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SUGAR INDUSTRY RESEARCH INSTITUTE

Dr Earle Roberts - Director of Research

CENTRAL SERVICES

ADMINISTRATIVE SERVICES

K. O'Gilvie	Administrative Manager
J. Seaton	Executive Secretary
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D. Hepburn	Clerk/Typist
C. Johnson	Driver
V. Blake	Custodian
D. Baker	Office Helper
O. Valentine	Secretary
M. Francis	Driver
E. Spencer	General Assistant
E. Lurch	Office Assistant
D. Gowan	Library Clerk
C. Newman	Typist/Receptionist

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A. Lawson	Laboratory Supervisor
Y. Berry	Laboratory Analyst**
M. McDonald	Laboratory Analyst
G. Allen	Laboratory Analyst*
J. Saunches	Laboratory Assistant
O. Lurch	General Assistant
B. Morris	Laboratory Assistant
S. Latchman	Laboratory Analyst
M. Richards	Laboratory Analyst

ECONOMICS & STATISTICS

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V. Smith	Snr. Statistical Clerk
N. Kerr	Statistical Clerk

INFORMATION SYSTEMS

O. Brown	Head of Department
D. McHayle	Programmer/Analyst
P. Kantu	Programmer/Analyst
B. Braham	Information Proc. Officer
D. Shady	Programmer

AGRICULTURAL SERVICES DIVISION

Mr Trevor Falloon - Agricultural Services Manager

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P. Wright	Snr. Area Agronomist
E. Henry	Area Agronomist
P. White	Area Agronomist
D. Golding	Area Agronomist
J. Fearon	Area Agronomist
M. Prince	Area Agronomist
W. Fray	Area Agronomist
N. Gordon	Area Agronomist
C. Spencer	Extension Officer
H. Headley-Lewin	Clerical Assistant*
B. Jackson	Clerical Assistant

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L. Pinnock	Field Officer
K. Grant	Asst. Field Officer
C. Brown	Asst. Field Officer
C. Lawson	Farm Manager
L. Agra	Consultant

AGRONOMY

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C. Fearon	Nutrition Agronomist
M. Lewis	Physiologist
U. Green	Agronomist
K. McPherson	Snr. Field Officer
C. Coleman	Field Assistant
R. Dixon	Asst. Field Officer
O. Wright	Field Assistant
D. Wright	Field Officer

ENTOMOLOGY

T. Falloon	Head of Department
A. Clarke	Laboratory Technician*
C. McNeil	Laboratory Technician

FACTORY SERVICES DIVISION

Mr Joshua Jaddoo - Factory Services Manager

ENGINEERING

M. Christopher	Supervisor - Instrumentation
B. Wilson	Junior Engineer
A. Lyle	Mechanical Engineer Technician
A. James	Snr. Technical Assistant*
J. Williams	Instrument Technician
S. Watson	Mechanic*
R. Lee	Mechanic*
P. Ellis	Machinist*
W. Morgan	Workshop Assistant*

SUGAR TECHNOLOGY

E. Manning	Research Technologist
S. Roman	Snr. Analytical Technician
H. Holness	Process Technologist

* - Left during the year

** - On study leave

1 PERSONNEL AND TRAINING

1.1 STAFF

Overseas Visits

Mr. Trevor Falloon, Agricultural Service Manager, attended a workshop entitled, "Preparing for El Nino" in New Jersey from April 29 - May 2. This workshop was sponsored by the International Research Institute (IRI) for Climate Prediction.

Dr. Earle Roberts, Director of Research and Mrs. Andree Nembhard, Executive Chairman, Sugar Industry Authority visited Tecnoazucar, Cuba from April 20 to 25 to explore the possibility of exchange visits between Tecnoazucar and the staff of the Institute.

A team consisting of Mrs. Andree Nembhard, Executive Chairman, Sugar Industry Authority, Dr. Earle Roberts, Director of Research, Mr. Joshua Jaddoo, Factory Services Manager visited the Audubon Sugar Institute from May 5 to 7, where discussions were held with Professor Peter Rein, the Director of the Institute about training for staff members and with Professor Donald Day about new methods of dextran anaylsis and the production of value-added chemicals from cane sugar. The team also visited St. Gabriel Sugar Research Station, which is the Agricultural Centre for Sugar Cane Research, Louisiana State University. A visit was also paid to Nicholls State University where discussions were held with Dr. Donald Ayo and Dr. Robert N. Falgout with regards to staff training.

Messrs. Joshua Jaddoo, Marrington McDonald, James Fearon and Errol Henry attended the American Society of Sugar of Cane Technologists Meeting from June 26 to 28.

Mr. Trevor Falloon, Agricultural Services Manager attended a Project Evaluation Workshop sponsored by the Common Fund for Commodities in Zimbabwe, Africa from August 8 to 16.

Messrs. Trevor Falloon, Malcolm Easy, Uriel Green and Kirkwood McPherson attended the annual Cane Breeding Workshop in Barbados from October 21 to 25.

Mr. Uriel Green, Agronomist, attended a two-week orientation session at the Cane Breeding Station in Barbados from November 18 to 29.

Arrivals

Miss Padmaja Kantu and Mr. Noel Gordon joined the Institute on January 7, 2002 as Programmer/Analyst in the Information Systems Department and Agronomist in the Extension Department respectively. Mr. Howard Holness joined the staff of the Factory Services Division as a Process Technologist on October 1, 2002 while Mrs. Brenda Jackson joined the Extension Department's Frome Office as Clerical Assistant on November 1, 2002.

