THE FIJI SUGAR CORPORATION LIMITED

SUGAR CANE RESEARCH CENTRE

ANNUAL REPORT
1999/2000

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MISSION

Advancing Industry By Excellence

In Research To Improve Productivity

PRINCIPAL OBJECTIVE

To Increase productivity, profitability and sustainability of the industry by producing high yielding disease resistance varieties and by facilitating an efficient extension service.

STAFF 1999/00

J S Gawander	Research Manager
H Mangal	Chief Extension Officer
P N Naidu	Senior Scientific Officer, Breeding/Selection
R Tamanikaiyaroi	Senior Scientific Officer, Crop Protection
P Lal	Scientific Officer, Breeding/Selection
S S Johnson	Scientific Officer, Crop Protection
Sarabjeet Singh	Scientific Officer, Central Laboratory
D V Kumar	Field Officer (Research)

Technical Assistants/Clerks	Departments
P S Raman	Agronomy
A Kadir	Central Laboratory
B Narayan (Mrs)	Central Laboratory
D Singh	Central Laboratory
Krishnamurthi	Crop Protection
S D Work	Crop Protection
P Narayan	Varieties
S Chand	Varieties
N Soli	ROC Group
S K Lal (Mrs)	Typist/Librarian
M Nair (Mrs)	Typist/Secretary

	Mills
K G Narayan	Rarawai
R Kumar	Rarawai
G Yenkaiya	Labasa
S Silian	Penang

SUPPORT STAFF

AGRONOMY

Abhimanu, Aporosa Rasavulu, Ilimeleki Katuba, Kailash Kumar H., Mun Sami, Sheik Saleem, Subram Naidu, Navin Reddy.

CENTRAL LAB/SMALL MILL

Arun H.S., James Krishna Samy, Mukesh Kumar, Raj Kumar, Suresh Mani, Venkat Samy.

GROUNDS/ESTABLISHMENT

Ram Kumar, Sat Narayan, Jairam Mudaliar

PLANT BREEDING/CROSSING/SELECTION

Bal Sundaram Mudaliar, Dharam Raj, Hari Krishna, Jayant Prasad, Kumaran, Rajendra Prasad, Solomoni Tusasa, Subramani Ramlu, Surend Prasad, Thomas Lingappa, Waisea Waqa, Bal Krishna, John David, Sital Singh, Aven Lal, Ajay Anand Prasad, Dineshwar Prasad, Ashok Kumar.

CROP PROTECTION

Bhaskaran Pillay, Muthu Krishna, Permal Samy, Naleen Krishna, Raj Kumar D., Shiu Dass, Ramend Lal, Diherandra Chand Rao

DISEASE CONTROL UNIT

Dinesh Dutt, Ilaitia Selabuco, Vijay Nand Sharma, Kelemedi Seru

ROC GROUP

Bisun Deo, Budh Ram, Hans Ram, Shiu Gopal

SECURITY

Jonetani Talemaitoga, Raj Gopal, Shiu Nadan, Suliasi Toki, Tarun Sami, Vereti Bureqele.

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RESEARCH MANAGER'S REPORT

The significant achievements of the past year has been a successful crop rehabilitation project that was initiated after the disastrous drought of 1998. This project achieved the industry objective of 4 million tonnes of cane and also recorded the highest plant area (24%) in the past 20 years of the total area under cane.

In addition a promising high sucrose yielding variety LF82-2122 successfully underwent a large mill trial. The large mill trial is a pre-requirement for any variety that is to be released commercially in the Fiji Sugar Industry. The results from the large mill trial were highly encouraging and this new variety will be distributed to the farmers for commercial cultivation during planting season next year.

A total of 429 crosses were made and 35,000 seedlings were raised from 236 crosses. Poor seed set continues to be a problem and efforts are in place to improve this. The selection of clones from LF97 and LF98 series were not done the previous year due to drought and thus were evaluated this year. A total of 1795 and 1388 clones were selected and advanced to stage 2 respectively. There were a total of 955 clones in stage 3 and these were from LF94 (300), LF95 (300) and LF96 (355). These trials will be evaluated next year and selections will be made for stage 4.

Eleven stage 4 trials were harvested during the year from which 19 promising varieties have been identified. These varieties will be advanced to stage 5 seedbed next year. There were an additional 30 varieties whose performance is on par with existing commercial varieties. These 30 varieties will be evaluated for their maturity pattern and then selection will be made for adaptation trials.

The screening of new clones for Downy mildew resistance continued in 1999 and 171 varieties were screened. In two separate Fiji Disease trials, 946 clones in the germplasm were screened, of which 713 were found to be resistant. The Ratoon Stunting disease (RSD) diagnosis continued during the year and results indicate that RSD is present in all sectors of Fiji. The Cane Weevil Borer (CWB) damage assessments continued during the year. Surprisingly the CWB damage was lower in both incidence and severity, which is contrasting to previous year's results. A total of 14325 hectares of plant and ratoon cane was inspected for major diseases and pests. Increase in the plant area inspection (10,654 ha) was due to the Crop Rehabilitation Project. The movement of diseased seedcane from one sector to another also attributed to the increased number of sectors infected with Fiji disease. All roguing data has been computerised for ease of access within the Research Centre Integrated System.

The fertilizer trials conducted by the Agronomy department continued on the various soil types of the sugar cane growing belt of Fiji. Generally higher yields were obtained in most of the trials during the year. The results of trials have shown some treatments produced economical responses to N, P and K fertilizers. The drip irrigation trial showed significant increase in cane and sucrose yields and in a fertigation trial, the fertigated plots produced higher yields compared to the non fertigated plots. Trials conducted on the impact of trash content on sucrose indicated that substantial decrease in %POCS occurs with increased trash levels. Higher yields were obtained in trials where weed control was done by use of pre and post emergence as compared to manual weed control. In an inter-row spacing trial, it was found that reducing the inter-row space to 0.8m produced higher cane and sucrose yields compared to the normal 1.37m.

The major activity of Extension services during the year was to rehabilitate the crop. The project was highly successful and the cane production increased significantly from 36.8 tonnes cane per hectare in 1998 to 61.3 tonnes cane per hectare in 1999. The Extension Support Group (ESC) project which was initiated in 1996 as a pilot project to improve communication between the research and farmers has now been established in all sectors. It is being slowly accepted and its achievements would need to be evaluated. The amount of burnt cane coming to the mill is rapidly increasing every year and is a major concern. The extension services will actively address this issue during the forthcoming years.

The Sugarcane Research Centre has lost a number of experienced staff in the past decade and this had slightly hindered our progress. However, a young group of researchers has been trained and has achieved much. These staff have shouldered the responsibilities of their respective areas well and have worked dedicatedly towards the goals of the Research Centre and management recognises that SCRC staff are organisation's very valuable assets. Efforts are now in place to restructure the departments and its related activities in an attempt to collectively enhance contributions towards the success of the Research Centre goals.

The progress made by all the department at the Research Centre during the year is attributed to all in the respective departments. My sincere thanks to all for their efforts.

AGRONOMY

CROP NUTRITION

Nitrogen

The trials at Malau and Naloto were further evaluated for third ratoon crop while Koronubu and Rarawai (F6) trials were evaluated for second ratoon crop. Trials established at Rarawai (F7), Legalega and Ellington in 1997 were harvested and evaluated for first ratoon crop. The trials established in 1998 were evaluated for plant crop. The nitrogen fertilizer application were split in two equal amounts and applied at 1½ and 3 months after planting and ratooning.

At Rarawai, on F6 and F7 we had three trials with six treatments of 0, 50, 100, 150, 200 and 300 kg N/ha replicated six times. Malau and Naloto trials had five treatments of 0, 50, 100, 200 and 300 kg N/ha replicated five times. Koronubu, Legalega (I) and Legalega (II) trials had application rates of 0, 50, 100, 150, 200 kg N/ha, and at Ellington II the rates were 0,50,100,150,200, 250 kg N/ha.

At the time of planting, phosphorus was applied at a rate of 20 kg/ha at Koronubu, 40 kg/ha at Legalega, 60 kg/ha at Labasa and Naloto. Potassium was applied in two equal splits of 50 kg/ha along with nitrogen application at Naloto, Koronubu and at a rate of 60 kg/ha split at Legalega. The high soil fertility at Rarawai did not warrant application of phosphorus fertilizer. Responses to different N fertilizer treatments in terms of cane and sucrose yields for the crops are shown in Table 1.

All sites except Naloto produced significant responses to cane yields in plant crop and first ratoon crop. In the first ratoon crop, the trials at Malau, Rarawai F6 and F7, Koronubu and Legalega I produced highly significant response for cane and sucrose yields with varying rates of nitrogen. In the second ratoon crop, the only trials to respond highly significantly to both cane and sucrose yields were Koronubu and Naloto whilst the trials at Rarawai F6 and F7 produced highly significant response for sucrose and cane yields respectively with varying levels of nitrogen.

In the third ratoon crop the trials at Malau and Naloto produced highly significant yields for cane and sucrose. It is essential to note that in all the trials, the cane yields improved significantly for all treatments this year in comparison with last year's yield. This is in view of the El Nino effect last year and the La Nina impact this year.

The new variety Naidiri showed highly significant response to nitrogen on a poor soil at Legalega (II). This trial again showed that 100kg N/ha produced significant yields. The trial on alluvial soil was damaged by flood. Inspite of this damage the trials produced highly significant yields.

Location Rainfall Raindays	Soil type and age at harvest	Variety and Crop	Treatment kg N/ha	POCS %				Cane yield (tc/ha)				Sucrose yield (ts/ha)			
				P	1R	2R	3R	P	1R	2R	3R	P	1R	2R	3R
Malau	Alluvial	Ragnar	0	17.4	17.3	17.2	15.0	93	38	55	75	16.3	6.5	9.5	11.3
2256/182	(6/95-10/96)	P	50	18.0	17.4	17.0	14.5	114	43	63	81	20.7	7.5	10.7	11.6
3488/166	(10/ 96-10/97)	1R	100	17.9	17.1	17.1	14.9	119	49	69	82	21.2	8.4	11.8	12.2
979/82	(10/97-10/98)	2R	200	17.8	17.3	17.9	14.7	118	57	87	88	21.2	9.9	15.6	13.0
2647/164	(10/98- 7/99)	3R	300	17.9	17.3	16.8	15.2	119	70	63	99	21.3	12.0	10.6	15.1
			CV %	3.6	3.1	5.2	5.0	4.9	6.2	17.2	5.4	7.5	5.9	10.5	7.9
			LSD 5%	(0.8)	(0.7)	(1.1)	(0.9)	6.9	4.0	(14.8)	5.8	1.9	0.7	1.6	1.3
			1%	(1.2)	(1.0)	(1.7)	(1.4)	**10.4	**6.0	(22.2)	**8.8	**2.9	**1.0	**2.3	**1.9
Naloto	Ferruginous latosol	Mana	0	17.7	16.9	17.4	15.5	102	51	32	70	18.2	8.5	5.7	10.9
			50	18.1	16.3	17.0	14.8	105	55	40	98	18.9	8.9	6.8	14.4
2920/109	(9/95-11/96)	P	100	17.8	16.3	16.6	15.5	115	56	47	97	20.6	9.1	7.9	15.1
2820/132	(11/96-11/97)	1R	200	18.1	16.5	17.5	14.5	108	55	56	98	19.6	9.1	9.7	14.2
646/43	(11/97-10/98)	2R	300	17.8	16.4	17.3	15.5	106	59	60	108	18.9	9.6	10.3	16.7
4054/118	(10/98-8/99)	3R	CV %	4.1	5.5	9.0	6.5	13.3	11.5	12.4	11.1	14.5	14.6	17.4	11.1
			LSD 5%	(0.9)	(1.1)	(1.9)	(1.2)	(18.1)	(8.0)	7.3	13.2	(3.5)	(1.7)	1.8	2.0
			1%	(1.4)	(1.7)	(2.9)	(1.9)	(27.1)	(12.0)	**11.0	**19.8	(5.3)	(2.5)	**2.7	**3.0
Rarawai F6	Alluvial	Aiwa	0	16.4	18.3	15.8		105	38	88		17.1	6.9	13.8	
3065/143	(6/96-8/97)	P	50	16.5	17.9	16.3		124	50	114		20.4	8.9	18.5	
549/71	(8/97-8/98)	1R	100	16.7	17.7	16.5		129	66	130		21.6	11.7	21.4	
3198/174	(8/98-8/99)	2R	150	16.4	17.6	16.0		120	75	134		19.7	13.2	21.5	
			200	16.9	17.7	16.1		120	68	116		20.3	12.2	18.7	
			300	17.0	17.8	14.5		124	71	145		21.2	12.7	21.1	
			CV %	3.2	2.9	6.4		9.6	10.9	15.1		10.6	11.3	19.4	
			LSD 5%	(0.6)	(0.6)	1.2		13.4	7.8	21.1		*2.5	1.4	*4.3	
			1%	(0.9)	(0.9)	1.8		**20.1	**11.6	**31.7		(3.7)	**2.1	(6.4)	
Koronubu	Nigrescent	Mana	0	16.9	18.1	15.3		78	35	93		13.2	6.3	14.2	
3042/141	(6/96-9/97)	P	50	16.7	18.1	15.6		86	41	112		14.3	7.5	17.4	
549/71	(9/97-9/98)	1R	100	16.8	17.8	15.4		95	50	125		15.9	8.8	19.2	
3460/139	(9/98-8/99)	2R	150	16.4	17.6	15.4		100	62	117		16.4	10.9	18.0	
			200	16.7	18.1	15.7		106	69	138		17.6	12.5	21.7	
			CV %	2.3	2.7	2.1		6.8	13.6	10.0		10.2	14.6	11.4	
			LSD 5%	(0.5)	(0.6)	(0.4)		8.0	8.8	14.8		*2.0	1.7	2.6	
			1%	(0.7)	(0.9)	(0.6)		**12.0	**13.3	**22.3		(3.0)	**1.6	**3.9	
Rarawai F7	Alluvial	Beqa	0	17.3	16.2			43	77			7.4	12.3		
912/100	(4/97-8/98)	P	50	17.3	16.3			46	104			8.0	17.1		
3195/174	(8/ 98-8/99)	1R	100	17.0	16.4			51	116			8.8	19.0		
			150	17.0	16.2			54	119			9.1	19.3		
			200	17.3	16.4			56	123			9.8	20.1		
			300	17.5	16.4			61	128			10.7	21.0		
			CV %	5.1	3.3			6.1	6.5			7.7	6.9		
			LSD 5%	(1.0)	(0.6)			3.7	8.3			0.8	1.5		
			1%	(1.5)	(0.9)			**5.5	**12.5			**1.2	**2.2		

Table 1 (Cont'd)

Location Rainfall Raindays	Soil type and age at harvest	Variety and Crop	Treatments kg/N/ha	POCS %		Cane yield (tc/ha)		Sucrose yield (ts/ha)	
				P	1R	P	1R	P	1R
Legalega (I)	Poor	Aiwa	0	16.9	16.1	38	42	6.4	6.8
922/80	(5/97-8/98)	P	50	16.1	16.9	41	64	6.6	10.9
2558/101	(8/98-7/99)	1R	100	17.0	16.4	44	79	7.5	13.1
			150	15.9	16.4	48	93	7.7	15.2
			200	15.8	16.4	61	103	9.7	16.9
			CV %	5.6	2.7	8.7	5.5	7.9	16.4
			LSD 5%	(1.1)	(0.6)	5.1	5.3	0.8	2.6
			1%	(1.7)	(0.8)	**7.7	**8.0	**1.1	**3.9
Ellington II	Ferruginous	Mana	0	12.1	10.6	35	82	4.2	8.7
745/97	(11/97-8/98)	P	50	12.7	10.8	39	90	4.9	9.6
2315/97	(8/98-11/99)	1R	100	12.2	10.3	41	95	5.1	9.8
			150	12.1	10.1	44	97	5.3	9.8
			200	11.6	10.8	47	102	5.5	11.1
			250	11.8	10.2	50	108	5.9	11.0
			CV %	8.2	10.4	5.9	5.4	8.3	12.7
			LSD 5%	(1.2)	(1.4)	3.2	6.5	0.5	(1.6)
			1%	(1.9)	(2.1)	**4.7	**9.8	**0.8	(2.4)
Legalega(II)	Poor	Naidiri	0	15.2		84		12.7	
1852/106	(4/98-8/99)	P	50	15.3		116		17.6	
			100	14.8		129		19.1	
			150	15.1		134		20.1	
			200	15.3		151		23.1	
			CV%	2.6		7.1		7.9	
			LSD5%	(0.5)		10.9		1.8	
			1%	(0.8)		**16.4		**2.8	
Rarawai	Alluvial	Naidiri	0	13.9		110		15.2	
3384.7/151	(4/98-6/99)	P	50	13.6		119		16.1	
			100	14.0		128		17.8	
			150	14.3		143		20.5	
			200	14.2		126		17.8	
			300	14.4		135		19.5	
			CV%	3.8		11.3		10.6	
			LSD5%	(0.6)		16.5		2.2	
			1%	(0.9)		*24.6		*3.3	

* Significant at 5% ** Significant at 1% ( ) Non significant

The trials established at Malau and Labasa in June 1996 on ferruginous latosolic soils to study the responses of cane and sugar yields to residual effect of phosphorus fertilizer was evaluated in the second ratoon crop. The details of plant and first ratoon crop were given in the previous annual report of 1998. The treatments were 0, 20, 40, 80 and 160 kg P/ha and were applied at the time of planting. The results for cane and sugar yields for P fertilizer is summarised in Table 2.

The variety Mana showed significant response to cane and sucrose yield in the second ratoon crop on ferruginous latosolic soil with various levels of P application at Malau. At Labasa, the second ratoon crop did not show any significant response. This would be anticipated in view of the fact that the soil P level recorded after the harvest of first ratoon crop had an average value of 17ppm for the trial site.

The optimum cane and sugar yields were obtained in the treatment range of 20-40 kg P/ha. In the second ratoon crop it is apparent that highest level of 160 kg P/ha produced the highest yield, nevertheless it may not be an economical yield.

Table 2 : The residual effects of phosphorus fertilizer on cane and sucrose yields (mean of five replications)

Location	Soil type	Variety	Treatment	POCS			Cane yield			Sucrose yield		
Rainfall	and age	and	Kg P/ha	%			(tc/ha)			(ts/ha)		
Raindays	at harvest	Crop		P	1R	2R	P	1R	2R	P	1R	2R
Malau	Ferruginous	Mana	0	16.6	15.5	14.4	39	22	56	6.4	3.4	8.1
	latosol		20	16.7	15.7	13.9	45	27	60	7.5	4.3	8.4
3462/159	(6/96-7/97)	P	40	16.3	16.0	14.0	67	31	65	10.9	4.9	9.2
1086/78	(7/97-7/98)	1R	80	17.1	16.0	15.0	48	40	67	8.2	6.4	10.1
2813/192	(7/98-6/99)	2R	160	17.1	16.6	14.2	45	29	77	7.8	4.7	10.9
			CV %	4.4	2.8	3.9	8.9	26.5	8.2	9.5	6.7	9.1
			LSD 5%	(0.9)	0.6	0.7	5.5	(10.1)	6.7	1.0	0.4	1.1
			1%	(1.4)	(0.8)	**1.1	**8.2	(15.1)	**0.1	**1.5	**0.6	**1.6
Labasa	Ferruginous	Mana	0	13.6	15.4	10.8	116	50	69	15.7	7.6	7.4
F 23	latosol		20	14.5	14.9	10.7	125	51	75	18.2	7.5	8.0
3489/182	(6/96-8/97)	P	40	14.1	14.1	10.1	127	53	72	17.8	7.5	7.3
1018/85	(8/97-8/98)	1R	80	14.3	15.0	10.4	127	53	75	18.0	7.9	7.8
2804/186	(8/98-6/99)	2R	160	14.0	15.1	9.9	120	58	72	16.8	8.6	7.2
			CV %	7.4	8.5	6.6	13.5	18.3	10.3	14.1	22.2	12.4
			LSD 5%	(1.2)	(1.5)	(0.8)	(19.2)	(11.2)	(8.6)	(2.8)	(2.0)	(1.1)
			1%	(1.8)	(2.2)	(1.2)	(28.8)	(16.8)	(12.9)	(4.2)	(3.0)	(1.6)

* Significant at 5% ** Significant at 1% ( ) Non significant

Potassium

The trial at Ellington II on ferruginous latosol was further evaluated in the second ratoon crop.

