber	The dry fibrous insoluble structure of the cane plant. Generally taken to mean all insoluble material in the cane delivered to a mill, and therefore includes soil or other extraneous insoluble matter in cane.
%fiber	Percent of fiber present in sugarcane
Purity	The true purity is the sucrose content as a percent of the dry substances or dissolved solids content. The solids consist of sugar plus non-sucrose components such as invert, ash and

	colorants. Apparent purity is expressed as polarization dived by refractometer Brix multiplied by 100.
%POCS	Pure Obtainable Cane Sugar. A measure of total recoverable sugar in the cane. A formula based on assumption that sugarcane contains pure sugar, impurities, water and fiber only. It assumes that only pure sugar is made, and that for every kilogram of impurities which goes to the factory, half a kilogram of sugar accompanies it.
LBC	Lime Buffering Capacity. It is modified from the original method which is used for the purpose of agricultural crops. It is a potentiometric method used for determining the amount of lime required for the soil to raise the pH based on the buffering capacity of the soil. LBC is a more efficient routine determination as compared to pH buffering capacity method in regards to result throughput.
RMSECV	RMSECV: errors are calculated on test/train splits using a cross validation scheme for the splitting. If the splitting of the data is done correctly, this gives a good estimate on how the model built on the data set at hand performs for unknown cases. However, due to the resampling nature of the approach, it actually measures performance for unknown cases that were obtained among the calibration cases. In simple, it is a formula used to build a model from a data set, as a validation of two data set. Thus, confirms data set from a new approach against the data set of the original method validating the performance of the origin of the new data set as similar to the existing method.
CQD	The body within the Fiji Sugar Industry Tribunal charged with implementing the QBPS procedures.
IMG	A group set up within each mill area, comprising representatives of the mill owner, the cane growers and the Tribunal to act as a point of contact between the CQD and the local industry.
UV-VIS spectrophotometer	Ultra violet visible light spectrum instrument. Is used to determine analyte concentrations by the absorption of light across the ultraviolet and visible light wavelengths through sugar cane juice, sugar and sugar by-products.
Nematology	The scientific study of nematode worms.
Pathology	The science of the causes and effects of diseases

9.0 FINANCIAL REPORT

1

DIRECTOR'S REPORT

AUDITOR'S REPORT

3

6

STATEMENTS & NOTES

Independent Auditors' Report

To the Board Members of Sugar Research Institute of Fiji (Continued)

Report on the Audit of the Financial Statements (Continued)

Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation of financial statements that give a true and fair view in accordance with IFRS for SMEs and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Institute's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Institute or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing the Institute's financial reporting process.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing (ISAs) will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with ISAs, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control.

- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

KPMG

Independent Auditors' Report

To the Board Members of Sugar Research Institute of Fiji (Continued)

Report on the Audit of the Financial Statements (Continued)

Auditors' Responsibilities for the Audit of the Financial Statements (Continued)

- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Institute's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditors' report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditors' report. However, future events or conditions may cause the Institute to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that identify during out audit.

Report on Other Legal and Regulatory Requirements

We have obtained all the information and explanations which, to the best of our knowledge and belief, were necessary for the purposes of our audit.

In our opinion:

i). proper books of account have been kept by the Institute, sufficient to enable financial statements to be prepared, so far as it appears from our examination of those books; and

ii). to the best of our knowledge and according to the information and explanations given to us the financial statements give the information required by the Sugar Research Institute of Fiji Act 2005, in the manner so required.

KPMG

15th July, 2019
Nadi, Fiji

KPMG
Chartered Accountants

Sugar Research Institute of Fiji
Statement of profit or loss and other comprehensive income
For the year ended 31 December 2018

	Note	2018 $	2017 $
Contributions and grants	3	3,457,237	2,347,161
Estate income		174,951	245,496
Other income	4	137,411	6,709
Total income		3,769,599	2,599,366
Cost of operations	5	(2,624,869)	(1,394,434)
Administrative expenses	6 (a)	(1,161,750)	(1,244,297)
Deficit from operations		(17,020)	(39,365)
Finance income	7	17,739	39,365
Finance expense		(719)	-
Deficit before tax		-	-
Income tax benefit		-	-
Balance at the beginning of the year		-	-
Deficit for the year		-	-

The notes on pages 9 to 20 are an integral part of these financial statements.