Departures

Mrs. Geneveve Allen, Laboratory Analyst, left the Institute on May 1, 2002. Mrs. Hyacinth Headley-Lewin, Clerical Assistant for the Extension Department and Miss Andrea Clarke, Laboratory Technician in the Entomology Laboratory left on August 30, 2002 and October 25, 2002 respectively.

Redundancy

The following staff members from the Factory Services Division's workshop were made redundant on December 31, 2002: Samuel Watson, William Morgan, Paul Ellis, and Ransford Lee.

Technical Papers

Papers presented by members of staff at the 65th Annual Conference of the Jamaica Association of Sugar Technologists (JAST), held at the Renaissance Jamaica Grande Hotel on November 7 to 8, 2002:

- *"A Review of the 2001/2002 Sugar Crop"* (D. Little/J. Jaddoo).
- "*Financial Options for Increased Sugar Cane Production-Credit vs. Price Support*" (C. Woolery)
- "*Jamaica's Sugar Industry in the Context of Global Weather Phenomena*" (T. Falloon)
- "*Factors Affecting the Levels of Dextran Entering the Sugar Factory at Appleton*" (P. Wright/D. Foster)
- "*Drip Irrigation Under Pineapple Row Spacing - A Farmer's Experience*" (D. Standford)
- "*Soil Forces and Shank Vibration on Deep Tillage Tools*" (K. Chandon/R.L. Kushwaha)
- "*Adaptation and Stability in Yield of Six Sugar Cane Varieties in Five Ecological Areas"* (M. Easy)
- "*Chemical Ripeners in Cane Quality Management*" (M. Edmond Lewis)
- "*Some Secondary and Micro-nutrients States of Sugar Cane Soils with Reference to Requirements"* (C. Fearon)
- "*Report on Visit to the Louisiana Sugar Industry*" (J. Fearon)
- "*The Performance of Five Commercial Sugar Cane Varieties Under Centre Pivot Irrigation at New Yarmouth*" (M. Easy/B. Michelin/L. Monroe)
- "*A Study of Roughening the Surface of Sugar Cane Mill Roller Shells as Practised in Jamaica*" (G. Oliver/B. Wilson)
- "*Platform Scales Upgrading with Management Software - A Progress Report*" (M. Christopher/ D. Shady)
- "*Dextran Analysis: A Comparative Investigation of Three Methods*" (M. Wilson/M. McDonald)
- "*Wastewater Quality at Sugar Factories*" (E. Manning)

1.2 VISITORS

Visitors to the Institute during the year included Mr. Marcielo Diliscia from Venezuela; Messrs. Vitus Evans, Edgar Watson and Horace Davis from the Jamaica Agriculture Development Fund; and Messrs. Jorge Abreu and Roberto Alboniga from the Agriculture Machinery Construction Institute, Cuba.

1.3 TRAINING

Miss Dian Gowan, Library Clerk, attended training at the Headquarters of the Jamaica Library Service from March 5-6.

Mrs. Elaine Manning, Research Technologist/ Environmentalist attended a regional Conference hosted by the National Environment & Planning Agency on "Pollutant Release and Transfer Register" at the Le Meridian Jamaica Pegasus Hotel from March 19 to 20.

The seminar on "Energy Efficiency Management "conducted by the Jamaica Public Service's Marketing & Energy Service Dept., on March 27, 2002 was attended by Mr. Andrew Lyle, Mechanical Engineering Technician.

Miss Salina Latchman, Laboratory Analyst, attended the Annual Raw Cane Sugar Manufacturers' Institute at the Nicholls State University, Louisiana from June 10 to20.

Miss Marvlyn Richards, Laboratory Analyst, attended training at the Markan Laboratories and the New York Sugar Trade Laboratory from July 29 to August 2.

Messrs. Cecil Woolery, Patrick White and Michael Prince attended a course in Project Management offered by the University of New Orleans from July 26-28.

Mr. Cuthbert Lawson attended a seminar conducted by the Professional Trainers Institute on "Coaching & Team Building Skills for Managers & Supervisors" at the Alhambra Inn Hotel on July 31.

Miss Ceseal Newman attended a Seminar on "Customer Care and Telephone Techniques", at Hamilton Knights Associates on August 15.

The summer training programme commenced on August 12, 2002 and was completed on August 27, 2002. Twelve courses were held during the period. The programme started later than usual to facilitate an extended crop at some factories due to island wide rain, which disrupted the crop.

A total of 192 persons participated in the programme.

The participants were distributed as follows:

Factory /Organisation	No. of Participants
Frome	38
Monymusk	37
Bernard Lodge	37
Appleton	23
Worthy Park	11
St. Thomas Sugar	12
Long Pond	12
Hampden	10
AIJCFA	3
SIRI	9
Total	**192**

The attendance on each course was as follows:

Course	No. of Participants
Core Sampler Maintenance	13
Introduction to Microsoft Excel	15
Introduction to Microsoft Word	12
Introducing to Microsoft Power Point	11
Computer Aided Designed	8
Fundamentals of Industrial Instrumentation	19
Laboratory Techniques	14
Mechanical Technology	16
Electrical Power Generation and Distribution	16
Supervisory Management	29
Seminar-Towards a cleaner Industry	14
Sugar Cane Processing	25
Total	**192**

The training programme was held in collaboration with UTECH, Nicholls State University (NSU) and HEART. The courses were held at four locations, namely: UTECH, HEART Portmore Academy, Medallion Hall Hotel and Golf View Hotel. Instructors were drawn from the Universities, HEART, industry specialists and factories. The courses were satisfactorily conducted at all locations.