The initial soil analysis results for the trials at Ellington II were pH 5.3, P 3 ppm and K 74 ppm. Results of the trial is summarised in Table 3. The cane and sucrose yield of the second ratoon crop produced highly significant yields similar to that of plant and first ratoon crop.

Table 3: The effect of potassium fertilizer on cane and sucrose yields (mean of five replications)

Location	Soil type	Variety	Treatment	POCS			Cane yield			Sucrose yield		
Rainfall	and age	and	kg K/ha	%			(tc/ha)			(ts/ha)		
Raindays	at harvest	Crop		P	1R	2R	P	1R	2R	P	1R	2R
Ellington II	Ferruginous	Mana	0	16.1	12.7	11.3	54	41	71	8.6	5.2	8.0
3198/130	(7/96-9/97)	P	50	16.1	13.5	11.3	58	50	84	9.4	6.8	9.5
938/85	(9/97-8/98)	1R	100	16.1	13.6	11.6	78	52	111	12.5	7.1	12.9
2314/97	(8/98-6/99)	2R	150	15.7	13.4	11.2	59	57	91	9.3	7.6	10.0
			200	16.2	13.6	11.5	58	53	82	9.4	7.1	9.4
			CV %	3.3	5.2	6.6	7.2	8.2	9.7	6.2	10.0	17.8
			LSD 5%	(0.7)	(0.9)	(1.0)	5.6	5.2	10.8	0.8	0.9	*2.3
			1%	(1.0)	(1.3)	(1.4)	**8.5	**7.8	**16.2	**1.2	**1.3	(3.4)

* Significant at 5% ** Significant at 1% ( ) Non significant

PLANTING AGRONOMY TRIAL USING SAME NUMBER OF EYE SETT PER PLOT

Blended fertilizers

The details of blended fertilizer trials established at Qeleloa and Yaladro were given in previous annual report of 1998. That report also had several errors. The CV% values for plant crop was wrongly rounded off to whole numbers. The exact values are recorded in this report and the CV% for cane yield of second ratoon crop should read 3.5 and not 35.

The third ratoon crop at both the sites produced highly significant cane and sucrose yields which can be seen in table 4.

Table 4 : The effect of blended fertilizers on cane and sucrose yields (means of four replications)

Location	Soil type	Variety	Treatments		POCS %				Cane yield (tc/ha)				Sucrose yield (ts/ha)			
Rainfall	and age	and	N-P-K (kg/ha)													
Raindays	at harvest	Crop	Plant	Ratoon	P	1R	2R	3R	P	1R	2R	3R	P	1R	2R	3R
Qeleloa	Alluvial	Aiwa	150-8-40	124-6-24	15.0	16.5	19	15.8	144	86	47	98	21.5	14.2	8.9	15.5
	Rich		150-8-8	123-21-123	15.0	16.6	19	16.6	140	92	52	105	20.9	15.3	9.7	17.3
1496/83	(5/95-8/96)	P	150-25-100	123-21-84	14.2	16.9	19	16.1	141	88	51	98	20.1	14.9	9.6	15.8
1682/85	(8/96-9/97)	1R	150-20-60	200-10-40	15.1	16.5	19	16.0	141	85	42	113	21.2	14.1	7.8	18.0
272/36	(9/97-9/98)	2R	150-15-112	50-10-40	14.9	17.1	19	16.0	139	85	42	100	20.7	14.6	7.9	16.0
3512/122	(9/98-8/99)	3R	0 - 0 - 0	0 - 0 - 0	15.4	16.7	18	15.6	122	72	38	92	18.8	12.1	7.0	14.3
				CV %	2.4	2.3	2.7	2.5	9.3	12.3	3.5	5.2	9.6	13.7	4.8	5.5
				LSD 5%	0.5	(14.7)	(0.7)	(0.6)	(18.2)	(0.6)	2.3	7.4	(2.8)	(2.8)	0.6	1.3
				1%	**0.7	(22.1)	(1.1)	(0.9)	(27.3)	(0.8)	**3.4	**11.0	(4.2)	(4.1)	**0.9	**1.9
Yaladro	Alluvial	Aiwa	150-8-40	124-6-24	15.9	15.0	18	14.2	149	110	62	111	23.6	16.5	11.2	15.8
	Rich		150-8-8	123-21-123	15.3	15.5	18	15.0	143	139	83	114	21.7	21.6	14.8	17.1
1846/76	(5/95-8/96)	P	150-25-100	123-21-84	15.6	15.2	18	14.8	156	126	80	107	24.4	19.1	14.5	15.7
2810/90	(8/96-9/97)	1R	150-20-60	200-10-40	15.8	15.8	18.0	15.1	164	114	76	113	25.9	18.0	13.7	17.0
532/36	(9/97-9/98)	2R	150-15-112	50-10-40	15.3	15.1	18	14.4	160	103	43	93	24.3	15.6	7.8	13.4
3671/96	(9/98-8/99)	3R	0 - 0 - 0	0 - 0 - 0	15.0	15.2	18	14.7	145	84	29	68	22.0	12.8	5.3	10.1
				CV %	6.4	3.5	1.9	5.8	12.9	4.9	5.6	9.7	11.8	4.9	5.6	9.8
				LSD 5%	(1.4)	(0.8)	(0.5)	(1.2)	(27.9)	7.8	5.0	13.9	(3.9)	1.2	5.0	2.1
				1%	(2.1)	(1.2)	(0.7)	(1.8)	(41.9)	**11.7	**7.4	**20.9	(5.9)	**1.8	**7.4	**3.1

* Significant at 5% ** Significant at 1% ( ) Non significant

Drip irrigation trials

Two preliminary trials were established at the Sugarcane Research Centre and Legalega Research Station to study the effect of sub-surface irrigation on cane and sucrose yields. The trial at Legalega Research Station had five replications of four treatments each. The three irrigated treatments received moisture equivalent to the ratio of 0.5 and 1.0 of Class A pan evaporation every third or fourth day and the control treatment was not irrigated (rainfed). The treatments which received moisture equivalent to the pan evaporation ratio had two drip tubes in the middle of the rows as one of the treatment and the other treatment had one tube under each row. The results of harvest data are summarised in Table 5.

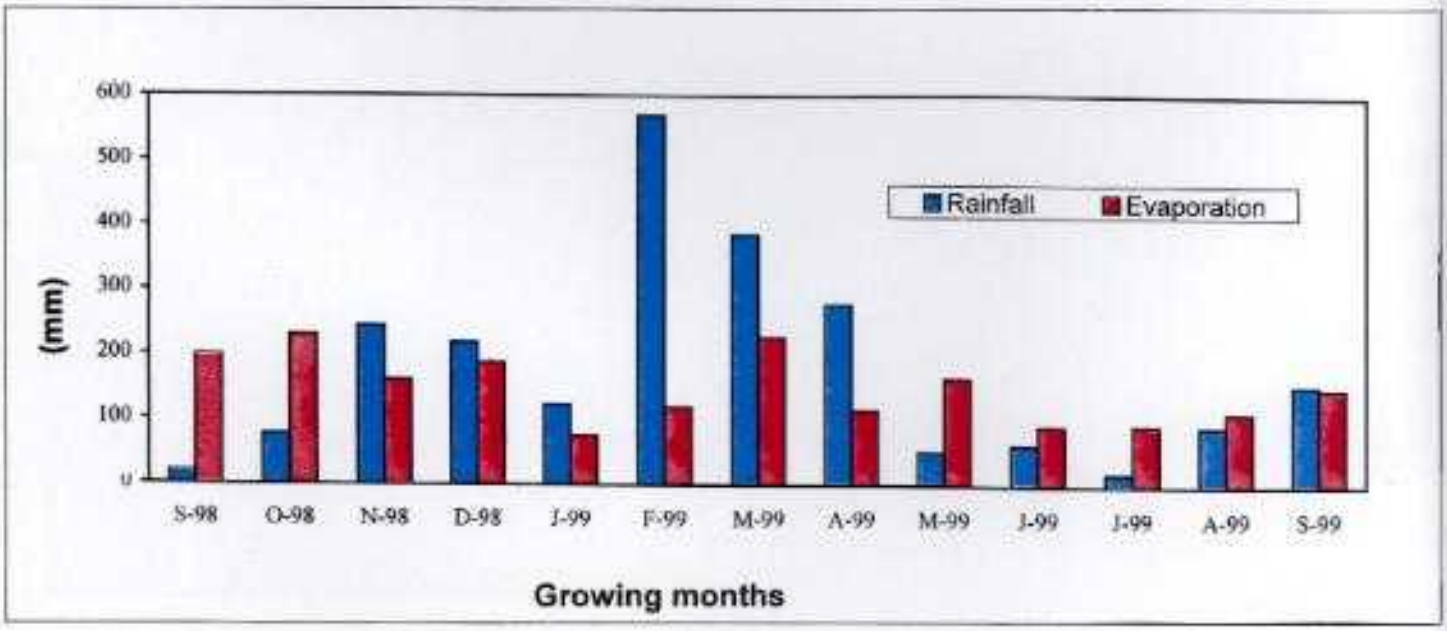
Table 5: The Effect of drip irrigation on cane and sucrose yields at Legalega

Treatment	Cane yield (tc/ha)		%POCS		Sugar Yield (ts/ha)	
	P	1R	P	1R	P	1R
T_1 = Control (rainfed)	56	86	16.9	15.9	9.5	13.6
T_2 = 50% PE (1 t.b.r) Δ	67	95	16.8	16.3	11.2	15.4
T_3 = 100% PE (2 t.b.r) Δ	81	90	17.2	16.5	13.9	14.9
T_4 = 100% PE (t/row) ΔΔ	69	93	17.2	16.1	11.9	15.0
P value α = 0.01	1.39×10^{-4} **	6.56×10^{-1} ns	2.76×10^{-1} ns	2.16×10^{-1} ns	1.17×10^{-5} **	4.34×10^{-1} ns

Δ t.b.r = tube between rows ΔΔ t/row = one tube per row ** highly significant PE = Pan Evaporation

All irrigation treatments produced highly significant increase in cane and sucrose yields in comparison to rainfed plot in the plant crop. The best treatment in terms of cane and sucrose yield for plant cane was T_3 (100% PE (2t.b.r)). However, for the first ratoon crop, T_2 (50% PE (1 t..b.r)) gave the best result in terms of cane and sucrose yields. It is worth noting that there was no significant difference between treatment in the first ratoon crop. This is due to high precipitation during the growing season of the first ratoon crop. This is clearly evident from Figure 1. This high rainfall was associated with La Nina effect.

Figure 1: Rainfall and evaporation during first ratoon crop of drip irrigation trial



Fertigation trial

This trial was conducted to study the effect of time of application of potassium on sucrose accumulation. The potassium and nitrogen fertilizer was applied through the tubes as per treatments.

T_1 = rainfed - 100% N + 100% K at 2 months after planting
T_2 = fertigation - 100% N + 100% K at 2 months after planting
T_3 = fertigation - 50% N + 33% K at 2 & 6 months, 33% K at 8 months after planting
T_4 = fertigation - 50% N + 20% K at 2 & 6 months, 60 % K at 8 months after planting

A total of 100 kg N and 120kg K per hectare was applied through the drip tube for treatment 2, 3 and 4. For treatment 1 the same amount of fertilizer was applied manually two months after planting.

Responses to different treatments in terms of cane and sucrose yields for the plant crop are summarised in Table 6.

Table 6: Effect of fertigation on cane and sucrose yields

Treatment	Cane yield (tc/ha)		%POCS		Sugar yield (ts/ha)	
	P	R	P	R	P	R
T_1	104	58	16.9	15.0	9.5	8.6
T_2	123	84	16.8	15.4	11.2	13.0
T_3	131	105	17.2	14.6	13.9	15.5
T_4	129	90	17.2	14.1	11.9	12.7
P value	1.09×10^{-1}	6.28×10^{-7}	8.4×10^{-1}	2.3×10^{-1}	1.8×10^{-1}	4.3×10^{-5}
$\alpha = 0.05$	ns	**	ns	ns	ns	**

The preliminary trials show significant effect of irrigation to cane and sucrose yields. Irrigation is an important factor in not only increasing cane and sucrose yields but also stabilizing production in the sugar industry. Supplementary irrigation is essential to stabilize cane yields and for inter-cropping.

The plant crop did not show any major significant difference between various treatments even though all irrigated treatments produced higher than rainfed treatment. This increased yields is attributed more to irrigation than to splitting of nutrient application as would be expected in view of the fact that evaporation was 248% greater than the precipitation.

In the ratoon crop this trend was totally reversed since evaporation was only 57% of the total precipitation. However, inspite the high precipitation there were significant difference between fertigated and non-fertigated plots. All treatments produced higher yields in comparison with non-fertigated treatment. Treatment (T_3) in which nitrogen and potassium was applied through the drip tube and split had highest yields. Thus split application of nutrients through the drip tubes close to the root system appears to be beneficial from the results of this preliminary trial.

Impact of trash content on % POCS

In view of the possible use of mechanical harvester in the distant future a preliminary study was conducted to study the impact of increased trash on %POCS.

The composition of trash was 80% tops plus green leaves and 20% dry leaves and soil. The results in Table 7 clearly indicates the effect of increased trash on brix, pol reading, purity and %POCS. It is envisaged that mechanization will have advantages but there are certain setbacks such as soil compaction, damage to stool, increased mud and trash that will be delivered to the mill need to be considered. Thus the impact of mechanization must be given serious consideration in view of compaction, damage to cane stools, and low %POCS due to increased trash levels.

Table 7: Impact of trash content on % POCS

% Trash	Sample no.	Brix	Pol	Purity	%Fibre	%POCS
0	1	22.3	75.5	79.11	10.7	13.18
2	2	22.2	75.0	78.96	10.78	13.08
5	3	21.1	69.2	76.99	10.48	11.93
7	4	21.5	71.2	77.54	11.28	12.20
10	5	20.5	65.2	74.58	10.87	10.93
15	6	20.1	62.2	72.85	11.90	10.12
20	7	19.7	60.4	72.33	12.88	9.67

** All data is the average value of two replicates*

Hot water treated seedcane

A preliminary trial was conducted at the Research Centre to study the impact of hot water treated seedcane on yield of cane. Three varieties Ragnar, Mana and Aiwa were treated at 50°C for 2 hours and were planted in the primary nursery.

Since the primary nursery was burnt accidentally, the seedcane for this trial was used from the secondary nursery. The age of the seedcane of the three treated varieties and those untreated were the same. The trial was planted at the Research Centre with five replication in a randomized block design.

The results of the trial does not show any major significant difference except for Mana variety. This would be expected if the cane was not infected by ratoon stunting disease bacteria. The results are given in Table 8.

Table 8: Cane yield of treated and untreated cane.

Variety	Treated yield (tc/ha)	Untreated yield (tc/ha)
Ragnar	92	95
Aiwa	120	124
Mana	130	107

A trial was established to estimate the cane yield loses from the influence of weeds on plant crop. The weed competition to which sugarcane is subjected is very high for cane planted in April-May season. Two herbicides were used as pre-emergence and post-emergence. The treatments were short cycle manual control, herbicide usage only and combinations of manual and pre-emergence and post-emergence herbicide.

Short cycle manual control treatment produced 44% more cane yield than treatment with no control of weeds. The highest yield was produced by treatments in which Diuron and E80 was applied as pre-emergence and post-emergence. The rates as pre-emergence were 2 kg/ha + 2 l/ha and as post-emergence the rates were 3 kg/ha and 3 l/ha of Diuron and E80 respectively. Post-emergence herbicide was applied three weeks after planting. This treatment produced 12% more cane yield than short cycle manual control treatment.

There is scope to improve cane yields with herbicide. It is worth noting that since most growers practice very little weed control or long interval manual weeding, the potential for economic improvements with herbicides is substantial. Further studies are required to determine the economic gain of the use of herbicides.

High density planting

High density planting can easily be adopted under the local conditions as an important strategy to increase yield. This is in view of the fact that there is very little mechanization in our cane fields. However, a comprehensive research program is needed to facilitate the validation and adoption of this technology.

A randomised complete block trial was established in 1998 with three treatment and four replications. The three treatments were 0.8, 1.0 and 1.37m inter-row spacing using Kaba variety. The results of cane and sugar yields with varying inter-row space are summarised in Table 9 and show superior cane and sugar yields with 0.8m inter-row spacing.

Table 9: Effect of row spacing on cane yield

Location Rainfall(mm)/ Raindays	Soil type and age at harvest	Variety & Crop	Treatment Row spacing	Cane yield (tc/ha)	% POCS	Sugar yield (ts/ha)
SCRC F33	Humic latosol	Kaba	1.3	85	10.6	8.8
2924/148	(May98-Jun 99)	P	1.0	122	10.7	13.0
			0.8	156	11.9	18.6
			CV%	12.0	15.0	26.7
			LSD5%	20.5	(2.3)	4.1
			1%	41.1	(4.7)	8.3

Quantity of seedcane

There are numerous reasons for low yield per unit area. Cane quality and quantity has a major impact on the final cane yield. With this in view a trial was established to determine the quantity and quality of seedcane that needs to be used per hectare.

Observations made in the trial indicates that at least 5 t/ha should be the minimum quantity of good quality seedcane used, however, to get optimum yields 7 t/ha is absolutely essential.

CENTRAL LABORATORY

Introduction

Central analytical laboratory provides chemical analysis services for advisory and research purposes. Soil and cane leaf samples are routinely analysed for all major nutrients. Soil texture, organic matter, micronutrients and exchangeable aluminium are determined on request. Salinity/Sodicity assessments are carried out to evaluate the suitability of land for cane cultivation in reclaimed areas. Sugarcane is analysed for sucrose content, juice purity, fibre, reducing sugars and dextran content.

Fertilizer Advisory Services (FAS)

The provision of cost effective and fertilizer recommendations to the sugar industry is one of the more important objectives of FAS. Fertilizer recommendations are based on the chemical analysis of the soil and folair analysis. Soil analysis compares level of nutrients in the soil with the threshold values needed for cane growth. The difference between the available and the required nutrient levels determines the recommended blended fertilizer. A total of 4991 growers used FAS in 1999 in comparison to 5862 in 1998 and 7514 in 1997. The number of soil samples received this year was low compared to previous years. A very wet condition was experienced this year due to impact of 'La Nina' effect and this may be one of the factors that also contributed to unfavorable sampling conditions.

A leaf sample is an excellent indicator of nutrient status of the plant, providing a useful check on the uptake of the fertilizers applied on the basis of soil analysis. This information can be used to make fertilizer adjustments to the next ratoon crop if required, or even to the current crop if it is young enough and is deficient of major nutrients. A total of 3230 advisory leaf samples were analysed in 1999 compared to 1897 in 1998. The increase in the number of leaf samples analysed could be attributed to the high percentage of plant cane which was due to the crop rehabilitation project of 1998. Table 1 shows the number of leaf and soil samples analysed during last five years.

A small proportion of cane farmers in Fiji use FAS. It is anticipated that more farmers will seek the services of FAS as they become aware of its benefits.

Year	Advisory Soil	Research Soil	Total	Advisory Leaf	Research Leaf	Total	Grand Total
1995	6928	1964	8892	3375	1482	4857	13749
1996	6247	2704	8951	3334	2452	5786	14739
1997	5837	1672	7514	1578	1914	3492	11006
1998	4547	1315	5862	1897	1394	3291	9153
1999	4097	1155	4991	3230	708	3912	8903

Sugar Cane Analysis

Sugar cane samples from various departments are routinely analysed for pol, brix, and fibre to determine %POCS. These analyses are performed for plant breeding and variety testing trials but it is also required for wide range of agronomic field trials and various research projects. The laboratory also analysed cane for reducing sugars and dextran content. This analysis was performed to study effect of delay in milling of the burnt and unburnt cane on cane quality.

MEASURING POL % IN CANE JUICE OF TEST VARIETIES THAT IS USED IN SUCROSE CONTENT DETERMINATION

CROP PROTECTION

Downy mildew disease

Downy mildew disease (***Perenosclerospora sacchari*** Miyake) has not been recorded on sugarcane in Fiji since 1997. It was last found in the Olosara sector of Sigatoka district in 1996. The eradication of this disease from Olosara sector in Sigatoka has been attributed to the vigilant roguing by the Disease Control Unit and the education of growers to plant approved cane varieties. A Downy mildew resistant maize variety Nirhala, that was distributed to the growers by the Ministry of Primary Industries has also reduced the possibility of this disease re-occurring.

Screening for Downy mildew resistance

A total of 244 clones were received from the Variety Testing department to screen for downy mildew disease resistance. Only 171 clones had acceptable levels of germination. Three series (LF94, LF95 and LF96) were screened with 11 standards at the downy mildew disease nursery at Tavakubu. Of the clones screened, 30% were resistant, 7% intermediate and 63% susceptible (Table 1).

The high amount of rainfall and humid conditions experienced during the trial attributed to the high inoculation pressure of the ***P. sacchari*** spores on to the test clones. Improvements were made to the disease nursery by installing mist-spraying nozzles that enhanced the inoculation process which was very effective.

Table 1: Resistance ratings of LF94, LF95 & LF96 series to downy mildew disease

Series	No. of clones resistant	No. of clones intermediate	No. of clones susceptible	Total
LF94	9	2	21	32
LF95	21	4	33	58
LF96	21	6	54	81
TOTAL	**51**	**12**	**108**	**171**

Fiji Disease

A total of 946 clones were screened for Fiji disease resistance during the April to December period of 1999. Results (Table 2) indicated that 44 were susceptible, 189 were moderately resistant and 713 were resistant.

Table 2: Results of screening for resistance to Fiji disease in 1999

Trial no.	Trial planted	No. of clones	No. of series	Resistance Ratings – No. of clones		
				susceptible (7-9)	moderately resistant (4-6)	resistant (1-3)
1	28/04/99	483	86	24	63	397
2	25/06/99	463	27	20	126	317
Total		946	113	44	189	713

A total of 180 samples were diagnosed for RSD using EB-EIA with all the sectors showing positive identification for ***Clavibacter xyli* ssp *xyli*** (Table 3). A drop of sap from all the samples were diagnosed under the microscope which gave a 20% positive identification for the bacterium. The difference in the positive identification of the bacterium using the two different diagnosis techniques (phase contrast microscopy and evaporative binding enzyme linked Immunoassay) shows the sensitivity of EB-EIA.

The results indicate that RSD is present in all the sectors diagnosed. Yako sector had the highest infection (40%) of samples while Cuvu sector had the lowest infection (6.7%). The samples diagnosed from Nausori Highland that contains the positive control had 100% infection.

Table 3: RSD diagnosis using EB-EIA

Sector	Percentage infection
Lautoka	28.6
Lovu	21.4
Meigunyah	14.3
Legalega	6.7
Lomawai	35.7
Cuvu	6.7
Olosara	13.3
Nawaicoba	6.7
Yako	40.0
Qeleloa	26.7
Daku	33.3
Positive control (Nausori Highland)	100

SUGARCANE DAMAGED BY WEEVIL BORER

Cane weevil borer

Fortnightly, 900 stalks of cane (30 samples consisting of 30 stalks per sample) from the Lautoka millyard were assessed for cane weevil borer damage, during June to November period of 1999. Using a random sampling method, 15 samples were taken from lorries and the other 15 samples from rail trucks. Only freshly harvested green cane were sampled. Our assessment came to a halt in November due to increased amount of burnt cane in the millyard.

Results (Table 4) indicated that 2.4% of the cane stalks sampled were damaged by cane weevil borer with a damage intensity of 0.4 – 0.6%. The corresponding percentage loss in cane quality due to the above borer damage were 0.7% POCS, 1.5% purity and –0.2% fibre.

Compared to 1998, CWB damage was lower in both incidence and severity (Table 4). In contrast, the loss in cane quality was higher in 1999 even though the damage was lower. These contrasting results may indicate that there are other factors affecting cane quality apart from CWB damage.

Table 4: Effect of cane weevil borer damage on cane quality at Lautoka

Lautoka millyard cane weevil borer damage assessment								Percentage loss in cane quality		
No.	Sampling date	% Mana Variety	% sample bored	% stalk bored	% weight damaged	% length damaged	% internodes damaged	% POCS loss	% purity loss	% fibre loss
1	16/06/99	73	70	4.22	0.97	1.08	1.31	0.95	2.95	-0.13
2	30/06/99	83	67	3.56	0.47	0.51	0.52	0.39	2.03	-0.23
3	14/07/99	100	53	2.11	0.35	0.45	0.44	0.08	0.04	-0.43
4	28/07/99	100	70	3.44	0.49	0.73	0.77	0.34	0.49	-0.39
5	11/08/99	100	47	2.00	0.32	0.52	0.68	1.14	2.65	-0.25
6	25/08/99	90	50	2.56	0.38	0.74	0.77	2.49	8.03	-0.02
7	08/09/99	97	50	2.78	0.55	0.65	0.69	-0.25	-2.58	-0.32
8	22/09/99	100	7	0.22	0.03	0.05	0.06	-0.29	0.50	-0.79
	06/10/99	100	53	2.33	0.51	0.76	0.84	1.01	0.36	-0.95
10	20/10/99	67	43	1.22	0.16	0.21	0.29	1.07	0.98	-0.49
11	03/11/99	100	50	1.28	0.36	0.33	0.34	0.63	1.20	0.08
	1999	92	51	2.38	0.42	0.55	0.61	0.69	1.51	-0.21
	1998	98	55	5.61	0.78	0.99	1.29	0.6	0.98	-0.38

The borer damage data on 22/09/99 seemed too low and may be due to sampling error. In addition, the negative POCS and purity percentage losses on 08/09/99 seemed irregular and may be due to error in small mill analysis. However, a slow decline in borer damage was observed,i.e. from 4.2% stalk bored in June (70% of samples bored) to 1.3% in November (50% samples bored).

A hypothesis for this declining trend as milling season progressed is outlined below. Cane that are older than 15 months and have undergone more ratooning do show more susceptibility to borer damage than plant cane of 12 – 14 months crop. Due to their maturity and large size, these cane are usually harvested first at the beginning of the crushing season. A higher borer damage is therefore expected at the beginning of the milling season. But as the milling season progresses, the amount of cane sent to mill for crushing that is 12-15 months old reduces so also the amount of borer damage.

A total of 14325.30ha of cane were inspected for major diseases and pests of which 10654.28ha were plant and 3671.02ha were ratoon cane (Table 5). The increase in plant area inspected was due to the Crop Rehabilitation Program (CRP) which increased the area planted in the industry. The variety Mana had the largest area inspected accounting for 73% of the area inspected.

The overall performance of the roguers have been encouraging. The average area inspected by a roguer in a month increased for Lautoka mill to 51.18ha (Table 6) compared to 14.9ha in 1998 because of the outbreak of Fiji disease in the Lautoka mill area.

The incidence of Fiji Disease (FD) in the Lautoka mill area amounted to 3267 stools located in 8 sectors (Table 8) compared to 3 sectors in 1998. Lomawai, Cuvu, Yako, Nawaicoba, Malolo, Qeleloa, Meigunyah and Natova (Table 7) were affected with Yako having the largest amount (1502) FD stools removed. The decrease in the number of infected stools removed could be attributed to both the vigorous roguing done in 1998 and to a large extent the increased inspection of plant cane compared to ratoon. Ratoon cane tend to have more incidence of Fiji Disease compared to plant cane.

An advance in disease control during the year was the recording of all roguing data into the computer. In the past years all records were only on paper and the risk of loss was high. It is envisaged that the new program on the computer would increase productivity and reduce the chance of loss of data.

Table 5 : A summary of roguing inspections conducted on plant and ratoon cane in all mill areas.

Variety	Lautoka		Labasa		Rarawai		Penang		All mill total	
	Plant	Ratoon	Plant	Ratoon	Plant	Ratoon	Plant	Ratoon	Plant	Ratoon
Mana	4234.26	1767.11	-	-	2238.10	487.40	796.14	933.60	7268.50	3188.11
Ragnar	15.77	13.06	393.21	3.20	15.00	7.20	0.40	8.10	424.38	31.56
Kaba	417.21	133.75	14.75	-	198.40	48.10	4.50	9.20	634.86	191.05
Waya	2.21	-	394.98	29.40	240.0	13.10	14.70	16.90	651.89	59.40
Mali	17.84	3.70	279.90	4.10	1.90	2.10	33.90	53.50	333.54	63.40
Vatu	-	-	803.51	21.10		-	7.40	12.10	810.91	33.20
Vomo	1.28	3.40	-	-	-	-	-	-	1.280	3.40
Beqa	1.44	-	257.60	-	-	0.90	-	-	259.04	0.90
Aiwa	93.46	4.00	22.44	-	57.80	15.10	9.90	8.00	183.60	63.10
Spartan	-	-	-	-	-	-	-	-	-	-
Galoa	5.73	-	59.01	-	-	-	-	-	64.74	11.50
Ono	5.31	-	-	-	0.30	-	-	-	5.61	-
Maize	0.39	-	-	-	-	-	-	-	0.39	-
Homer	-	-	-	-	-	-	-	-	-	-
Yasawa	-	-	-	-	-	-	-	-	-	-
Others	-	36.05	4.84	-	4.50	7.50	6.20	17.90	15.54	25.40
Total	**4794.90**	**1961.07**	**2230.24**	**57.80**	**2756.00**	**581.40**	**873.14**	**1059.30**	**10654.28**	**3671.02**
Mill total	**6755.92**		**2299.54**		**3337.40**		**1932.44**		**14325.30**	

Table 6 : Monthly performance of roguers in terms of hectares inspected in each of the four mill areas.

Month	Lautoka			Rarawai			Labasa			Penang		
	Plant	Ratoon	Total	Plant	Ratoon	Total	Plant	Ratoon	Total	Plant	Ratoon	Total
January	38.78	-	38.78	-	-	-	-	-	-	-	-	-
February	237.35	99.17	336.52	-	-	-	92.40	68.40	160.8	-	-	-
March	409.43	200.65	610.08	107.70	-	107.7	285.1	-	-	78.70	95.00	173.70
April	438.26	113.81	552.07	289.90	-	289.9	248.3	-	-	56.00	99.40	155.40
May	437.46	94.92	532.38	337.50	0.60	338.1	240.7	0.90	-	82.00	59.50	141.50
June	642.92	64.68	707.60	416.40	-	416.4	147.84	-	-	115.80	79.50	195.30
July	640.58	114.27	754.85	386.60	3.20	389.8	121.15	-	-	134.74	78.30	213.04
August	583.23	213.77	797.00	377.90	18.30	396.2	221.6	-	-	100.90	147.20	248.10
September	390.4	290.31	680.71	337.40	91.90	429.3	211.95	-	-	125.70	134.00	259.70
October	359.32	310.78	670.1	261.30	193.60	454.9	222.4	-	-	106.50	102.90	209.40
November	406.44	267.75	674.19	193.30	135.20	328.5	189.55	-	-	68.10	145.40	213.50
December	210.68	190.96	401.64	48.00	138.60	186.6	249.3	-	-	4.70	118.10	122.80
Total	**4794.9**	**1961.1**	**6755.9**	**2756**	**581.4**	**3337**	**2230**	**69.3**	**161**	**873.1**	**1059**	**1932**
Mthly mean	**435.9**	**178.3**	**614.17**	**275.6**	**83.1**	**333.7**	**202.8**	**6.93**	**209**	**87.3**	**105.9**	**193.2**
Av. ha inspected per roguer per mth		**51.18**			**47.67**			**34.85**			**48.3**	

Table 7 : Incidence of Fiji Disease Summary

District	Sector	No. of Farms with FD	FD Stools Removed	Location
Sigatoka	Lomawai	10	334	Navutu
	Cuvu	1	11	Maro
	2	**11**	**345**	
Nadi	Yako	23	1502	Nabou, Sariyawa, Bavu, Savusavu
	Nawaicoba	11	159	Randa, Dakadaka, Mala, Drasa-Loqi
	Malolo	13	146	Marasa Drasa-Loqi, Loqi,Nadovi
	Qeleloa	9	117	Nakala
	Meigunyah	2	13	Tovatova
	5	**58**	**1937**	
Lautoka	Natova	27	1083	Bikini, Nadele, Nagado, Vaturu
	1	**27**	**1083**	
Grand total	**8**	**91**	**3267**	**20**

Sector	No. of farms inspected	Total area inspected (ha)		Diseases found	FD stools removed	No. of farms with unapproved varieties
		Plant	Ratoon			
Sigatoka District						
Olosara	349	312.39	133.33			1
Cuvu	320	433.85	132.73		11	0
Lomawai	326	392.01	173.84		334	2
Total	**995**	**1138.25**	**439.9**	**1-11**	**345**	**3**
Monthly		**1578.15**				
Nadi District						
Yako	202	404.65	81.38		1502	0
alolo	300	502.38	207.99		146	0
Qlcloa	366	455.65	326.59		117	1
Meigunyah	176	278.20	94.52		13	1
Navakai	114	170.91	145.35		159	0
Legalega	114	182.26	60.36			0
Total	**1272**	**1994.05**	**916.19**	**1-15**	**1937**	**2**
Monthly		**2910.24**				
Lautoka District						
Natova	276	399.49	136.50		1083	2
Saweni	288	414.32	74.64			0
Lautoka	227	318.28	88.19			2
Lovu	235	246.84	114.36			2
Drasa	261	394.43	80.48			3
Total	**1287**	**1773.36**	**494.17**	**1-15**	**1083**	**9**
Monthly		**2267.53**				
Overall Total	**3554**	**6755.92**			**3267**	
Monthly *Mean/Roguer*	**26.92**	**51.18**				

Disease key:

1. COR = Common rust
2. BRS = Brown stripe
3. POB = Pokkah boeng
4. RIS = Ring spot
5. LES = Leaf scorch
6. RER = Red rot
7. ORR = Orange rust
8. RES = Red stripe
9. EYS = Eye spot
10. YED = Yellow disease
11. FD = Fiji disease
12. IRD = Iron deficiency
13. CHS = Chlorotic streak
14. TAT = Tangle top
15. PUD = Purple disease
16. DOM = Downy mildew

In 1999, the number of registrations was 22,178 with the registered cane area of 96,979 hectares. The total area cultivated was 94,751 hectares. A substantially large crop of 3,958,138 tonnes of cane was harvested from an area of 64,535 hectares and 376,501 tonnes of sugar was produced. There was a significant increase in cane yield compared to 36.8 tonnes per hectare in 1998 to 61.3 tonnes per hectare in 1999. This was mainly due to favourable weather conditions for cane growth that prevailed during the season, timely fertilizer application and highest plant cane harvest in proportion to total area harvested. The plant cane harvested was 24% of the total area harvested which was the best in the last 20 years.

The sugar yield was 5.94 tonnes 94NT per hectare. The yield was affected due to unseasonal rainfall that prevailed during the harvesting season caused by La Nina phenomenon that affected the climatic pattern of the zone.

The burnt cane was 32.4% of total cane crushed which was lowest since 1994. Mana was the dominant variety at all Viti Levu mills accounting for 87% of the crop harvested (61% of the total crop). The varieties Ragnar, Mali, Vatu and Waya accounted for 27.4%, 27.0%, 22.9% and 13.5% respectively of the crop harvested at Labasa Mill.

The rainfall at Lautoka and Rarawai mill centres during growing period (May 98 – April 99) was much higher than the LTM except for the months of May to October where drought to near drought condition prevailed. The rainfall for the same period for Labasa and Penang mill centres were near LTM except for months of May to August which were drought months. The monthly rainfall for the four mill centres from May 1998 to April 1999 in comparison to LTM is shown in Table 1.

Table 1: Rainfall (mm) for all mills from May 1998 to April 1999

Mills	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Lautoka													
Monthly rainfall	36.5	5.0	7.0	0.6	23.1	38.0	481.1	196.3	1017.5	516.5	138.6	388.2	2848.4
No. of raindays	6	1	2	1	4	3	15	18	27	23	21	18	139
90 years average	97.9	66.4	46.6	65.9	69.2	87.4	121.4	183.9	296.9	321.4	311.5	181.1	1849.6
Rarawai													
Monthly rainfall	12.7	3.6	1.4	0.8	81.5	46.4	497.9	336.4	1032.9	557.7	301.8	360.0	3233.1
No. of raindays	3	2	1	1	6	3	16	16	24	23	25	18	138
113 years average	76.3	33.6	23.9	99.6	105.0	150.0	228.6	235.3	349.8	358.1	356.6	302.5	2319.3
Labasa													
Monthly rainfall	31.0	67.1	0.7	3.1	85.1	84.0	181.6	544.6	897.0	451.8	153.6	182.4	2682.0
No. of raindays	2	5	3	3	9	10	12	26	27	26	28	24	175
109 years average	110.8	64.2	44.6	50.5	74.8	100.5	205.6	250.2	360.2	355.6	380.9	232.8	2230.7
Penang													
Monthly rainfall	45.6	37.4	12.0	13.0	169.9	22.2	124.7	238.7	729.8	409.1	273.6	317.5	2393.5
No. of raindays	19	15	11	8	19	9	11	24	25	24	26	20	211

Table 2: Extension targets and achievements from April 1999 to March 2000

Mills	Plant-new land or after fallow (ha)			Replant - directly after harvest (ha)			Soil samples (no.)			Leaf samples (no.)		
	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Lautoka	2930	2204	75	320	366	114	3065	1632	53	1475	820	56
Rarawai	3927	4079	104	774	1036	139	2456	1650	67	1540	1074	70
Labasa	1574	1290	82	1292	1009	78	2152	1076	50	1360	883	65
Penang	1249	1205	96	168	161	96	1104	506	46	640	270	42
Total	9680	8778	91	2554	2572	101	8777	4864	55	5015	3047	61

Mills	Blend 'A' (no. 50 kg bags)			Blend 'B' (no. 50 kg bags)			Blend 'C' (no. 50 kg bags)			Blend 'D' (no. 50 kg bags)		
	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Lautoka	9095	6868	76	41670	37069	89	284500	228650	80	16340	12289	75
Rarawai	17220	10288	60	56580	61589	109	194100	151535	78	18610	11456	62
Labasa	25185	11378	45	39078	28813	74	299535	225496	75	30000	27669	92
Penang	4660	2415	52	19730	16406	83	62510	45375	73	7880	7921	101
Total	56160	30949	55	157058	143877	92	840645	651056	77	72830	59335	81

Mills	Main drain (metres)			Field drains (metres)			Trash conservation (ha)			Contour lines (metres)		
	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Lautoka	51900	58623	113	60000	59243	99	7190	5941	83	65000	45285	70
Rarawai	12770	16135	126	17210	20850	121	6520	7160	110	86000	74470	87
Labasa	23050	14530	63	44400	40195	91	5820	5051	87	71000	67813	96
Penang	11000	10382	94	11200	9962	89	2230	2064	93	40000	12195	30
Total	98720	99670	101	132810	130250	98	21760	20216	93	262000	199763	76

Mills	Grower demonstration plots (no.)			Extension (no. of meetings)			Field days (no. held)			Farm management courses (no.held)		
	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Lautoka	70	8	11	824	428	52	7	3	43	7	-	-
Rarawai	100	62	62	985	543	55	4	1	25	4	4	100
Labasa	100	47	47	1566	763	49	10	2	20	10	4	40
Penang	40	11	28	235	119	51	4	-	-	4	-	-
Total	310	128	41	3610	1853	51	25	6	24	25	8	32

Mills	Mill mud (tonnes)			Vetiver (metres)			Unapproved varieties ploughout (ha)			Grower visit (nos.)		
	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target	Target	Actual	% of Target
Lautoka	9650	1359	14	4200	350	8	265	46	17	7680	6519	85
Rarawai	12900	6323	49	8600	3180	37	59	70	119	21420	18180	85
Labasa	9800	6302	64	9200	1270	14	58	64	110	6590	6398	97
Penang	5200	-	-	4000	20	1	152	74	49	-	-	-
Total	37550	13984	37	26000	4820	19	534	254	48	35690	31097	87

- **Planting**

The planting programme was successful, achieving 93% of the target. The planting was completed by 31 October 1999. The total area planted in proportion to the registered area was 12% which was second highest since 1995.