The Sugar Cane Processing Course was held in collaboration with NSU. This course lasted for four days and was conducted by two NSU lecturers and the Factory Services Manager, SIRI. In attendance were factory personnel at the supervisory and operator levels who are responsible for maintenance, processing, laboratory analyses and factory reporting.

Frome, **Monymusk** and **Appleton** participated in all twelve courses. **Bernard Lodge** participated in eight (8), **Worthy Park** in six (6), **Long Pond** in nine (9), **St Thomas Sugar** in ten (10), and **Hampden** in nine (9).

Course Evaluation

The majority of participants were of the view that the courses would enhance their performance on the job. The subject areas covered were thought to be adequate and the instructions delivered at an acceptable level.

2 WEATHER

With *El Nino* Jamaica had learned to expect enhanced spring rains and a reduction in July to November rainfall. The mild *El Nino* of 2002 did not follow that pattern. Instead, after the traditional first quarter drought, there was nearly a complete failure of the spring rains until Labour Day, May 23, when, as reported by the meteorological service, a low-pressure system developed from a stationary front and resulted in severe flooding throughout most of the country. The most intense rainfall occurred in the central region. In the next 3-4 weeks some extraordinary totals were recorded.

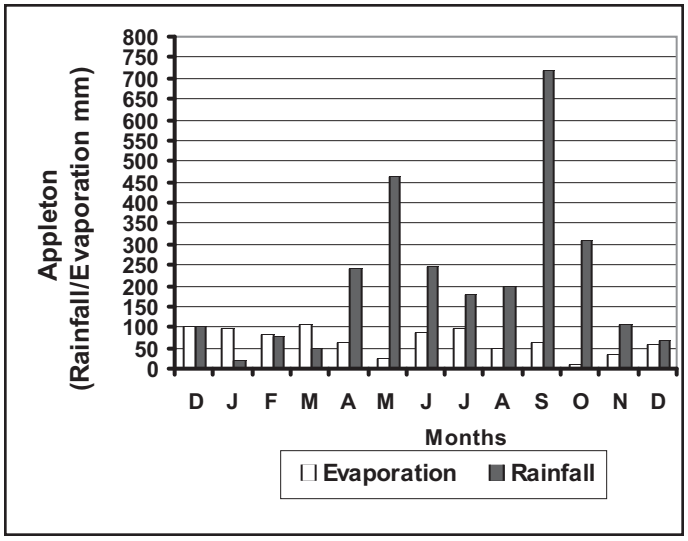
The rain gauge at the SIRI office in Mandeville recorded 329 mm (13 inches) in a single day. Rainfall of that intensity had rarely been seen in central Jamaica in living memory. **Monymusk**, in the Irrigated Area, which receives on average just 850 mm per annum, exceeded that in May and June alone, *End Table 3*.

Below average rain in July and August tended to support the view that *El Nino* brought reduced rainfall in July-November. However, in September the island came under the influence of hurricanes Isidore and Lili, both within a space of three weeks. This was followed in mid-October by tropical storm Marco. In the Irrigated Areas September alone saw estates averaging just under 600 mm. With the water table still relatively high from the May-June floods, ponds which dotted the landscape in low lying areas again reappeared, cane fields were again severely scoured and many in the **Appleton Basin** were submerged for weeks. Although the October-December period saw normal to below normal rainfall, the St Elizabeth and Westmoreland areas, in particular, showed none of the usual browning of grass as countless springs kept the surface well watered. Similarly those cane fields which had escaped being submerged remained a verdant green suggesting a continuation of the active growth phase at a time when cane should have been ripening. Meanwhile, in Clarendon, the Milk River, which had overflowed its banks in the May/June floods, continued to gush through cane fields at St Jago keeping fields inaccessible to the end of the year.

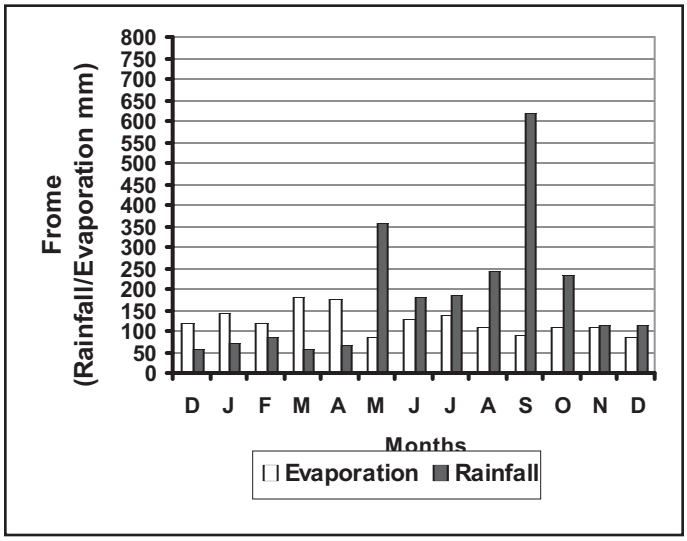
With this type of rain, there were generally huge moisture surpluses in most areas, *Figs 2.1-2.4*, though much of this was rainfall not useful for crop growth. Several areas in fact surpassed or were close to their record annual rainfall totals. For instance, **Worthy Park's** 2265 mm beat its previous high of 2125 recorded in 1986.

The year was therefore one in which the industry suffered severe setbacks to its infrastructure, with damage to roads and bridges, drains and irrigation canals as well as direct crop loss from fields which had to be replanted, or suffered growth retardation from prolonged submergence under water. In addition, the high water table would have impeded drying off resulting in relatively poor juice quality at the start of the crop, particularly in the Wet West.