- **Soil and Leaf Analysis**

During the year a total of 4,864 growers soil samples were taken for analyses. Fertilizer recommendations were given to the individual growers based on the analytical results of the soil samples. Similarly, 3,047 leaf samples were taken and analysed for the nutritional status of the crop. The computerised fertilizer advisory sheets were personally delivered to the growers and recommendations were discussed along with other extension activities.

- **Soil Conservation**

Trash was conserved on 20216 hectares of crop ratooned. This was 35% of the available area for trash conservation. There was no planting done on slopes with furrow running up and down the slopes. Basically, all planting on slopes were done on contour lines.

- **Vetiver Grass**

In this target period, 4,820 metres of new hedge of vetiver was established along contour lines on sloping lands. The vetiver grass quickly forms narrow and very dense hedge. Its stiff foliage blocks the passage of soil and debris. It also slows any runoff and gives rainfall a better chance of soaking in to the soil.

- **Fertilizer Delivery**

The fertilizer delivered to growers during the year is shown in Table 2. The NPK use (kg/hectare) in all mills (1994-2000 crop) is shown in Table 3. In comparison with the last season there has been a significant decline in fertilizer delivery at all mills. This was mainly due to growers carrying stocks from last season where grant financing for the purchase of fertilizer was available.

SOIL

CONSERVATION

THROUGH

CONTOUR

PLANTING

Mill	Fert.	1994	1995	1996	1997	1998	1999	2000
Lautoka	N	91.80	92.70	90.20	87.50	93.80	111.60	87.6
	P	15.30	15.50	14.90	15.89	16.56	22.22	15.0
	K	63.24	63.80	62.70	60.63	63.19	76.59	60.7
Labasa	N	117.33	115.20	116.00	85.55	119.55	120.30	99.4
	P	26.10	23.00	24.20	15.35	24.04	24.82	19.6
	K	78.05	77.60	80.00	59.08	80.32	82.97	69.3
Rarawai	N	80.58	80.43	87.30	86.50	98.65	102.39	89.1
	P	13.25	13.32	14.80	15.40	17.07	21.44	15.6
	K	55.80	55.43	60.20	59.70	65.71	69.86	62.5
Penang	N	95.83	95.00	100.70	93.26	101.04	111.70	84.8
	P	19.72	17.88	17.60	16.90	17.32	21.61	14.3
	K	65.25	68.00	71.10	65.70	67.34	78.89	61.0
All mill average	N	96.39	97.08	98.55	93.70	103.52	112.20	91.4
	P	18.59	17.42	17.88	17.80	19.03	22.81	16.5
	K	65.59	66.21	68.50	64.93	69.41	77.21	63.8

Fertilizer usage in Fiji

In the past decade, considerable changes have occurred in fertilizer use for sugarcane production in Fiji. During this period the N, P and K requirements of cane have been and continue to be the subject of extensive fertilizer trials by the Sugarcane Research Centre and Sugar Technical Advisory Mission of the Republic of China both based at Lautoka. As current expenditure on fertilizers by the Fiji sugar industry is in excess of $18 million per annum, it is necessary to ensure that they are being used as efficiently as possible. The fertilizer cost is about 16% of the total growers' cost of production.

The data given in Table 4 shows the N, P and K fertilizer usage in the Fiji sugar industry from 1986 to 1998. There has been a marked change in the proportion of N, P and K usage since the blended fertilizer was introduced in 1990. Before 1990, the preference of growers for nitrogen fertilizer at the expense of phosphorus and potassium is clearly evident. The blended fertilizer has provided a more balanced nutrition for the crop and proved beneficial for soils where P and K are required. The average amount of N fertilizer used per hectare declined substantially after 1991. It reached a peak of 142 kg N/ha in 1989 and a low of 71 kg N/ha in 1992. Since then N use has gradually increased, the industry average for the 1998 crop being 103 kg N/ha.

Conversely, there has been a dramatic increase in the amount of potassium fertilizer used from an average 26 kg K/ha in 1991 to 69 kg K/ha for the 1998 crop. In addition there has been a slow but steady increase in the use of phosphorus fertilizer from an average of 9 kg P/ha in 1991 to 19 kg P/ha for the 1998 crop.

Table 4: Area harvested and amounts of N, P, K used in the Fiji sugar industry, 1986-2000

Year	Harvested cane area (ha)	Nutrients applied in tons			Proportions		
		N	P	K	N	P	K
1986	66270	7855	765	1408	10.3	1.0	1.8
1987	66511	6769	501	1154	13.5	1.0	2.3
1988	63817	8002	733	1426	10.9	1.0	1.9
1989	71158	10141	885	2382	11.5	1.0	2.7
1990	69666	7777	649	1774	12.0	1.0	2.7
1991	72709	8347	643	1886	13.0	1.0	2.9
1992	72649	6551	870	3336	7.5	1.0	3.8
1993	75089	6844	1186	4506	5.8	1.0	3.8
1994	74388	7158	1380	4945	5.2	1.0	3.6
1995	73977	7660	1335	5315	5.7	1.0	4.0
1996	73981	7520	1413	5193	5.3	1.0	3.7
1997	73312	7050	1339	4885	5.3	1.0	3.6
1998	57039	7050	1351	4885	5.2	1.0	3.6
1999	64535	7852	1597	5406	4.9	1.0	3.4
2000	75558*	6902	1249	4821	5.5	1.0	3.9

Forecast area

The means of determination of the rate of fertilizer usage is based on the actual deliveries made to growers. The 1999 usage is inflated due to growers receiving fertilizer more than their actual application due to grant financing for the purchase of fertilizer. As a result, the 2000 usage is deflated.

Extension activities

The extension workers contacted all growers (excluding the absentees) once between November and January for establishing the disposition of cane land and setting growers' production objective. Due to the sector size it was impossible to maintain regular individual grower contact.

Extension Support Group (ESG)

The first Extension Support Group (ESG) was established at Legalega Sector in Nadi District in March 1996. ESG enables the growers' leaders to be the primary target of the extension efforts and they in turn complement the work of the extension/field staff at the gang level. ESG facilitates the transfer of information to more growers in a shorter time. Due to the success of the first ESG, the concept was introduced at Rarawai Mill in Drumasi Sector (October 1996) and at Penang Mill in Malau Sector (January 1997).

By October, 1999, ESG had been established at all sectors in cane belts. In some sectors ESG is not achieving its desired results due to the lack of drive by the extension personnel and poor participation by growers leaders. Overall, it is steadily making inroad and achieving its objectives.

The existing cane varieties have the potential to produce high yields on a wide range of Fiji soils. Research trials show that with good farm management yields of between 80 to 120 tonnes cane per hectare can be obtained. The present average yield of about 55 tonnes per hectare is of great concern.

Individual farm yields vary widely with two thirds of the industry's cane production coming from about one third of the growers. Based on the known yield potential of the majority of soils under cane, an average yield of about 70 tonnes/ha should be achievable. Presently, we have approximately 75,000 hectares under cane and based on the yield potential (70 tonnes/ha), a total production of 5.25 million tons of cane is possible and at an average TC/TS ratio of 8.5, 600,000 tonnes of sugar could be produced annually.

Fiji's sugar production ranges between 450,000 to 500,000 tonnes annually. Hence, a great improvement in yield is necessary to achieve 600,000 tonnes of sugar, which would be possible if the majority of the growers adopt productive farm management practices.

Some of the major extension objectives towards the attainment of higher yields in the sugar industry are as follows:

- to ensure correct cane varieties are planted for different soil types and environment.
- to ensure correct planting methods
- to ensure timely planting
- to eliminate gaps in plant and ratoon cane (currently plant population is only 60-70% in many fields).
- to ensure better quality seedcane
- to ensure good weed control
- to ensure growers use the recommended amounts of fertilizer
- to advocate trash management as a means of increasing yield
- to reduce the amount of cane left in the field after cutting

1998/99 Crop Rehabilitation Project

Outlined below is an evaluation report on the crop rehabilitation project.

Introduction

The 1997/98 drought in the sugarcane areas had caused a very substantial decline to the sugarcane production for the 1998 season. The decline in production had an adverse effect on the national economy; quite apart from that on cane growers and millers.

The overriding importance of increasing production as a matter of urgency, was recognised by all concerned within the sugar industry. However, the vast majority of the cane growers did not have the resources to undertake crop rehabilitation without assistance. The Government and the industry, in recognition of this fact, had agreed to the implementation of Crop Rehabilitation Project on a partnership basis.

Overall Objectives

The Crop Rehabilitation Project had the following objectives:

- To help rehabilitate those growers who had performed consistently over the past years and whose ability to produce similar tonnage was threatened due to losses resulting from drought of 1997/1998.
- To re-establish the national cane production to approximately 3.5-4 million tonnes for 1999.
- To increase and stabilise the national cane production to 4.5 million tonnes by 2001.
- To achieve the above, it was determined that 21000 hectares of new plant cane has to be established in the project period.

Project Monitoring Committee

An Industry Crop Rehabilitation Scheme Monitoring Committee consisting of the Chairman of the Su Commission, the Chief Executive of the Council and Managing Director of the Corporation and th representatives had been responsible for monitoring the administration and progress of the project. The Ch Extension Officer was appointed the Project Coordinator.

Project Administration

As the Corporation has been responsible for the management and implementation of the project, a "PROJE ADMINISTRATION MANUAL" was prepared setting procedures and control. Training sessions were held for Field Staff at each mill centres prior to the commencement of the project.

Project Duration

The project commenced in July, 1998 and concluded on 31 December, 1999.

Result

- Planting

The planting target was set at 21000 hectares for all mill areas. The achievement is shown in Table 5.

Table 5: Planting achievement (hectares)

	1999	2000	Total
Assisted	14517	7823	22340
Unassisted	2832	3471	6303
	17349	11294	28643

- Crop

The cane production for the target period is shown in Table 6 in comparison to 1998 production.

Table 6 : Cane Production

Year	Hectares harvested	Tonnes	Yield tonnes/hectare
1998 (drought)	57036	2090821	36.8
1999	64535	3958138	61.3
2000 (forecast)	75558	4200000	55.6

The Fertilizer usage is tabulated below.

Table 7: N,P,K (Kg/ha) fertilizer use in comparison to 1997 crop.

Crop	N	P	K
1997	98.6	17.9	68.5
1998	93.7	17.8	64.9
1999	112.2	22.8	77.2
2000	91.4	16.6	63.8
Av. 1999 & 2000	101.8	19.7	70.5
% Improvement compared to 1997	3	10	3

It must be noted that growers carried fertilizer in stock in 1999 that was used for 2000 crop. The amount used is based on fertilizer deliveries made to the growers through the Corporation books.

Project Cost

The following commodities and services were provided under the project;

- land preparation
- seedcane material, harvesting and cartage
- planting cost
- fertilizer
- weedicide
- drainage (later part of the project and only in Sigatoka District)

The total cost of the project is tabulated below:

Activities	**$(Million)**
Land preparation	7.742
Seedcane	5.087
Fertilizer	23.812
Weedicide	2.193
Hire of labour	1.103
Irrigation	0.008
Mill mud	0.002
Drainage	0.002
Administration	0.500
Total	**40.467**

Management Capacity

The project was managed and controlled by the Corporation. The whole project lasted for 18 months and within this period the industry bounced back to its pre-drought level of production.

Strength

Some of the strength of the project was as follows;

(i) Sound procedural documentation

The experience of 1983/84 crop rehabilitation project was of great help in drawing up procedure for this project. The procedure was documented. It was precise and a clear guideline for everyone involved in the project.

(ii) Capacious accounting system

Well designed computer programme was implemented whereby grower entitlement and expenditure was input into on-line system. This enabled generation of report at any given time and at various levels.

(iii) Reporting system

To monitor the progress of the rehabilitation work, mills submitted fortnightly reports to the Project Co-ordinator on the following:

a. Area prepared for planted
b. Area planted
c. Amount of fertilizer delivered
d. Seedcane requirement and availability
e. Details of expenditure incurred

(iv) Management at National level

The day to day control and management of the project at national level was single handed by the Project Co-ordinator. This resulted in quick and conformity in decision making.

(v) Weakness

Two areas of weakness has been identified; mainly

- lack of adherence to the procedures.

  Some staff involved in the project did not strictly adhere to the guidelines given in the Administration manual. This resulted in redo and duplication of works.

- lack of documentation on audits

  The mill co-ordinators had to carry out regular audit at sector level. There were cases where this was not done. Some did it but lack records which results in repetition of errors.

Conclusion

Once again the industry has proved that given the resources it can "bounce back" to normal level of production from devastating effects of natural disasters.

Rainfall Events

The year 1998 was the worst drought to affect Fiji in this century due to the impact of El Nino effect. The El Nino that developed around May 1997 continued in 1998. The drought conditions began to ease in November as a result of widespread rain. More than two times the average rainfall was received in Nov and Dec.

The year 1999 started with above average rainfall in all mill centres as Fiji started to experience the La Nina Effect. January was the wettest month in all mill centres. The new record of 1018mm rainfall was received in Lautoka and 1033mm in Rarawai. Lautoka mill area experienced above average rainfall in all months except in March, May and June (Figure 1). Rarawai mill centre had below average downpour in March, May, Sept, Oct and Nov (Figure 3). All other months received above average rainfall compared to long term average.

Labasa mill centre recorded above average rainfall compared to LTMs in all the months except in March, April and December (Figure 2) while Penang mill centre also recorded above average rainfall in most of the months except in March, April and August (Figure 4).

The La Nina conditions continued throughout the year and all centres experienced above average rainfall in most of the months. Annual rainfall and its distribution data for various sectors in four mills are presented in Tables 3-6.

Lautoka

A total of 3456mm rainfall was received. This represented 186% of the 90 year LTM. Rain fell on 176 days.

Rainfall was recorded on 174 days and total rainfall received was 3340mm, which was 144% of the 90 year LTM.

Labasa

Rainfall was recorded on 237 days. Total rainfall received was 3141mm, which was 141% of the 90 year LTM.

Penang

Penang mill centre received rain on 213 days. Total rainfall received at this centre was 3848mm, which was 152% of the 90 year LTM.

Research Centre Meteorological Station

Table 7 summarizes the data for relative humidity, air and earth temperatures, evaporation and sunshine hours at Research Centre Meteorological Station.

Relative Humidity

Months of Jan, Feb, Apr, Aug, Nov and Dec had higher mean relative humidity values than 42 year long term average. High relative humidity observed was due to high rainfall experienced during these months.

Air Temperature

Monthly maximum temperatures were very similar to the long term average (LTM). Jan, Feb, Nov and Dec had below average maximum temperature while other months had 0.3-0.8°C higher values than the 43 year LTM. Highest maximum temperature recorded was 32.7°C in Jan, Feb and Dec. Lowest minimum temperature was recorded in July (17.5°C).

Evaporation

Sunken pan evaporation for most of the months recorded was below the 42 year LTM except in Mar and May. Transeau ratios in Table 2 gives an indication of moisture available for cane growth during the year. Moisture limiting conditions prevailed from March to October except for April. The rest of the year had sufficient moisture for moderate to good cane growth. Evaporation in Jan, Feb, Nov and Dec were above the 42 year long term monthly average.

Earth Temperature

Earth temperatures are recorded at profile depths of 5cm, 10cm, 20cm and 100cm. A general deadline in the earth temperatures was observed which is due to the generally higher rainfall received this year.

Sunshine

April, May and July recorded above average sunshine hours compared to 41 year LTM. The longest monthly average sunshine hours were recorded in July and the shortest monthly average sunshine hours were recorded in January.

Mills	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Lautoka Mill													
Monthly Rainfall	1017.5	516.5	138.6	388.2	26.3	49.6	115.0	136.2	91.6	149.2	354.4	473.3	3456.4
No. of raindays	27	23	21	18	4	5	5	13	12	13	17	18	176
90 years average	296.9	321.4	311.5	181.1	97.1	66.2	47.4	66.7	69.4	88.1	124.0	187.2	1857.0
% of average	342.7	160.7	44.5	214.4	27.1	74.9	242.6	204.2	132.0	169.4	285.8	252.8	186.1
Rarawai Mill													
Monthly Rainfall	1032.9	557.7	301.8	360.0	25.3	55.5	94.6	107.7	67.0	138.4	226.2	373.3	3340.4
No. of raindays	24	23	25	18	4	4	7	11	10	15	17	16	174
113 years average	349.8	358.1	356.6	302.5	75.8	33.8	24.5	99.7	104.7	149.9	228.6	236.5	2320.5
% of average	295.3	155.7	84.6	119.0	33.4	164.2	386.1	108.0	64.0	92.3	99.0	157.8	144.0
Labasa Mill													
Monthly Rainfall	897.0	451.8	153.6	182.4	124.7	99.0	118.9	80.8	89.1	270.5	434.7	238.9	3141.4
No. of raindays	27	26	28	24	13	10	12	17	15	16	26	23	237
109 years average	360.2	355.6	380.9	232.8	110.9	64.5	45.3	50.8	74.9	102.1	207.7	250.1	2235.8
% of average	249.0	127.1	40.3	78.4	112.4	153.5	262.5	159.1	119.0	264.9	209.3	95.5	140.5
Penang Mill													
Monthly Rainfall	729.8	409.1	273.6	317.5	436.6	71.6	102.0	54.8	323.6	379.4	287.4	462.2	3847.6
No. of raindays	25	24	26	20	15	5	17	10	15	19	16	21	213
101 years average	437.5	354.4	416.7	397.7	118.5	67.2	50.1	94.6	84.6	121.3	152.4	236.2	2531.2
% of average	166.8	115.4	65.7	79.8	368.4	106.5	203.6	57.9	382.5	312.8	188.6	195.7	152.0

Table 2 : Transeau ratio moisture status of soil 1999

P.E	Moisture status	Months
Less than 0.25	Drought conditions	May
0.26 - 0.50	Very dry - limiting moisture. Slow growth.	June
0.51 - 1.00	Dry - limiting moisture. Slow growth.	March, July, August, September, October
1.1 - 2.00	Moderate - sufficient moisture for moderate growth.	
Greater than 2.00	Good - sufficient moisture for good growth.	January, February, April November, December

Table 4: Rainfall data (mm) for Rarawai Mill - 1999

Sector	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Varoko (Sarava)	1054.0	546.0	191.0	367.0	20.0	69.0	85.0	100.0	58.0	120.0	188.0	372.0	3170.0
No. of raindays	19	19	18	15	3	4	5	7	7	9	15	12	133
Mota	1100.6	713.0	392.0	318.0	86.0	82.0	115.0	122.0	120.0	149.0	268.0	496.2	3961.8
No. of raindays	18	18	15	13	4	3	8	6	6	10	15	11	127
Koronubu	1073.0	594.0	264.0	343.0	24.0	52.0	105.0	99.0	112.0	132.0	363.0	529.0	3690.0
No. of raindays	22	19	23	19	5	2	6	7	7	9	16	13	148
Rarawai	1047.9	549.1	292.0	360.0	25.3	55.2	94.6	106.5	65.5	147.6	222.8	354.4	3320.9
No. of raindays	19	20	24	18	4	3	7	10	9	12	17	14	157
Veisaru	845.6	432.4	213.0	234.8	19.8	43.6	63.9	83.7	55.6	141.6	180.6	327.8	2642.4
No. of raindays	20	16	22	15	2	2	4	8	5	10	16	14	134
Navatu	925.0	445.0	201.2	267.0	7.0	42.0	86.0	87.0	44.0	123.4	174.0	369.7	2771.3
No. of raindays	17	14	13	10	2	2	5	4	4	6	10	11	98
Varavu	848.0	587.0	124.0	291.0	Nil	63.0	80.0	103.0	62.0	103.0	255.0	413.0	2929.0
No. of raindays	17	14	12	14	-	3	5	6	3	7	11	11	103
Tagi Tagi	987.0	607.0	151.0	223.0	5.0	72.0	72.0	78.0	40.0	26.0	386.3	466.0	3113.3
No. of raindays	16	14	7	11	1	1	4	3	3	6	7	9	82
Drumasi (Davota)	1111.0	756.0	164.0	321.0	21.0	89.0	87.0	68.0	49.0	185.0	481.0	516.0	3848.0
No. of raindays	18	15	9	11	2	2	5	3	5	4	13	8	95
Tavua	841.0	568.0	109.0	295.0	11.0	75.0	79.0	50.0	30.0	147.0	339.0	373.0	2917.0
No. of raindays	18	14	8	11	2	1	5	3	5	4	16	8	95
AES	1032.9	557.7	301.8	360.0	25.3	55.5	94.6	107.7	67.0	138.4	226.2	373.3	3340.4
No. of raindays	24	23	25	18	4	4	7	11	10	15	17	16	174
Nukuloa	1123.4	708.0	304.0	345.0	46.0	56.0	128.0	126.0	95.0	144.0	463.0	514.0	4052.4
No. of raindays	21	18	17	16	3	2	6	7	6	9	17	19	141

Sector	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Waiqele	899.2	461.4	220.8	183.2	116.2	140.8	91.6	72.8	89.4	284.8	590.6	266.2	3417.0
No. of raindays	24	25	24	22	8	6	6	9	12	13	24	22	195
Wailevu	887.1	399.2	149.3	212.6	269.9	107.4	58.7	94.8	82.4	188.8	461.3	207.7	3119.2
No. of raindays	29	26	20	23	9	6	10	17	13	12	27	21	213
Vunimoli	1190.4	493.4	210.8	141.0	169.3	146.4	72.2	77.6	83.6	302.4	528.4	273.3	3688.8
No. of raindays	23	18	16	16	8	8	11	10	15	16	22	21	184
Korowiri (Labasa M)	897.0	451.8	153.6	182.4	124.7	99.0	118.9	80.8	89.1	270.5	434.7	238.9	3141.4
No. of raindays	27	26	28	24	13	10	12	17	15	16	26	23	237
Nagigi (Bucaisau)	773.2	345.2	192.6	230.4	221.5	80.0	59.0	186.3	171.2	206.5	418.2	436.0	3320.1
No. of raindays	18	16	21	11	6	5	6	13	13	8	17	17	151
Wainikoro	728.5	360.0	175.5	515.5	507.0	58.8	22.5	194.7	136.1	225.6	502.8	189.6	3616.6
No. of raindays	28	22	25	22	5	4	3	12	13	12	16	20	182
Vunivutu	1025.2	503.2	272.8	371.0	143.6	99.3	48.6	328.0	207.2	347.2	715.6	730.4	4792.1
No. of raindays	25	18	14	11	3	5	1	15	9	17	23	21	162
Papalagi	759.0	320.2	158.8	145.0	145.6	65.4	58.0	190.8	144.0	127.3	245.3	247.2	2606.6
No. of raindays	25	14	17	19	4	6	5	12	9	9	17	15	152
Kuru Kuru	996.3	445.5	232.1	457.3	234.7	56.7	4.8	220.4	325.2	324.5	911.4	373.5	4582.4
No. of raindays	26	25	21	21	9	7	4	9	14	15	18	18	187
Daku	425.6	286.6	236.2	255.1	239.1	67.5	14.7	186.1	160.0	208.9	472.8	269.9	2822.5
No. of raindays	19	14	21	19	8	4	5	13	15	13	18	17	166
Natua (Seaqaqa)	942.0	485.8	355.2	296.4	81.0	171.2	73.8	128.6	85.4	261.4	741.7	312.6	3935.1
No. of raindays	30	26	24	21	5	11	9	18	15	16	26	23	224
Seaqaqa Sub. St.	883.7	444.3	244.5	245.1	55.2	133.0	66.8	103.2	54.3	256.9	504.6	222.8	3214.4
No. of raindays	25	25	22	18	7	7	7	12	8	11	20	21	183
Rokosalase	976.0	674.3	493.9	335.1	35.0	31.7	166.5	124.0	191.0	190.0	760.2	318.9	4296.6
No. of raindays	17	28	31	21	1	2	9	6	9	10	27	23	184
Naravuka	677.0	576.6	Nil	Nil	Nil	Nil	Nil	107.3	247.0	247.0	795.0	320.0	2969.9
No. of raindays	24	12	-	-	-	-	-	14	16	11	24	20	121

Table 6: Rainfall data(mm) for Penang Mill - 1999

Sector	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Nanuku	760.0	469.0	154.4	195.6	146.4	90.2	63.6	58.4	157.0	196.4	174.4	360.0	2825.4
No. of raindays	19	20	16	13	6	3	6	4	9	9	12	12	129
Ellington	688.8	420.6	347.2	220.0	437.9	55.6	55.0	115.4	366.9	423.6	402.1	429.2	3962.3
No. of raindays	22	15	16	17	7	3	3	8	13	9	11	12	136
Penang	729.8	409.1	273.6	317.5	436.6	71.6	102.0	54.8	323.6	379.4	287.4	462.2	3847.6
No. of raindays	25	24	26	20	15	5	17	10	15	19	16	21	213

Table 7: Meteorological data for Sugar Cane Research Centre, Lautoka - 1999

Measurements	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Relative humidity (%)												
Humidity	86	86	71	79	71	73	73	76	73	69	80	79
42 years average	76	77	80	77	80	80	75	73	70	69	73	73
Air temperature (°C)												
Mean maximum	29.9	30.0	31.6	30.9	30.0	29.1	29.2	28.7	29.3	29.5	30.0	30.6
Mean max 43 years	30.5	31.6	31.0	30.4	29.3	28.8	28.5	28.5	29.2	29.4	30.3	31.4
Mean minimum	23.7	23.4	23.8	23.8	21.4	21.0	21.1	21.1	21.7	21.7	22.8	23.6
Mean min 43 years	23.8	22.5	24.1	23.2	21.3	21.0	19.7	20.4	20.9	21.2	23.0	23.7
Mean	26.8	26.7	27.7	27.4	25.7	25.1	25.2	24.9	25.5	25.6	26.4	27.1
Highest maximum	32.7	32.7	32.6	32.1	31.7	30.6	30.8	31.0	31.2	32.0	31.7	32.7
Lowest minimum	21.6	21.4	22.4	22.4	18.2	19.0	17.5	18.0	18.4	18.8	19.9	21.5
Evaporation (mm)												
Sunken pan	83.9	108.2	146.9	106.5	113.7	85.7	116.5	116.8	123.9	159.5	153.4	153.2
Sunken pan 42 years	165.5	121.0	133.7	129.1	109.0	94.3	119.7	139.4	146.1	182.7	163.8	197.7
Raised pan	104.4	125.6	167.5	122.6	128.4	100.6	134.0	129.8	140.1	175.7	172.4	178.0
Raised pan 42 years	156.8	140.9	145.5	133.6	113.7	104.2	137.6	155.8	166.9	201.4	181.7	205.3
P:E ratio	9.7	4.1	0.8	3.2	0.2	0.5	0.9	1.0	0.7	0.8	2.10	2.7
Earth temperature (°C)												
5 cm	27.4	26.7	31.1	28.2	26.3	25.3	25.6	25.5	27.1	28.9	28.1	28.4
10 cm	27.4	26.6	29.0	27.5	25.9	25.0	25.3	25.1	26.3	27.5	27.5	27.9
20 cm	28.8	28.3	30.3	28.9	27.9	26.9	27.1	26.8	27.8	28.9	29.0	29.3
100 cm	23.0	21.5	24.1	23.0	22.6	21.5	21.6	21.3	21.9	22.9	22.2	22.8
42 year mean 5 cm	28.9	28.3	27.7	27.3	26.1	24.5	23.6	24.7	26.3	28.2	30.3	31.0
42 " " 10 cm	28.1	28.5	27.5	26.8	24.7	24.6	23.8	24.6	26.6	27.2	28.1	29.9
42 " " 20 cm	28.9	30.0	28.8	28.2	26.9	25.9	26.7	25.9	27.0	28.3	30.0	30.7
Sunshine (hours)	3.7	5.4	7.7	6.4	7.5	6.5	8.4	6.4	6.0	7.4	6.6	5.6
41 years mean	6.4	6.3	6.8	7.0	5.6	8.4	7.6	7.7	7.3	8.3	6.5	7.8

Fig. 1: Lautoka Mill- 1999 Rainfall Distribution Compared With long Term Average Rainfall

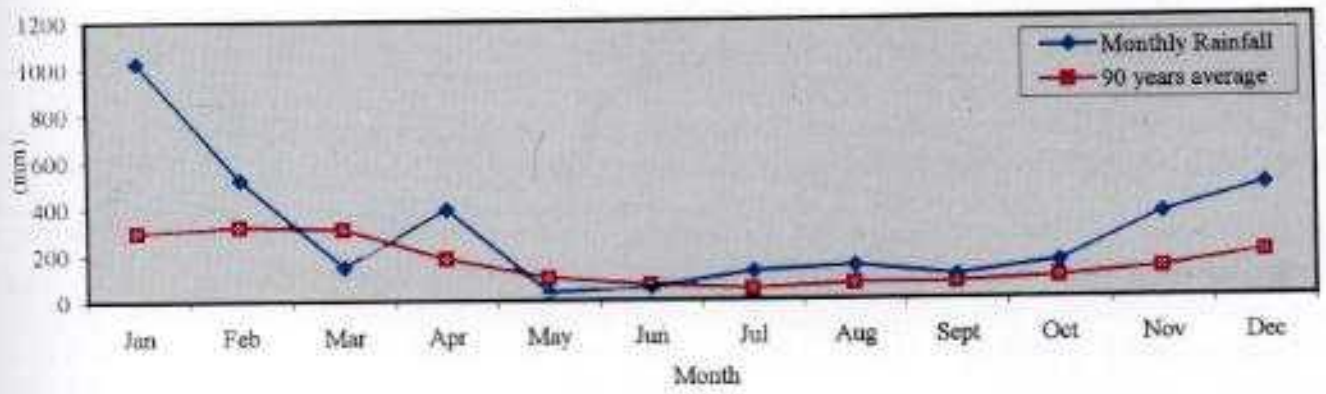


Fig. 2: Labasa Mill -1999 Raifall Distribution Compared with Long term Average Rainfall

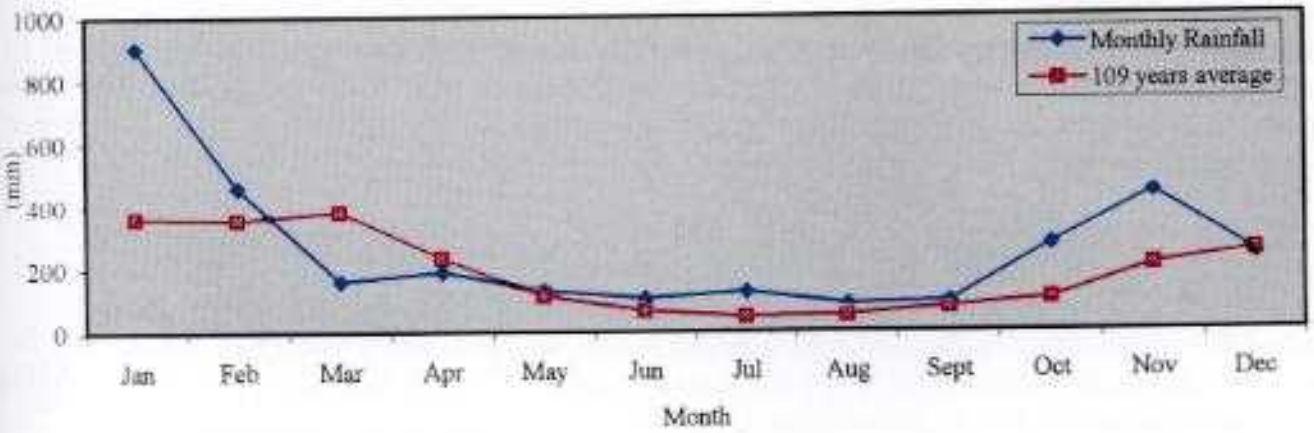


Fig. 3: Rarawai Mill- 1999 Rainfall Distribution Compared With Long Term Average Rainfall

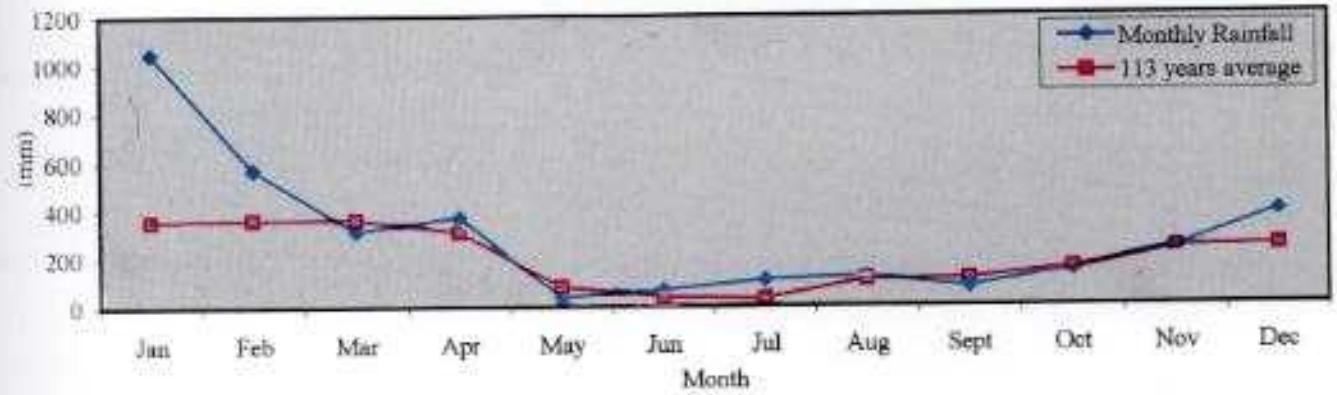
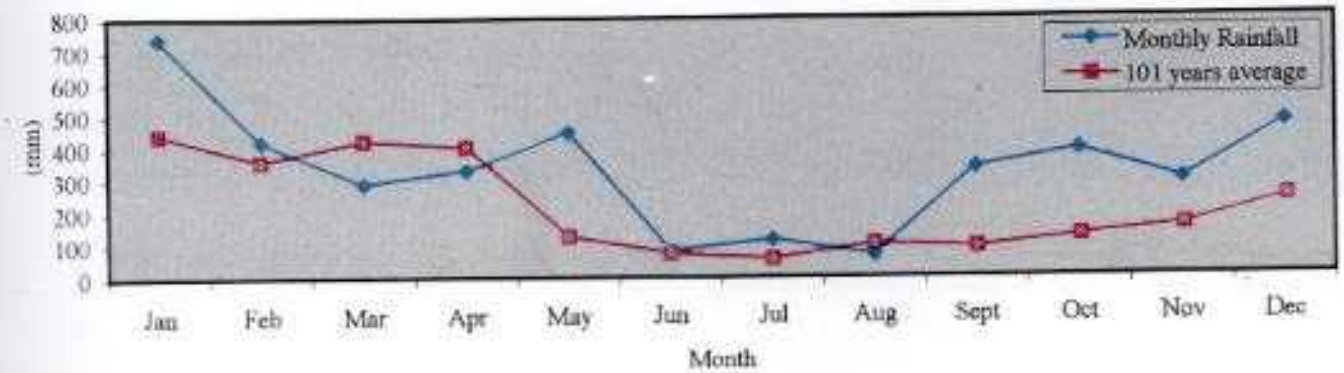


Fig. 4: Penang Mill- 1999 ranfall distribution Compared With long term average rainfall



PLANT BREEDING

Plant Breeding and Variety Programme

The plant breeding and variety selection programme progressed well during the year. The year series and corresponding stage in the programme are now in order.

Flowering

The breeding plot in Dobuilevu served as the main source of sugarcane flowers during the 1999 crossing season. Most of the flowers for setting crosses were harvested from the breeding plot that was established in 1998 and part from an old breeding plot. Thus, (90%) of the flowers were harvested from a total of 526 varieties present in the two breeding plots established in Dobuilevu. The remaining (10%) of the sugarcane flowers were harvested from the germplasm collection in Lautoka and the stage 4 and 5 variety trials at Rarawai and Legalega.

Crossing

A total of 429 crosses were made during the crossing season which lasted for about two months. Of the 429 crosses, 413 biparental crosses were made which accounted for 96% of the total crosses made during the season. The remainder (4%) were polycrosses.

Sugarcane Fuzz and Seedlings

Sugarcane fuzz was sown between 10 August and 9 September. A total of 520 families comprising of crosses made during the last four seasons were sown in the glasshouse of which 236 families germinated and produced approximately 35000 seedlings.

Varietal disposition

Table 1 shows the number of clones and the year series in the breeding and evaluation programme for stages I, II and III for the past six years.

Table 1 : Number of clones (1994 - 1999)

Stage	LF94	LF95	LF96	LF97	LF98 (ICT)	LF99
1	30504	39504	25614	30918	9012	32000
2	3165	1297	1708	1795	1388	
3	300	300	355			

Two stage 1 trials were evaluated during the 1999 season and these include the LF97 series which had free stooling and LF98 series intensive care trial (ICT) that had 2 stalk per stool supported on a trellis.