Fig. 2.1: Water Balance Data - December 2001 to December 2002

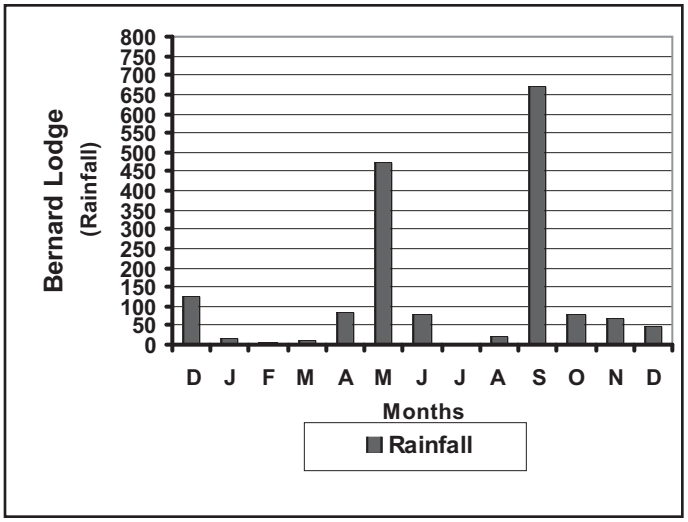


Appleton

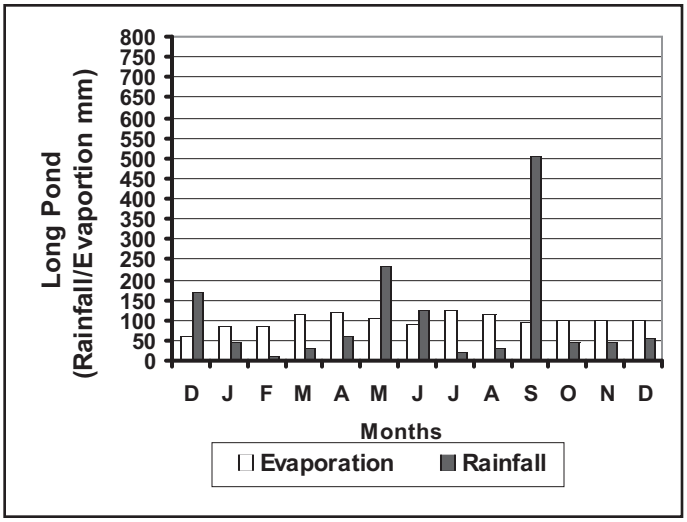


Frome

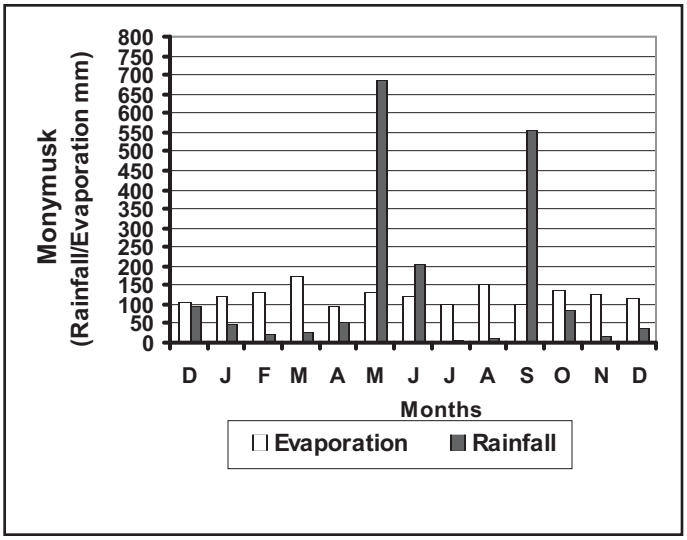
Continued Fig. 2.1: Water Balance Data - December 2001 to December 2002



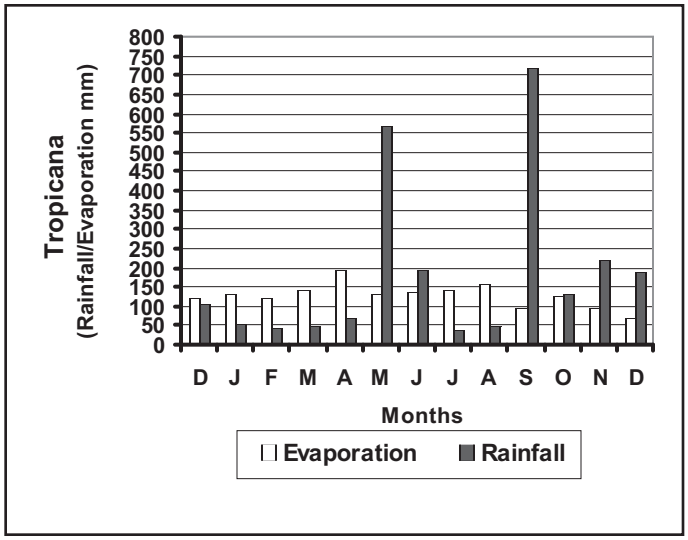
Bernard Lodge



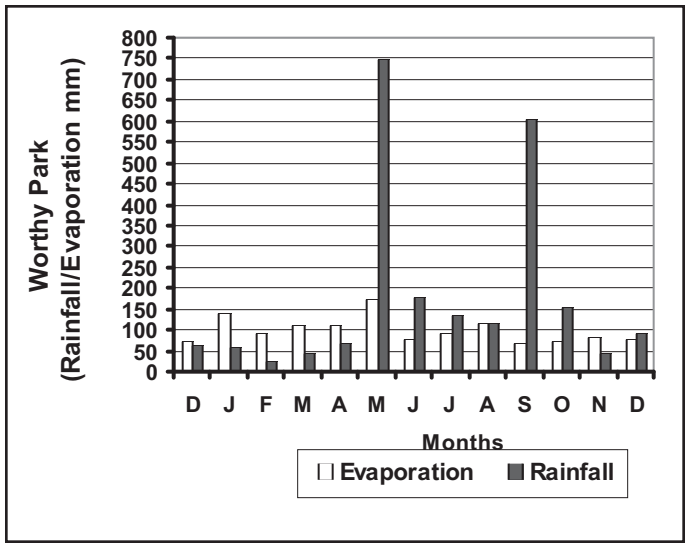
Long Pond



Monymusk



Tropicana



Worthy Park

3 CANE AGRONOMY

3.1 SUGARCANE NUTRITION

Phosphorus in Ratoons

Assessment of the merits of applying phosphorus to succeeding ratoons on the Carron Hall Clay of **Long Pond** (a study begun in 1996) had previously shown positive responses at the 2nd ratoon stage, where a significant yield increase of 1.1 ts/ha was obtained with 65 kg P/ha. At 5th ratoons, sugar recovery increased by 0.59 ts/ha with 26 kg P/ha compared to the zero control, but declined when increased to 65 kg P/ha, *Fig.3.1*. The increase in sugar recovery resulted from both increased cane tonnage and improved JRCS. This study began with a blanket application of 44 kg P/ha at planting and varied P dressings at 2nd, 3rd and 5th ratoons. Results demonstrate the need for P dressings for ratoons grown on this phosphorus deficient soil. However, additional phosphorus is not necessary for each successive ratoon. In summary, this investigation, which is still in progress, indicates a response to phosphorus at planting, at the second and fifth ratoon stages. Growers on this soil should therefore be applying fertilizer accordingly, but would be best guided by specific tests conducted by SIRI.

Organic Fertilizer

Further studies were conducted to determine the optimum combinations of organic and inorganic fertilizer on Sydenham Clay at **Bernard Lodge**. At the 7- month growth stage, BJ82102 showed increases of the order of 3.99 tc/ha with addition of 5 t/ha composted filter cake + 4 t/ha poultry manure, while halving the standard inorganic dosage of nitrogen to 50 kg/ha and maintaining standard dosage of potash at 104 kg/ha, *Table 3.1*. Statistically significant yield increases were also obtained in BJ78100 plots. Yield increases between a dosage of 83 and 104 kg K/ha tended not to be significant, hence the lower rate should suffice. These trends were maintained at the 8-month growth stage. Additional data will be taken at 11 months and at harvest.

Data gathered so far suggests that the combination of organic and inorganic fertilizer results in higher yields. A total of 1388 mm of rainfall was received up to 8 months of growth, with 534 mm (38%) obtained in May and 662 mm (49%) in September, and there was severe flooding of plots which retarded early growth.

However, there is already more than enough information suggesting that growers with ready access to poultry manure or filter cake should apply these for conditioning soils and boosting yields.

Residual Value of Manures

The residual value of composted filter cake and poultry manure, on BJ82119, applied in 2nd and 3rd ratoon stages, was evaluated in the succeeding 4th ratoons on the SIRI Experiment farm, at Springfield. Yields continued to be low under the low rainfall regime (796 mm during the growing period) and only 6 irrigation cycles, *Table 3.2*. Nonetheless, yields were appreciably higher in plots which had been treated with poultry manure and poultry manure in combination with composted filter cake than in plots which received only inorganic fertilizer. Highest yields of 60 tc/ha and 7.14 ts/ha were obtained for plots treated with 7.5 tonnes poultry manure and 6 tonnes composted filter cake per hectare . The increases in yields were in the order of 9.78 tc/ha and 1.41 ts/ha over those from plots given inorganic fertilizer only.

Fig. 3.1: Mean Yields of 4 Varieties to P Dressing on Carron Hall Clay

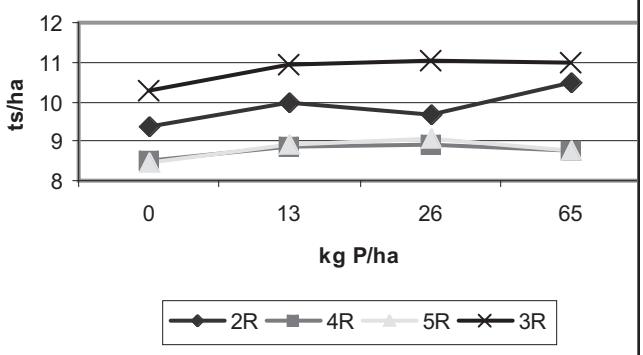


Table 3.1: Cane yields with combinations of organic and inorganic fertilizers on Sydenham Clay, Bernard Lodge

			Estimated cane yield at 7 Mo.		Estimated cane yield at 8 Mo.	
Treatments			**BJ82102**	**BJ78100**	**BJ82102**	**BJ78100**
N (kg/ha)	**K (kg/ha)**	**Manure (t/ha)**	**tc/ha**	**tc/ha**	**tc/ha**	**tc/ha**
50	42	9*	45.47	47.15	50.55	50.30
50	83	9*	47.82	49.29	54.54	55.78
50	104	9*	49.29	51.74	55.15	56.56
100	42	0	44.25	38.95	47.61	47.15
100	83	0	45.30	42.51	49.65	53.10
100	104	0	45.01	46.73	49.25	52.30
		SED	1.71	1.46	1.42	1.38
		LSD 0.05	3.59	3.06	2.98	2.89

* 5 t/ha composted filter cake + 4 t/ha poultry manure

In the following year, with no further addition of manures, soil pH in manure-treated plots varied from 7.47-7.94 and was considered more suitable for cane growth than the pH 8.15 recorded in the control plots, *Table 3.3*. Levels of organic matter, phosphorus and potassium were higher where manure had been applied.