The LF97 series (free stooling) trial was supposed to be evaluated in 1998 but due to the severe drought, the evaluation had to be deferred for another year. However, the above trial was evaluated in September 1999 and from a total of 30918 clones planted, 1795 clones were selected for advancement to stage II. The selection of the clones for advancement to stage II was based on brix, vigor and disease incidence.

The LF98 series was evaluated according to the old plant breeding programme (ICT) using regression. The basis of selection for all populations in the stage 1 were on ratings arrived at after calculating for the standards against their known ratings. The ratings 0 to 9 were used where 0 indicated the best of performance and 9, the worst for brix whereas for fibre ratings 3 – 6 is preferred.
Once the standards were brixed and the fibre measured, the regression line was graphed. Figure 1 and 2 shows regression line graph for brix and fibre respectively for the standards.

Figure 1: Regression Line – Brix

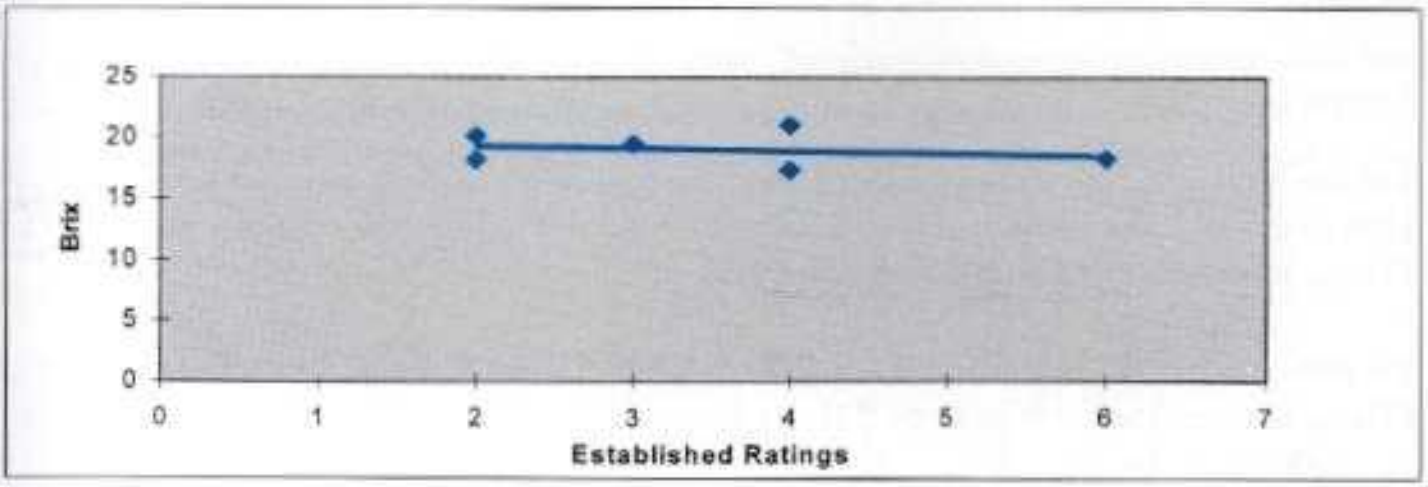
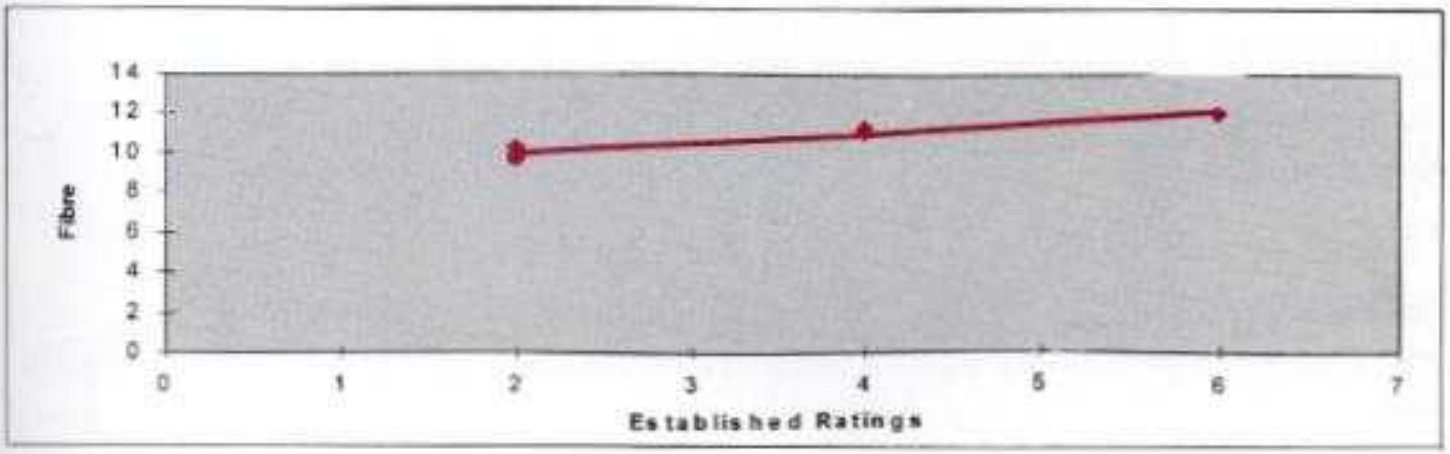


Figure 2: Regression line - Fibre



The following ratings for brix and fibre were obtained from figures 1 and 2.

Ratings	Brix	Fibre
1	> 21.0	11.0
2	20.6 - 20.8	11.5
3	20.0 - 20.4	12.0
4	19.6 - 19.8	12.5
5	19.0 - 19.4	13.0
6	18.6 - 18.8	13.5
7	18.0 - 18.4	10.5
8	17.4 - 17.8	10.0
9	< 17.2	< 9.5

A total of 9012 clones of the LF98 series was planted as an ICT in January 1999. The evaluation of this trial was carried out in November and from a total of 9012 clones planted, 1388 clones were selected for advancement to stage II. The selection of the clones for the advancement to stage II was based on brix and rind hardness ratings.

Stage II

Two new stage II trials were planted during the year and these include the LF97 series and LF98 series. The LF98 series stage II was planted in as ICT. A total of 1795 and 1388 varieties were selected from the LF97 and LF98 series respectively and planted in the stage II trials.

The above two trials will be evaluated in July 2000. Selection of clones from stage II for advancement to stage III in the LF97 series will be based on the following criteria:

- brixing in July
- field grading (early, mid and late)
- preliminary selection of 400 varieties based on brix and field grading that are sent to the small mill for bio-chemical analysis.
- final selection of 300 varieties based on POCS and ratoon observation.

In the LF98 (ICT) series, the selection of clones will be based on brix and rind hardness ratings and the selected clones will be advanced to stage III pot trials or lines.

Stage III

The stage III trials consisted of LF94 and LF95 series ratoon crop and LF96 series plant crop. Bio-chemical analysis of fibre content (%fibre), sucrose content (%POCS) and purity was carried out on all the stage III series.

standard was 13.73. Thus, of the 300 varieties sent to the small mill, 46 varieties had POCS greater than the average POCS of the standards and were advanced to the stage IV seedbed.

In the LF95 series, the sucrose content, (%POCS) ranged from 12.57 - 14.17 and the average POCS of the standard was 13.45. Thus, of the 300 varieties sent to the small mill, 93 varieties had POCS greater than the average POCS of the standards and were advanced to the stage IV seedbed.

For the LF96 series, all the 355 varieties were sent to the small mill for bio-chemical analysis and a preliminary selection of varieties for advancement to stage III seedbed was made on the plant data. The sucrose content, (%POCS) ranged from 11.10 - 11.86 and the average POCS of the standard was 11.52. Thus, from a total of 355 varieties, 116 varieties were planted in the stage III seedbed. The final selection will be carried out after ratoon observation in year 2000.

Stage IV LF94 and LF95 Series Seedbeds

The stage IV seedbeds consisted of LF94 and LF95 series. The selection of varieties for both the series were based on the POCS and field grading data for plant and ratoon crop. From the LF94 series 47 varieties were selected and from the LF95 series 93 varieties were selected and seedbeds were established in Waqadra. The stage IV trials of the above series will be planted in March / April next year at all the four mill centres.

IMPORTED VARIETIES FROM TAIWAN IN POST ENTRY QUARANTINE

VARIETY TESTING

Variety Trials

During the year six stage 4 and four stage 5 trials were planted and eleven stage 4 trials were harvested. In addition three stage 4 seedbeds were established.

Weather affecting trials

Above average rainfall was received during the year throughout the cane belt and the cane growth was vigorous in all the trials. Most of the varieties were lodged in all the trials and field observations of characteristics could not be assessed.

Stage 4 trials

Eleven stage 4 trials were harvested during the year, which comprised of second ratoon crop of LF89, LF90 and LF91 series. The cane in all these trials was severely lodged due to the vigorous growth. Proper harvesting for weighing was difficult. The consolidated plant, first and second ratoon results of the trials are presented in Tables 1, 2 and 3. The results indicate that 19 varieties have performed well. The sucrose content (POCS) data has been used to identify the promising varieties instead of sucrose yield data. The plot size of these trials was small and some cane had died over the trial duration. The sucrose yield data could not be relied upon; therefore some varieties with lower sucrose yield than the standards have been selected. The following varieties LF89-2488, LF90-254, 384 and LF91-1925 have already been advanced to the stage 5 trials last year. A seedbed of the remaining 15 varieties plus an additional 30 varieties that have performed on par with the standard commercial varieties and has not been included in the tables will be established next year for planting stage 5 trials in the year 2001.

Table 1 Consolidated (plant, first and second ratoon) results of LF89 series varieties selected for advancing to stage 5 seedbed

Variety	%Fibre	%POCS	Cane yield (tc/ha)	Sucrose yield (ts/ha)
LF89-1347	10.87	12.13	66	8.19
LF89-2008	9.90	11.73	67	8.43
LF89-2016	10.04	11.34	76	8.68
LF89-2025	10.14	11.88	81	9.74
LF89-2166	11.16	11.84	85	10.57
LF89-2488	11.19	11.97	71	8.46
LF57-5104*	10.84	11.00	73	7.89
LF60-3917*	9.82	11.04	78	8.99
LF73-229*	9.97	11.52	85	9.71

*The above results are the average of four trials each having two replications. *Standard varieties LF60-3917 (Mana), LF73-229 (Aiwa), LF57-5104 (Mali).*

Variety	%Fibre	%POCS	Cane yield (tc/ha)	Sucrose yield (ts/ha)
LF90-254	9.74	11.63	61	6.99
LF90-255	10.50	11.40	81	9.34
LF90-384	10.01	11.57	64	7.42
LF90-1779	10.20	11.71	91	10.68
LF90-1787	10.45	11.34	93	10.37
LF90-2048	11.57	12.23	92	11.03
LF57-5104*	10.88	10.50	76	7.74
LF60-3917*	9.98	11.60	95	10.94
LF73-229*	9.84	11.86	104	12.00

*The above results are the average of four trials each having two replications. *Standard varieties LF60-3917 (Mana), LF73-229 (Aiwa), LF57-5104 (Mali).*

Table 3 Consolidated (plant, first and second ratoon) results of LF91 series varieties selected for advancing to stage 5 seedbed

Variety	%Fibre	%POCS	Cane yield (tc/ha)	Sucrose yield (ts/ha)
LF91-531	13.13	11.56	92	10.47
LF91-654	11.69	11.69	67	7.99
LF91-1623	11.97	11.41	75	8.14
LF91-1925	12.05	12.05	109	13.23
LF91-3818	10.61	11.10	67	7.20
LF91-3904	11.47	11.49	66	7.37
LF91-4056	10.28	12.87	69	8.96
LF57-5104*	11.14	10.70	90	9.39
LF60-3917*	9.87	11.50	92	10.43
LF73-229*	10.49	11.46	104	11.52

*The above results are the average of four trials each having two replications. *Standard varieties LF60-3917 (Mana), LF73-229 (Aiwa), LF57-5104 (Mali).*

Stage 5 trials

Four stage 5 trials incorporating varieties selected from the consolidated plant and first ratoon results of the LF89, 90 and 91 series were planted at each mill centre. Varieties that have performed well in these trials in the second ratoon crop will be advanced to stage 5 trials in the year 2001. The trials will be analyzed over a three-year period starting in year 2000.

Promising Varieties

Seed material of two more promising varieties LF83-998 and LF82-2244 have been established and plans are to plant the large mill trial next year with Ragnar as the standard.

Large Mill Trial (LMT) and Release of the Promising variety

The large mill trial of the promising variety LF82-2122 was successfully carried out at Rarawai in July. The variety Ragnar was used as a standard. No problems were encountered in the milling operations of the promising variety. The results were highly encouraging and are summarized in Table 4.

Table 4: Comparative LMT results

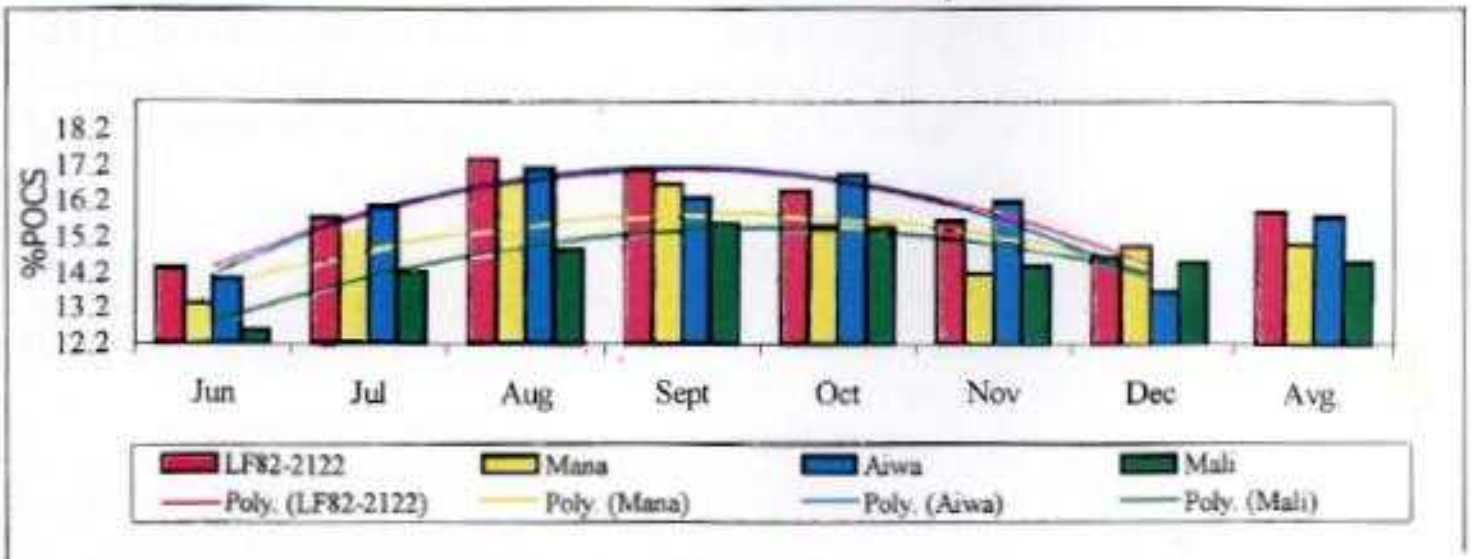
Varieties	Ragnar	LF82-2122
Cane yield tc/ha	123	129
% Fibre	10.71	11.43
% Cell breakage	89	87
large mill - POCS	12.89	12.70
- purity	87.2	87.1
small mill - POCS	15.14	15.38
- purity	87.7	89.9

LF82-2122 had a higher fibre percent than Ragnar. The fibre content of LF82-2122 is around the break-even point for Rarawai and this will contribute in saving fuel costs. The sucrose content (%POCS) of LF82-2122 was 12.70, which was almost on par with Ragnar 12.89 and was 12% higher than the mill POCS (10.92) for the particular week in which the LMT was conducted. The mill crushes selectively harvested cane in the early part of the season. In selective harvesting, early maturing and preferably ratoon cane is harvested ahead of plant cane. In the maturity pattern studies it was observed that the sucrose content of LF82-2122 is higher than the existing commercial cane throughout the season (refer Table 5 and Figure 1). This trend indicates that more sugar can be made from LF82-2122 compared to existing commercial cane. The promising variety LF82-2122 will be released for commercial planting next year. The characteristics and results of this variety are presented in Table 6 & 7 and Figure 2 & 3.

Table 5: Maturity data %POCS of LF82-2122 and commercials (plant and first ratoon)

Variety	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Avg.
LF82-2122	14.32	15.76	17.41	17.10	16.51	15.67	14.63	15.91
Mana	13.32	15.44	14.91	16.69	15.54	14.17	14.93	15.00
Aiwa	14.03	16.09	17.16	16.32	16.97	16.23	13.66	15.78
Mali	12.58	14.24	14.89	15.58	15.47	14.38	14.46	14.51

Figure 1: Maturity Trend of LF82-2122 and Commercial Varieties



Characteristic	Comment
Germination and growth	Quick germinating, grows vigorously in early stage with good leaf cover (canopy formation)
Trashing	Matured leaves are lightly clinging and could be easily removed
Adaptation	Wide adaptation - grows well on all major soil types
Habitat	Erect when germinating and remains the same during growing period
General appearance	Stalks are of uniform length in a stool and of medium thickness, yellowish green (unexposed) and changes to brownish red (exposed)
Leaves	Open, curved near the top and the blade is of medium thickness
Flowering	Flowers sparsely
Ratooning	Good ratooning ability (regrowth and yield)
Maturity pattern	Early maturing retains high sucrose content throughout crushing season
Cane and sucrose yield	Cane and sucrose yield is higher than existing commercial varieties
Disease resistance	Resistant to FIJ disease rating ❸ Intermediate to Downy Mildew rating ❺
Distinct feature	Long auricle *(Note – not seen at all times)*
Sheath hair	Dense sheath hair (Note- sheath hair falls as cane matures)

Table 7. Consolidated results of plant, first and second ratoon crop

Variety No.	% Fibre	%POCS	Cane yield tc/ha	Sucrose yield ts/ha
LF82-2122	11.39	14.57	119	16.66
Mana [3]	10.02	13.74	112	14.64
Aiwa	10.52	13.98	103	13.73
Mali	10.79	12.81	93	10.98

Results are average of three seasons i.e. plant, first and second ratoon from five locations each having three replications.