Table 3.2: Residual value of poultry manure and composted filter cake applied over 2 years, SIRI Experiment Farm, Springfield, at 4th ratoon, BJ82119

Treatments	tc/ha	JRCS	ts/ha
550 kg/ha 17-0-20 (Standard)	50.51	11.42	5.73
Standard + 12 t/ha PM	55.82	11.50	6.44
Standard + 7.5 t/ha PM + 6 t/ha CFC	60.29	11.89	7.14
Standard + 6.5 t/ha PM + 7 t/ha CFC	58.00	11.35	6.56
Standard + 8.5 t/ha PM	58.21	11.15	6.46
SED	1.60	0.18	0.18
LSD 0.05	3.31	0.37	0.38

PM.... Poultry Manure applied in previous years

CFC....Composted Filter Cake applied in previous years

Table 3.3: Soil pH, organic matter, available P and K in organic matter treated 5th ratoon, BJ82119, SIRI Farm, Springfield

Treatments	Soil pH	% Organic Matter	P (ppm)	K (ppm)
550 kg/ha 17-0-20 (standard)	8.15	2.07	38	180
Standard + 12 t/ha PM	7.66	2.09	51	195
Standard + 7.5 t/ha PM + 6 t/ha CFC	7.75	2.13	51	215
Standard + 6.5 t/ha PM + 7 t/ha CFC	7.94	2.24	51	196
Standard + 8.5 t/ha PM	7.47	2.68	49	196

Soil Nutrients Evaluation

Assessments of phosphorus, potassium, calcium and magnesium status were carried out for fields to be replanted at **Appleton**, **Monymusk**, **Hampden**, **St Thomas Sugar Co.** and **Worthy Park**. These assessments are an integral part of the SIRI Fertilizer Advisory Service assisting growers towards cost effective fertilizer practices.

Phosphorus: Mean phosphorus in soils ranged from 20 ppm at **St Thomas Sugar Co**, to 200 ppm at **Monymusk,** *Table 3.4*. In the Gayles Valley area of **Hampden**, Pera in **St Thomas Sugar Co** and **Worthy Park** where phosphorus may be low to very low, dressings of 300-350 kg/ha 14-28-14 were recommended to be applied to the planting furrows, followed by additional dressings of nitrogen and potash at 8 weeks. **Monymusk** and **New Yarmouth** as usual showed high to very high phosphorus levels in the lighter soils and so none was recommended for soils with those characteristics.

Potassium: Soil potassium was below adequate levels in most of the fields sampled and so most recommendations included potassium in the fertilizer mixtures. However, mean K levels were quite adequate in soils tested from the Parnassus area of **Monymusk** and at **Worthy Park** where reduced dosages were accordingly recommended.

Calcium: High calcium levels (5 151- 6 488 ppm) were found in fields sampled at **New Yarmouth** and **Monymusk**, *Table 3.5*. In contrast, certain fields at Gayles Valley, in **Hampden**, and **Worthy Park** showed not only low calcium levels but were also quite acidic, to the point where liming was recommended to increase the pH.

Magnesium: Magnesium was adequately supplied in fields tested at **New Yarmouth**, **Monymusk** and **St. Thomas Sugar**. Fields at **Hampden** and **Worthy Park** showed values of less than 80 ppm, which would place them in the deficient range.

Table 3.4: Phosphorus and potassium status of fields replanted on Estates in 2002

Estate	Farms	# of fields sampled	Mean P (ppm)	# of P-deficient fields	Mean K (ppm)	# of K-deficient fields
Appleton	New Yarmouth	29	50	7	131	29
Monymusk	Chesterfield	15	200	0	156	12
	Parnasus	5	26	4	185	2
	Vizzard Run	10	98	4	181	5
Hampden	Gayles Valley	30	29	14	76	18
St. Thomas Sugar	Pera	28	20	26	161	19
Worthy Park	Worthy Park	41	55	11	194	34
Standard Adequacies			20 - 40		185 - 230	

Table 3.5: Calcium and magnesium levels in fields to be replanted on Estates

Estate	Farms	# of fields sampled	Mean Ca (ppm)	# of Ca-deficient fields	Mean Mg (ppm)	# of Mg deficient fields
Appleton	New Yarmouth	29	6374	0	778	0
Monymusk	Chesterfield	15	5151	0	896	0
	Parnassus	5	6488	0	1945	0
	Vizzard Run	10	5630	0	686	0
Hampden	Gayles Valley	30	2623	1	148	5
St Thomas Sugar Co.	Pera	28	6479	0	299	0
Worthy Park	Worthy Park	41	2528	2	386	7
Standard Adequacies			500 - 1000		80 - 132	

Investigations

It is recognised that secondary and micro-nutrients play important roles in sugarcane nutrition. These are evaluated periodically in soil and leaf nutrient surveys. Shortages of magnesium, zinc, copper and boron are sometimes found but an economic response to treatment is often lacking. A number of such trials were in place at **Frome** in 2002.

Magnesium

In a trial conducted on Roaring River Clay at **Frome**, magnesium applied at 0, 25, 50, and 75 kg/ha to plant cane BJ82102 failed to show significant differences in cane tonnage. The magnesium, in the form of magnesium sulphate, was applied as a side dressing before the canes were moulded at 8 weeks.

Zinc

BJ7938 treated with 10 kg/ha zinc at planting, harvested as seed canes at 9 months, showed higher yield of just over 3 tc/ha than plots given no zinc at **Frome**. The zinc, in the form of zinc sulphate, was also applied as a side dressing at 8 weeks. Yields tended to decline when Zn rates were increased to 20 and 30 kg/ha, *Table 3.6*.

Table 3.6: Yields of plant cane BJ7938 in response to zinc application on Pennants Clay Loam , Frome

Zinc (kg/ha)	tc/ha
0	47.31
10	50.86
20	48.32
30	47.4
SED	0.91
LSD .05	1.9

Copper

BJ82102 treated with copper dressings on Roaring River Clay at planting showed no positive yield increases with rates of 0, 5,10 and 15 kg/ha Cu. Copper addition of 5 kg/ha on Pennants Clay Loam at **Frome**, with soil test of 3 ppm, yielded 54.79 tc/ha compared to 48.15 tc/ha in the zero control, *Table 3.7*. Cane yield tended to decline when copper was increased above 5 kg/ha. The economic benefits from copper sulphate at a cost of $365.31/kg were however considered marginal.

Table 3.7: Yield of 9-month old BJ7938 in response to copper on Pennants Clay Loam, Frome

Cu kg/ha	tc/ha
0	48.15
5	54.79
10	53.5
15	48.49
SED	0.91
LSD .05	1.93

3.2 ANALYTICAL LABORATORY

Introduction

The laboratory completed over 23 000 analyses for the year 2002. This included over 1 500 analyses done for research purposes in the areas of juice, sugar and molasses analyses. Routine analytical work was done on samples classified as foliar, soil, wastewater, irrigation water, sugars, molasses, cane juice, fertilizer, dunder and compost. The different parameters determined included brix, pol, reducing sugars, dextran, whole raw and affined colour, suspended solids, micro and macro-nutrients, total dissolved salts, biochemical oxygen demand, BOD and chemical oxygen demand, COD.

The Laboratory conducted training sessions for core laboratory workers and other industry personnel, carried out several core laboratory audits and factory audits at **Frome** and at **St Thomas Sugar** as well as organised three

collaborative testings of cane samples between core laboratories. One paper was presented at JAST 2002 and at the conference dinner it was announced that one of two papers, 'Octapol as a Replacement for Lead Subcetate in Polarization of Cane Juice' presented from the laboratory at the previous conference was awarded Best Factory Paper for 2001. One staff member attended the American Society of Sugarcane Technologists Conference in Florida. Another member of staff was based at Markan Laboratories in New York for one week and was able to spend one day at the New York Sugar Trade Lab where improvements in laboratory methods for sugar analysis and instrumentation were observed. A subsequent collaborative testing of sugar samples for dextran was done with the New York Sugar Trade Lab and the results obtained by the laboratories were not statistically different from each other.

Evaluation of Laboratory Methods

The Laboratory continued to participate in the plant tissue and soil material exchange programmes conducted by Wageningen University of the Netherlands in an effort to maintain precision and accuracy in analytical techniques. In the analysis of plant material, improvements were noted in the determinations for zinc and iron as there was a greater level of acceptability of the results, possibly due to the acquisition of new lamps for the atomic spectrophotometer.

There was continued acceptance by Wageningen University of the results of analyses for soil samples. Continued improvements were seen in the analyses for elements extracted by calcium chloride (CC) solution as expertise in this method was developed.

The Laboratory participated in the collaborative testing of raw sugar for pol and moisture organised by the Sugar Association of London. Statistical analysis showed that the results obtained by SIRI were not significantly different from the results obtained by other participating laboratories.

Sugar Quality 2002

The industry wide average was not as good as in the previous year. The specification for dextran of less than 250 mau was not met. Average dextran was 386 mau. The safety factor was within the specification for all factories. The average result for reducing sugars was within the specification i.e. less than 0.70%. The average pol for the industry was 97.93°.

Molasses Analysis

The results obtained for the analyses of molasses showed that there was still room for improvement in the exhaustion of final molasses at all the factories. Average purity of 35.24% and pol of 29.94° were obtained.

Wastewater Analyses

The routine collection and analysis of wastewater were conducted in the normal fashion. The results for the samples analysed showed biochemical oxygen demand (BOD) and chemical oxygen demand (COD) levels were much too high, even for samples taken in the out-of-crop period, whereas the other parameters sometimes exceeded the specification as set out by the Natural Resources Conservation Authority (NRCA) for wastewater from factories. Nitrates and sulphates were usually within specification and oils were usually not found. Values for phosphates generally exceeded the standard. Some parameters were influenced by activities at the factories for example high pH, conductivity values and phosphate levels could indicate cleaning operations being carried out at time of sampling.

Irrigation Water Quality

There was no statistically significant change in the salinity and SAR of water samples from wells analysed for the period under review.