Figure 2: Consolidated cane yields of plant, first and second ratoon crop (tc/ha)

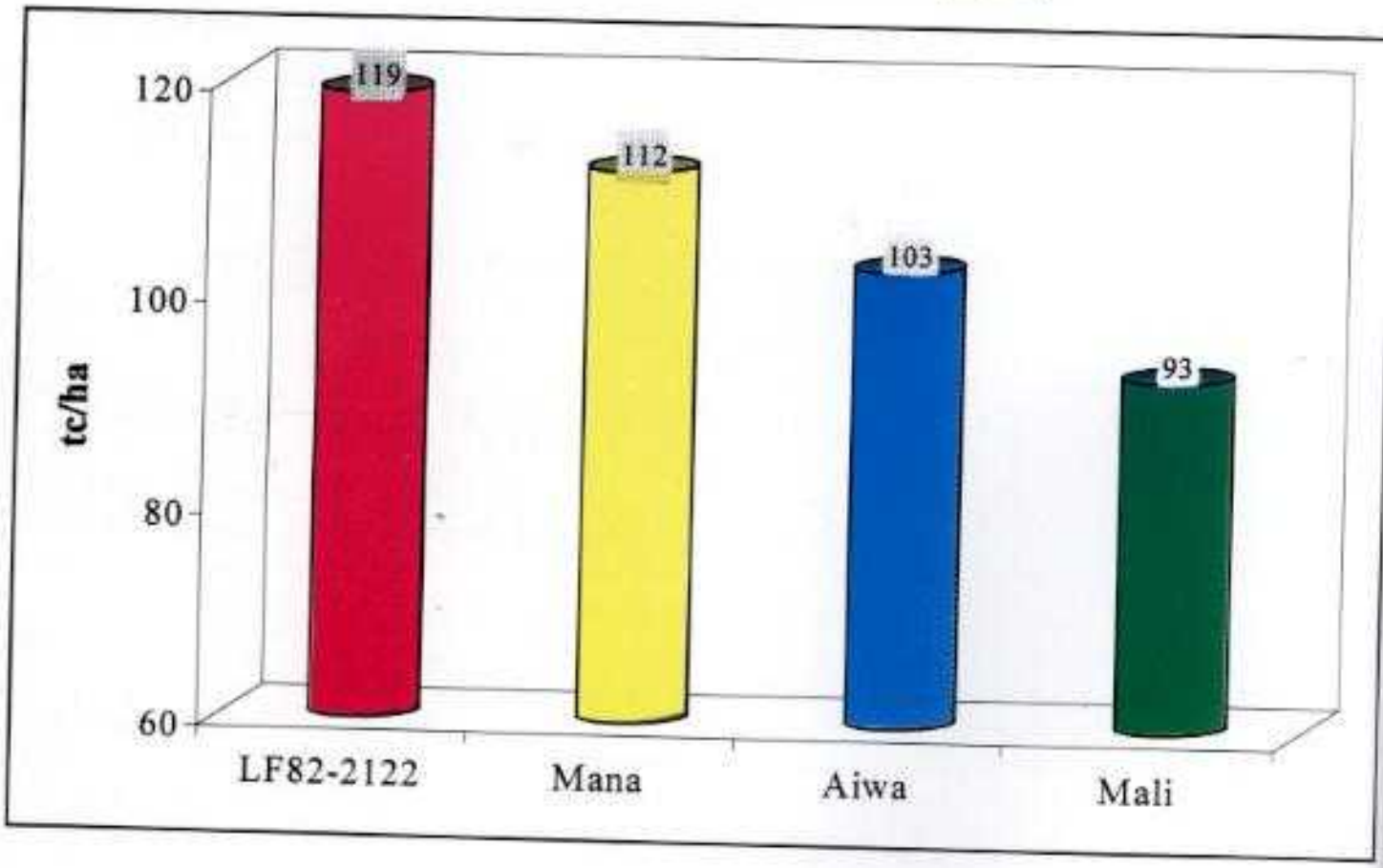
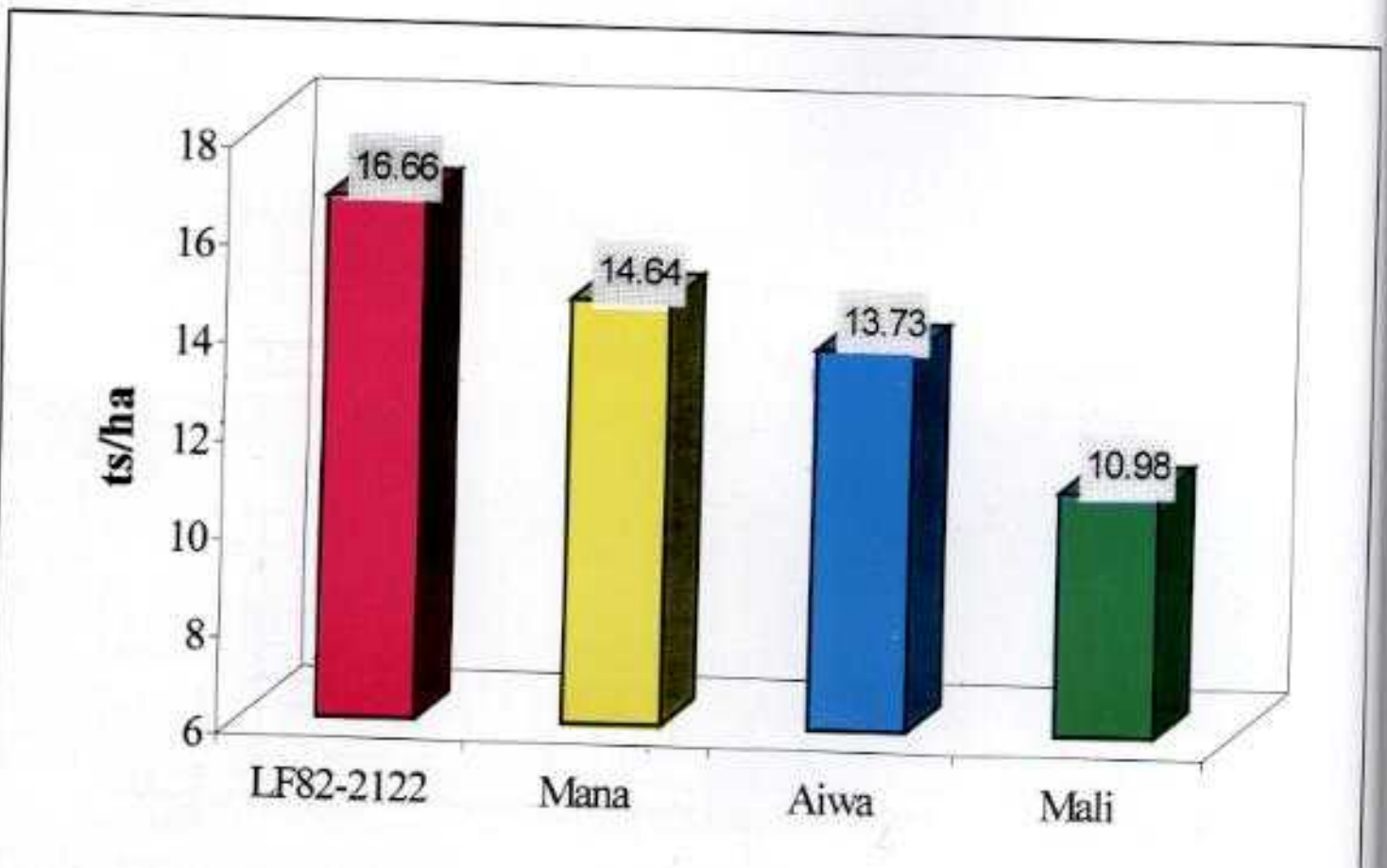


Figure 3: Consolidated sucrose yields of plant, first and second ratoon crop (ts/ha)



Appendix 1 : Main features of 1999 season compared with 1998

	Lautoka		Rarawai		Labasa		Penang		All mills	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Total registrations	8268	8284	5891	5883	5486	5493	2511	2518	22156	22178
Total farm basic allotments (tonnes)	1475647	1478873	1126274	1127037	1210123	1210093	424171	425371	4236215	4241374
Total registered area (tonnes)	33822	33887	25190	25172	25947	25979	11916	11941	96875	96979
Total area cultivated (hectares)	33433	33014	22453	22850	25576	27249	7606	11638	89068	94751
Total area harvested (hectares)	18956	22145	12809	16352	19874	20490	5400	5548	57039	64535
Total farm harvest quotas (tonnes)	Open	Open	Open	Open	Open	Open	Open	Open	Open	Open
Sugar make (Actual tonnes)	84397	1360403	50132	100987	93472	110173	27702	28938	255703	376501
Tonnes 94 N.T sugar	86214	139059	50809	102838	94486	111868	28228	30090	259737	383855
Yield tonnes 94 N.T. sugar per hectare	4.55	6.28	3.97	6.29	4.70	5.40	5.13	5.21	4.55	5.94
Tonnes cane per tonnes sugar 94 N.T.	7.26	10.31	7.98	9.65	8.91	10.83	8.27	11.72	8.08	10.31
%POCS	13.88	9.98	13.73	10.50	12.44	9.71	13.08	9.52	13.19	10.00
Cane purity average for season	84.10	80.10	83.30	82.90	81.80	78.60	84.00	79.50	83.30	80.40
Tonnes cane harvested	625763	1433143	406811	992968	832622	1192735	232825	339292	2098021	3958138
Tonnes cane crushed	626348	1433730	405715	992422	832735	1192735	233540	339251	2098338	3958138

Appendix 2: Crop production details

	Lautoka		Rarawai		Labasa		Penang		All mills	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Areas harvested (hectares)										
Plant	1548	5182	1187	4939	1679	4024	845	1383	5259	15528
First ratoon	1620	1561	1406	1346	2461	1832	1107	779	6594	5518
2nd ratoon	2272	1602	1826	1521	2550	2202	1055	944	7703	6269
Other ratoons	13516	13800	8390	8546	13184	12432	2393	2442	37483	37220
Total	18956	22145	12809	16352	19874	20490	5400	5548	57039	64535
Proportion of crop harvested according to area										
Plant	8.2	23.4	9.3	30.2	8.4	19.6	15.6	24.9	9.2	24.1
First ratoon	8.5	7.0	11.0	8.2	12.4	8.9	20.5	14.0	11.6	8.6
2nd ratoon	12.0	7.2	14.2	9.3	12.8	10.7	19.5	17.0	13.5	9.7
Other ratoons	71.3	62.4	65.5	52.3	66.4	60.8	44.4	44.1	65.7	57.6
Total	100	100	100	100	100	100	100	100	100	100
Yield tonnes per hectares harvested										
Plant	40.6	74.1	41.6	65.7	48.9	63.2	51.6	68.1	45.2	68.1
First ratoon	37.3	69.9	36.2	61.1	46.2	65.4	46.7	63.2	41.9	65.3
2nd ratoon	34.1	65.7	31.4	58.0	42.5	58.3	42.9	59.8	37.4	60.4
Other ratoons	31.5	60.5	29.7	58.3	40.1	55.5	38.6	57.1	34.6	58.1
Average yield/ha	33.0	64.7	31.8	60.7	41.9	58.2	43.1	61.2	36.8	61.3
Main varieties crushed according to tonnes(%)										
Ragnar	1.8	1.4	2.0	1.3	31.0	27.4	0.8	0.7	13.3	9.0
Ono	-	-	-	-	-	-	-	-	-	-
Yasawa	-	-	-	-	-	-	-	-	-	-
Waya	-	-	3.1	3.3	14.0	13.5	2.4	1.3	6.4	6.0
Spartan	-	-	-	-	-	-	-	-	-	-
Aiwa	1.6	2.3	1.9	2.4	0.1	0.1	0.5	1.1	1.0	1.6
Vómo	-	-	-	-	-	-	-	-	-	-
Mali	0.5	0.4	-	-	31.8	27.0	9.9	7.5	13.9	8.7
Galoa	0.3	0.3	-	-	4.4	5.1	0.2	0.4	1.9	1.7
Mana	88.7	88.6	87.4	86.3	0.1	0.1	81.0	85.1	52.5	60.6
Kaba	6.3	6.5	4.9	6.2	0.3	0.4	1.7	1.1	3.1	4.4
Vatu	0.1	-	-	-	15.9	22.9	3.3	2.7	6.7	7.0
Beqa	0.2	0.1	0.5	0.3	0.4	1.1	0.1	-	0.3	0.5
Expt./Others	0.5	0.4	0.2	0.2	2.0	2.4	0.1	0.1	0.9	0.5
Total	100	100	100	100	100	100	100	100	100	100

ll	For 12 months ended 31st December					For 12 months ended 30th September				
	01/01/99 to 31/12/99					01/10/98 to 30/09/99				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
utoka	1835	2243	2331	1214	3456	1474	1948	2663	614	3195
arawai	2314	2704	2641	1294	3340	1789	2622	2814	590	3483
abasa	2236	2714	2734	1555	3141	2431	2345	3119	974	3008
enang	2580	2404	3174	1274	3848	2139	2109	3488	1036	3104

Appendix 4: Monthly rainfall (mm) for 1999 compared with average since commencement of records (to nearest mm)

Mills	No. of years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Lautoka	90 yrs average to 1998	297	321	312	181	97	66	47	67	69	88	124	187	1856
	1999 actual	1018	517	139	388	26	50	115	136	92	149	354	473	3457
Rarawai	113 yrs average to 1998	350	358	357	303	76	34	25	98	105	150	229	237	2322
	1999 actual	1033	558	302	360	25	56	95	108	67	138	226	373	3341
Labasa	109 yrs average to 1998	360	356	381	233	111	65	45	51	75	102	208	250	2237
	1999 actual	897	452	154	182	125	99	119	81	89	271	435	239	3143
Penang	101 yrs average to 1998	438	354	417	398	119	67	50	95	85	121	152	236	2532
	1999 actual	730	409	274	318	437	72	102	55	324	379	287	462	3849

Appendix 5 : Rainfall distribution affecting 1999 crop(mm)

Month	Period	Lautoka	Rarawai	Labasa	Penang
July '98	Early	6.8	Nil	0.2	3.8
	Mid	Nil	Nil	0.2	6.0
	Late	0.2	1.4	0.3	2.2
August '98	Early	0.6	Nil	2.8	2.6
	Mid	Nil	Nil	Nil	0.2
	Late	Nil	0.8	0.3	10.2
September '98	Early	2.0	0.8	8.8	5.8
	Mid	Nil	53.6	Nil	89.2
	Late	21.1	27.1	76.3	74.9
October '98	Early	38.0	44.8	0.5	7.4
	Mid	Nil	1.6	50.8	14.8
	Late	Nil	Nil	32.7	Nil
November '98	Early	0.1	111.9	85.7	15.2
	Mid	445.1	357.3	83.9	108.2
	Late	36.0	28.7	12.0	1.3
December '98	Early	48.8	56.0	125.4	65.2
	Mid	65.0	72.0	141.4	86.5
	Late	82.5	208.4	277.8	87.0
January '99	Early	147.3	133.0	64.7	112.2
	Mid	652.1	648.7	535.7	401.2
	Late	218.1	228.8	296.6	216.4
February '99	Early	237.8	216.2	94.1	115.6
	Mid	266.5	285.2	278.0	271.5
	Late	12.2	56.3	79.7	22.0
March '99	Early	53.2	111.1	39.5	34.6
	Mid	29.1	113.8	77.1	64.4
	Late	56.3	75.1	37.0	174.6
April '99	Early	124.4	105.0	77.2	87.8
	Mid	141.6	95.1	34.2	106.5
	Late	122.2	162.6	71.0	123.2
May '99	Early	22.0	15.0	20.6	33.4
	Mid	1.4	Nil	1.7	5.6
	Late	2.9	10.3	102.4	397.6
June '99	Early	48.2	48.0	84.4	71.6
	Mid	Nil	7.5	14.6	Nil
	Late	1.4	Nil	Nil	Nil
July '99	Early	Nil	4.8	2.9	2.0
	Mid	27.0	24.8	77.5	21.6
	Late	88.0	65.0	38.5	31.2
August '99	Early	52.7	61.2	35.1	55.8
	Mid	50.7	36.8	31.0	12.2
	Late	32.8	9.7	14.7	30.8
September '99	Early	42.8	32.5	32.4	159.8
	Mid	17.2	20.4	7.6	20.0
	Late	31.6	14.1	49.1	143.8
October '99	Early	38.3	54.7	122.0	135.8
	Mid	5.3	35.7	95.6	29.0
	Late	105.6	46.0	52.9	214.6
November '99	Early	206.8	83.4	79.8	97.2
	Mid	101.7	79.1	141.6	117.4
	Late	45.9	63.7	213.3	72.8
December '99	Early	323.5	224.6	101.2	315.6
	Mid	110.0	121.9	100.0	74.4
	Late	39.8	26.8	37.7	72.2
Total		4202.6	4281.3	4040.5	4424.9

ills		Average for period of five seasons					Last five seasons individually				
		1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
utoka	Plt	4462	5962	5904	4007	3634	2764	3198	2030	1548	5182
	Rtn	13804	15370	18108	19743	20580	21628	21970	22949	17408	16963
	Total	18266	21332	24012	23750	24214	24392	25168	24979	18956	22145
rawai	Plt	3432	4122	4463	3574	2899	2268	2791	2250	1187	4939
	Rtn	10519	12256	13836	14805	17360	18161	17794	18302	11622	11413
	Total	13951	16378	18299	18379	20259	20429	20585	20552	12809	16352
basa	Plt	1790	2736	2365	2512	3120	2643	2767	2446	1679	4024
	Rtn	7817	11300	16306	17181	19604	20303	19310	19480	18195	16466
	Total	9607	14036	18671	19693	22724	22946	22077	21926	19874	20490
nang	Plt	1030	1474	1697	1396	1386	1120	1187	1031	845	1383
	Rtn	2490	2903	4036	5029	4958	5090	4964	4824	4555	4165
	Total	3520	4377	5733	6425	6344	6210	6151	5855	5400	5548
ll mills	Plt	10714	14294	14429	11489	11039	8795	9943	7757	5259	15528
	Rtn	34630	41829	52286	56758	62502	65182	64038	65555	51779	49007
	Total	45344	56123	66715	68247	73541	73977	73981	73312	57038	64535

ppendix 7 : Tonnes of cane harvested

Mills	Average for period of five seasons					Last five seasons individually				
	1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
autoka	936340	1213388	1254266	104894	1283569	1515880	1561446	1160879	625763	1433124
arawai	757596	890130	984244	1006366	1017374	1044098	1229978	906495	406811	992857
abasa	453388	707813	980634	1015166	1166055	1216290	1238443	910137	832622	1192688
enang	173214	243115	310406	332592	291206	333790	349348	302083	232825	339286
ll mills	2320538	3045446	3529550	2459018	3758204	4110058	4379215	3279594	2098021	3957955

Appendix 8 : Tonnes of cane per hectare harvested

Mills		Average for period of five seasons					Last five seasons individually				
		1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
Lautoka	Plt	58.1	65.6	61.7	65.4	64.7	74.5	75.5	58.6	40.6	74.1
	Rtn	48.4	52.5	48.0	54.2	51.2	60.6	60.1	45.4	32.3	61.8
	Total	50.5	56.1	51.4	55.5	52.4	62.1	62.0	46.5	33.0	64.7
Rarawai	Plt	65.5	66.1	65.1	64.3	61.2	61.2	73.6	54.5	41.6	65.7
	Rtn	50.0	49.7	51.3	52.0	48.1	49.8	57.6	42.8	30.8	58.6
	Total	53.5	54.4	53.3	54.2	50.1	51.1	59.8	44.1	31.8	60.7
Labasa	Plt	54.7	61.7	63.9	58.9	59.3	64.5	66.9	48.3	48.9	63.2
	Rtn	44.1	47.3	50.8	51.5	50.4	51.5	54.5	40.7	41.2	57.0
	Total	46.4	50.4	52.5	51.5	51.3	53.0	56.1	41.5	41.9	58.2
Penang	Plt	58.2	61.5	63.3	63.1	57.2	63.7	68.3	61.9	51.6	68.1
	Rtn	44.0	48.4	50.5	48.6	43.1	51.6	54.0	49.4	41.6	59.9
	Total	48.2	52.7	54.3	51.1	46.0	53.7	56.3	51.6	43.1	61.2
All mills	Plt	60.1	64.7	63.5	62.6	61.2	66.7	71.7	54.6	45.2	68.1
	Rtn	47.3	48.8	49.5	55.8	48.1	54.1	57.2	43.6	35.9	59.2
	Total	50.3	53.0	52.6	53.3	50.2	55.6	59.2	44.7	36.8	61.3

Appendix 9 : Hectares harvested in relation to contract and cultivated area (ha)

Mills	1999 hectares (A)				Hectares harvested as % various categories "A"	
	Contract (1)	Cultivated (2)	Harvested		(1)	(2)
Lautoka	33887	33014	22145		65	67
Rarawai	25172	22850	16352		65	72
Labasa	25979	27249	20490		79	75
Penang	11941	11638	5548		46	48
Total	96979	94751	64535	Mean %	67	68

Mills	Rough average for period of five seasons					Last five seasons individually				
	1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
Lautoka	25	28	26	17	15	12	13	8	8	23
Rarawai	25	25	24	19	14	11	14	11	9	30
Labasa	18	20	11	13	14	11	13	11	8	20
Penang	27	34	29	22	23	18	19	18	16	25
All mills	24	26	21	17	16	12	13	11	9	24

Appendix 11: Plant and ratoon yields and percentage of total area harvested

Mills	Plant		First ratoon		Other ratoons		All cane	
	Tc/ha	% Area	Tc/ha	% Area	Tc/ha	% Area	Tc/ha	% Area
Lautoka	74.1	23	69.9	7	60.5	70	64.7	100
Rarawai	65.7	30	61.1	8	58.3	62	60.7	100
Labasa	63.2	20	65.4	9	55.5	71	58.2	100
Penang	68.1	25	63.2	14	57.1	61	61.2	100
All Mills	68.1	24	65.3	9	58.1	67	61.3	100

Appendix 12: Weekly POCS in cane 1999 season

Week no.	Week ending	Lautoka	Rarawai	Labasa	Penang
1	31/05/99	-	-	8.97	-
2	07/06/99	9.94	9.35	8.58	9.02
3	14/06/99	10.44	9.63	9.08	9.03
4	21/06/99	10.41	9.77	9.34	9.21
5	28/06/99	10.55	10.29	9.79	9.17
6	05/07/99	10.50	10.69	9.81	9.65
7	12/07/99	10.82	10.92	10.00	10.10
8	19/07/99	11.31	11.01	10.48	10.36
9	26/07/99	11.13	11.60	10.47	10.53
10	02/08/99	11.65	11.85	10.20	10.99
11	09/08/99	11.71	11.66	10.24	10.93
12	16/08/99	11.48	12.07	10.51	11.32
13	23/08/99	11.62	12.00	10.93	11.10
14	30/08/99	11.59	11.91	10.87	10.55
15	06/09/99	11.46	11.47	10.47	10.74
16	13/09/99	11.56	11.61	10.45	10.45
17	20/09/99	11.25	11.11	10.58	10.11
18	27/09/99	11.14	10.96	10.40	10.02
19	04/10/99	11.13	10.85	10.69	9.76
20	11/10/99	10.92	10.77	9.92	9.37
21	18/10/99	10.57	10.34	10.41	9.32
22	25/10/99	9.98	10.10	10.33	9.50
23	01/11/99	9.91	10.15	10.22	8.94
24	08/11/99	9.28	9.62	10.10	8.20
25	15/11/99	8.73	9.27	9.77	7.43
26	22/11/99	9.01	8.26	9.44	7.64
27	29/11/99	8.73	8.12	9.33	7.43
28	06/12/99	9.96	8.00	8.91	6.59
29	13/12/99	6.86		8.62	6.79
30	20/12/99	8.58		8.92	6.97
31	27/12/99	7.31		8.41	
32	03/01/00	7.42		8.13	
33	10/01/00	6.61		6.43	
34	17/01/00	6.07		6.93	
35	24/01/00	7.18		6.87	
36	31/01/00	5.58		6.58	
37	07/02/00	6.27		6.90	
Seasonal average		**9.98**	**10.50**	**9.71**	**9.52**

	Rough average for period of five seasons					Last five seasons individually				
	1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
	13.35	13.00	12.19	12.00	12.50	11.73	11.45	11.80	13.88	9.98
	13.17	13.10	12.12	12.09	12.90	12.39	11.34	12.01	13.73	10.50
	12.49	12.47	12.20	12.37	12.12	11.55	10.45	11.90	12.44	9.71
	12.84	13.00	12.28	12.15	12.59	12.11	11.38	11.92	13.08	9.52
ll Avg.	13.09	12.90	12.15	12.27	12.51	11.88	11.15	11.90	13.19	10.00

ndix 14 : Sugar produced (tonnes 94 N.T. equivalent) from area harvested

	Tonnes sugar 94 N.T equivalent						
	1993	1994	1995	1996	1997	1998	1999
oka	160251	175524	164254	166776	124818	86214	139059
wai	128510	150531	123950	135132	99454	50809	102838
asa	134547	156733	135566	122415	97114	94486	111868
ang	26346	42620	39303	37990	33011	28228	30090
mills	449654	525408	463073	462313	354397	259737	383855

endix 15 : Sugar per hectare harvested (tonnes 94 N.T equivalent)

ls	Average for period of five seasons					Last five seasons individually				
	1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
toka	6.82	7.63	5.97	6.55	6.15	6.73	6.63	5.00	4.55	6.28
awai	6.95	6.64	6.38	6.36	6.29	6.07	6.62	4.84	3.97	6.29
asa	5.92	6.07	6.20	6.20	6.00	5.91	5.55	4.43	4.70	5.40
ang	6.30	6.91	6.34	5.70	5.47	6.33	6.18	5.63	5.13	5.21
rage	6.62	6.75	6.21	6.28	6.05	6.26	6.25	4.83	4.55	5.94

Appendix 16 : Length of season (weeks) - Start and finish of crushing (date)

Mills	Rough average for period of five seasons					Last five seasons individually				
	1971/75	1976/80	1981/85	1986/90	1991/1995	1995	1996	1997	1998	1999
Lautoka	29.0	32.4	29.3	28.8	28.0	33.7 Jun 13 Feb 3	34.0 Jun 4 Jan 27	32.8 Jun 10 Jan 26	15.4 Jul 21 Nov 06	35.3 Jun 1 Feb 3
Rarawai	29.8	32.9	26.4	26.2	25.3	26.7 Jun 13 Dec 17	29.8 Jun 4 Dec 30	27.9 Jun 10 Dec 22	11.4 Jul 30 Oct 18	26.3 Jun 1 Dec 2
Labasa	26.8	33.5	27.9	26.6	29.4	32.1 Jun 6 Jan 15	36.1 Jun 5 Feb 6	29.2 Jun 17 Jan 8	26.4 Jul 13 Dec 31	37.0 May 25 Feb 7
Penang	27.6	30.3	28.1	25.5	21.5	25.0 Jun 6 Nov 11	25.7 Jun 4 Dec 1	27.0 Jun 10 Dec 16	21.1 Jun 24 Nov 19	29.0 Jun 1 Dec 15
All mills	28.3	32.3	28.4	26.8	26.1	29.4	31.4	29.2	18.6	31.9

Appendix 17 : Varietal performance

Varieties	Percent of hectares harvested									
	Lautoka		Rarawai		Labasa		Penang		All Mills	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Ragnar	1.8		2.0		31.0		0.8	0.6	11.3	9.3
Waya	-		3.1		14.0		2.4	1.4	6.5	6.0
Mali	0.5		-		31.8		9.9	8.4	12.5	9.8
Homer	-		-		-		-	-	-	-
Spartan	-		-		-		-	-	-	-
Galoa	0.3		-		4.4		0.2	0.1	1.5	1.7
Aiwa	1.6		1.9		0.1		0.5	0.9	1.0	1.6
Ono	-		-		-		-	-	-	-
Yasawa	-		-		-		-	-	-	-
Vomo	-		-		-		-	-	-	-
Mana	88.7		87.4		0.1		81.0	84.1	57.2	59.0
Kaba	6.3		4.9		0.3		1.7	1.0	3.0	4.3
Vatu	0.1		-		15.9		3.3	2.9	5.8	7.3
Beqa	0.2		0.5		0.4		0.1	0.1	0.3	0.6
Exp.	0.2		-		0.1		-	-	0.1	0.1
Other varieties	0.3		0.2		1.9		0.1	0.5	0.8	0.3

Mills	Hectares planted (A)					A as percentage of registered area					A as percentage of area cultivated				
	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999	1995	1996	1997	1998	1999
Lautoka	3242	1995	2334	5634	2570	10	6	7	17	8	9	6	7	17	8
Rarawai	2857	2322	2138	5467	5115	11	9	9	22	20	11	9	9	24	22
Labasa	3070	2791	2139	4385	2299	12	11	8	17	9	11	11	8	17	8
Penang	1290	1158	1229	1625	1366	10	10	10	14	11	17	16	16	21	12
Total	10459	8266	7840	17111	11350	11	9	9	18	12	12	9	10	19	12

Appendix 19: Planting - varieties (percentage of total acreage planted)

Year	Varieties	Lautoka	Rarawai	Labasa	Penang	All mills
1997	Ragnar	0.7	0.9	31.2	0.3	9.0
1998	Ragnar	0.5	0.5	20.2	0.4	5.2
1999	Ragnar	0.3	1.1	22.6	0.2	1.0
1997	Waya	-	4.7	14.7	3.3	5.8
1998	Waya	-	4.4	15.1	1.7	5.1
1999	Waya		4.3	22.6	3.0	7.3
1997	Mana	83.4	81.6	-	81.6	59.8
1998	Mana	79.9	81.3	-	80.4	60.2
1999	Mana	87.3	81.7	-	85.0	67.2
1997	Galoa	0.5	-	5.7	0.9	1.8
1998	Galoa	0.4	-	3.1	0.5	1.6
1999	Galoa	0.2	-	5.9	0.6	1.4
1997	Vatu	-	-	22.1	2.2	6.4
1998	Vatu	-	-	36.5	2.8	9.8
1999	Vatu			23.9	1.8	5.6
1997	Mali	1.0	-	21.9	8.7	7.6
1998	Mali	0.9	-	17.9	8.2	5.6
1999	Mali	0.4	-	15.6	6.8	4.4
1997	Aiwa	4.3	2.4	0.8	1.5	2.3
1998	Aiwa	4.8	3.0	1.1	3.3	3.5
1999	Aiwa	4.1	3.6	1.1	1.2	4.3
1997	Beqa	0.3	0.3	2.3	0.2	0.8
1998	Beqa	-	-	4.1	0.1	1.2
1999	Beqa			7.7	0.1	1.8
1997	Kaba	9.2	10.1	0.6	1.3	5.8
1998	Kaba	12.9	10.5	0.7	2.5	7.7

Appendix 20 : Cane transport in Fiji (tonnes of cane harvested and actual method of delivery)

Mills		Delivered portable line		Winch trailer or lorry to mainline		Road transport direct to mill carrier		Total	
	Year	Tonnes	% of Total	Tonnes	% of Total	Tonnes	% of Total	Tonnes	% of Total
Lautoka	1995	177975	12	756785	50	581120	38	1515880	100
	1996	137109	9	785808	50	638529	41	1561446	100
	1997	105033	9	577412	50	478434	41	1160879	100
	1998	62457	10	236254	38	327052	52	625763	100
	1999	143312	10	697537	49	592275	41	1433124	100
Rarawai	1995	81294	8	457224	44	505580	48	1044098	100
	1996	120111	10	509453	41	600414	49	1229978	100
	1997	58117	6	367128	40	481250	53	906495	100
	1998	31089	8	133117	33	242605	60	406811	100
	1999	79670	8	419542	42	493645	50	992857	100
Labasa	1995	68619	6	466141	38	681530	56	1216290	100
	1996	125342	10	419912	34	693189	56	1238443	100
	1997	40227	4	351235	39	518675	57	910137	100
	1998	40831	5	325731	39	466060	56	832622	100
	1999	69008	6	463605	39	660075	55	1192688	100
Penang	1995	29551	9	63796	19	240443	72	333790	100
	1996	23316	7	70997	20	255035	73	349348	100
	1997	22539	7	64631	21	214913	71	302083	100
	1998	17059	7	38047	16	177721	76	232827	100
	1999	23375	7	65366	19	247545	74	339286	100
All mills	1995	357439	9	1743946	42	2008673	49	4110058	100
	1996	405878	9	1786170	41	2187167	50	4379215	100
	1997	225916	7	1360406	41	1693272	52	3279594	100
	1998	151436	7	733149	35	1213438	58	2098023	100
	1999	315365	8	1646050	42	1993540	50	3957955	100

Year	Lautoka	Rarawai	Labasa	Penang	All Mills
1968	14.9	17.8	0.5	11.0	11.1
1969	8.7	8.9	0.6	4.7	5.7
1970	18.7	26.1	6.4	12.9	16.0
1971	10.7	13.4	0.9	8.9	8.5
1972	17.0	22.4	2.7	4.6	11.7
1973	24.9	36.5	5.1	20.7	21.8
1974	18.2	29.1	3.6	14.1	16.3
1975	12.9	28.0	4.9	15.1	15.2
1976	17.7	28.9	6.9	11.8	16.3
1977	19.1	25.3	9.6	8.2	15.6
1978	14.9	25.9	9.6	15.0	16.4
1979	21.5	27.4	16.0	18.0	20.7
1980	17.6	21.2	19.4	17.0	18.8
1981	23.2	24.8	13.6	13.2	18.7
1982	18.3	18.4	18.0	12.0	16.7
1983	25.1	8.2	12.9	10.0	14.1
1984	28.6	25.2	22.4	16.2	23.1
1985	29.5	15.1	15.1	11.3	17.8
1986	23.8	34.2	20.9	19.0	24.5
1987	37.7	15.2	16.0	19.2	22.0
1988	20.6	13.6	12.7	10.0	14.2
1989	24.3	30.4	13.7	14.6	20.8
1990	42.5	46.4	32.0	27.6	37.1
1991	52.5	52.1	44.4	41.1	47.5
1992	35.6	33.4	29.2	19.4	29.4
1993	39.0	36.0	27.0	19.8	30.5
1994	43.4	42.5	37.6	28.7	38.1
1995	54.8	48.1	39.9	33.2	44.0
1996	50.7	49.1	33.5	34.8	42.0
1997	67.0	67.7	54.5	44.6	58.5
1998	74.6	86.8	47.0	45.9	62.8
1999	41.6	39.8	17.1	26.3	32.4

APPROVED CANE VARITIES

Sugarcane varieties approved for planting during 2000 are - Mana, Aiwa, Beqa, Galoa, Kaba, Mali, Ragnar, Vatu, Yasawa, Waya, Spartan, Ono, Vomo, Homer and Naidiri. Varieties are recommended to growers based on their soil type, giving a choice of at least three varieties as laid down in the Master Award.

LAUTOKA MILL

Olosara

Rich alluvial soils	Ragnar, Yasawa, Aiwa, Beqa, Vomo, Kaba, Naidiri
Medium soils	Kaba, Mali, Beqa, Ragnar, Mana, Aiwa, Naidiri
Poor soils	Mana, Mali, Kaba, Naidiri

Cuvu

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Mali, Beqa, Ragnar, Mana, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Naidiri
Sandy soils	Kaba, Mana, Galoa, Naidiri

Lomawai

Flat : Fertile soils	Ragnar, Yasawa, Kaba, Vomo, Aiwa, Beqa, Naidiri
Medium soils	Kaba, Mali, Beqa, Ragnar, Mana, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Naidiri
Sandy soils	Kaba, Mana, Galoa, Naidiri

Yako

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri
Sandy soils	Kaba, Mana, Galoa, Naidiri

Nawaicoba

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri
Sandy soils	Kaba, Mana, Galoa, Naidiri

Malolo

Flat : Fertile soil	Ragnar, Yasawa, Vomo, Vatu, Kaba, Aiwa, Beqa, Naidiri
Medium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Mana, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

oa

alluvial soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
ium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Mana, Aiwa, Naidiri
soils	Kaba, Mali, Mana, Naidiri

unvah

: Fertile soils	Ragnar, Kaba, Yasawa, Vomo, Vatu, Aiwa, Beqa, Naidiri
ium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
soils	Kaba, Mali, Mana, Homer, Naidiri

ilega

: Fertile soils	Ragnar, Yasawa,Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
lium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
r soils	Kaba, Mali, Galoa, Homer, Naidiri

iva

: Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
lium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
r soils	Kaba, Mali, Mana, Homer, Naidiri
dy soils	Kaba, Mana, Galoa, Naidiri

toka

: Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
dium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
r soils	Kaba, Mali, Mana, Homer, Naidiri

eni

: Fertile soils	Ragnar, Yasawa, Vatu, Vomo, Aiwa, Beqa, Kaba, Naidiri
dium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa, Naidiri
r soils	Kaba, Mali, Mana, Homer, Naidiri
dy soils	Kaba, Mana, Galoa, Naidiri

u

: Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
dium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Mana, Aiwa,Naidiri
r soils	Kaba, Mali, Mana, Homer, Naidiri

va

: Fertile soils	Ragnar, Yasawa, Vatu, Kaba, Aiwa, Beqa, Naidiri
dium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Mana, Aiwa, Naidiri
r soils	Kaba, Mali, Mana, Homer, Naidiri
ne soils	Kaba, Mana, Galoa, Naidiri

RARAWAI MILL

Varoko

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Mota

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Naloto

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Koronubu

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Veisaru

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Rarawai

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Varavu

Flat : Fertile soils	Ragnar, Yasawa, Spartan, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri

Tagitagi

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Mali, Vatu, Beqa, Ragnar, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Homer, Naidiri
Salt affected areas	Kaba, Mana, Galoa, Naidiri

Yaladro

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Mali, Vatu, Aiwa, Naidiri

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Kaba, Ragnar, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Kaba, Mali, Mana, Waya, Vatu, Homer, Naidiri
Salt affected areas	Kaba, Mana, Galoa, Naidiri

LABASA MILL

Waigele

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Homer, Naidiri

Wailevu

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Homer, Naidiri
Saline soils	Mali, Galoa, Vatu, Naidiri

Vunimoli

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Homer, Naidiri

Labasa

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Homer, Naidiri
Saline soils	Mali, Galoa, Vatu, Naidiri

Bucaisau

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Waya, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Waya, Homer, Naidiri
Saline soils	Mali, Galoa, Waya, Vatu, Naidiri

Wainikoro

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Waya, Aiwa, Beqa, Naidiri
Poor soils	Mali, Kaba, Waya, Homer, Naidiri
Saline soils	Mali, Galoa, Waya, Vatu, Naidiri

Daku

Flat : Fertile soils	Ragnar, Yasawa, Vomo, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Spartan, Kaba, Mali, Waya, Aiwa, Beqa, Naidiri
Poor soils	Mali, Galoa, Waya, Vatu, Homer, Naidiri

Seaqaqa District

Poor soils	Ragnar, Mali, Ono, Kaba, Aiwa, Beqa, Homer, Naidiri

PENANG MILL

Nanuku

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Waya, Kaba, Mali, Vatu, Aiwa, Naidiri
Poor soils	Waya, Mana, Kaba, Mali, Homer, Naidiri
Salt affected areas	Mana, Kaba, Galoa, Naidiri
Viti Vanua area	Mana, Kaba, Mali, Ragnar, Naidiri

Malau

Rich alluvial soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Waya, Ragnar, Kaba, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Mana, Kaba, Mali, Homer, Naidiri
Salt affected areas	Galoa, Kaba, Mana, Naidiri

Ellington I & II

Flat : Fertile soils	Ragnar, Yasawa, Vatu, Aiwa, Beqa, Kaba, Naidiri
Medium soils	Waya, Ragnar, Kaba, Mali, Vatu, Beqa, Aiwa, Naidiri
Poor soils	Mana, Kaba, Mali, Homer, Naidiri
Salt affected areas	Galoa, Mana, Kaba, Naidiri

A COMMON LEAF DISEASE CAUSED BY LEAF MINOR TUNNELLING IN THE MID-RIB CAUSING FUSARIUM SACCHARI INFECTION.