Replacement for lead subacetate

Octapol, the non-toxic reagent that has replaced lead sub-acetate as the clarifying agent in polarimetric measurements of cane juice at the core laboratories, was investigated to assess its suitability for determining the pol of raw sugars and final molasses. For sugar pol, a comparison was made between Octapol and lead subacetate. Octapol was found to be a good substitute, with the filtered sugar solution being quite clear. These values were compared with those obtained using lead subacetate. Measurements using Octapol generally gave readings lower than those obtained when lead sub-acetate was used. Polarization measurements were carried out at 589 nm. NIR measurements for determining pol values of raw sugars were also employed on the above sugar samples. A comparison of all three sets of results will be reported at a later date.

Research into the use of an OmniMark Moisture Teller for moisture determinations in raw sugar analysis was carried out using over 200 samples and a correlation equation:

$$Y = 0.9738 \times +0.0276, \; r^2 = 0.9081$$

where Y = oven moisture value

X = moisture teller reading

Further work was done on the correlation between conductivity and gravimetric ash values in raw sugars and molasses.

Analysis Of Dextran In Cane Juice

An overview of three methods investigated, namely the Modified Haze test, Optical Activity DASA test and Midland's

Monoclonal Antibody test revealed that each method had its own unique advantages and disadvantages with no significant correlation between them. Statistical analysis of over 100 tests showed that the Midland Monoclonal Antibody test had the highest level of precision and accuracy while the Modified Haze and Optical Activity methods followed in that order. For a standard dextran solution of 300 ppm average results of 300, 327 and 291 ppm were obtained using the Midland test while the Haze method gave average results of 360, 1014 and 576 ppm. Average results for the Optical Activity test were 512, 449 and 389 ppm.

Reducing Sugar Analysis

A total of 20 molasses samples was received from Australia for reducing sugar (GS4/3-3) and total reducing sugar (GS4/3-7) analysis as part of the work being done by the GS 4 ICUMSA committee for the meeting set for June 2002. The work is summarised as follows:

Collaborative tests for reducing sugars (ICUMSA Method GS4/3-3) and total reducing sugars after hydrolysis (ICUMSA Method GS4/3-7) have been completed on cane molasses using the Lane & Eynon Constant Volume Procedure.

Twelve laboratories, familiar with Lane & Eynon titrimetry, from nine countries participated in the collaborative testing program. Five cane molasses samples were analysed as blind duplicates.

The statistical requirements of ICUMSA Subject 3 Method Format, Collaborative Testing and Treatment of Data were observed. Five only lab/sample outliers were identified in the data from 120 paired analyses. There was one Cochran outlier and two Grubbs outliers in testing Method GS4/3-3 and two Cochran test outliers in Method GS4/3-7.

The testing met the repeatability and reproducibility requirements with an average Horwitz ratio of 1.50 for Method GS4/3-3 and 0.77 for Method GS4/3-7. Average repeatability and reproducibility figures were 0.77 and 1.60 respectively for Method GS4/3-3 and 1.51 and 2.47 respectively for Method GS4/3-7.

The precision obtained indicates higher precision in reproducibility in each of the methods compared with those given in the Methods Book. The precision observed for repeatability was higher than that in the Methods Book for Method GS4/3-3 and near to that indicated as likely in a previous report. The repeatability precision for Method GS4/3-7 was lower than that suggested in the Methods Book and lower than that reported in a laboratory at the earlier Session. The results obtained are considered to indicate inherent difficulties in the method which persist even when the analyses are conducted by competent staff in sugar industry laboratories.

4 CROP PROTECTION

4.1 ENTOMOLOGY

Sugar cane stalk borer (*Diatraea saccharalis*)

For the last two years the focus in insect pest control has been on reviving the biological control programme against the sugar cane stalk borer. Chemical control has always been considered relatively ineffective against this pest which spends much of its life safely hidden within the cane stalk. In more northern latitudes with a distinct winter, which induces dormancy in the borer, once that dormancy is broken, properly timed aerial spraying may be directed at larvae before they penetrate stalks. Without this facility, Jamaica has had to rely solely on biological agents to effect control.

Two main parasitic species attack the borer locally - a fly *(Lixophaga diatraeae)* and a wasp *(Agathis stigmaterus)*. Eggs are also parasitised by *Trichogramma* spp and both eggs and larvae as well as pupae and adults are attacked by a range of predators. However, the local complement of natural enemies has not been enough to keep damage within tolerable levels, particularly in the southern irrigated belt. To augment the range of biological control agents the Institute has been importing parasites of various types for several decades.

By the early eighties the one that became established and quickly multiplied to become dominant in cane fields was the parasitic wasp, *Cotesia flavipes*. It was thought that field populations would be self-sustaining and so the programme of laboratory rearing and releasing to fields was gradually phased out. However, by the end of the nineties it was observed that field populations of *Cotesia* had almost completely disappeared while borer damage was still at unsatisfactory levels. A fresh colony of *Cotesia* was obtained from Barbados and cross-bred with local stock to resume the parasite rearing/release programme in 2000. Field releases have been aimed primarily at areas of **New Yarmouth** known to harbour heavy borer infestations. Releases have also been made at **Monymusk** and **Lucky Valley Farm** (Clarendon).

Evaluation of the programme during 2002 showed encouraging levels of parasitism in the **New Yarmouth/Monymusk** area, where from almost zero, parasitism levels were approaching 5%, though the native parasitic species were still the prime biological agents in an overall parasitism of 22%. At the height of the programme in the eighties parasitism by *Cotesia* stood at some 18% and overall parasitism in the region of 37%. The programme is aimed at restoring those levels of parasitism.

Borer Damage

Spot surveys of borer damage revealed fairly high levels at **New Yarmouth**, and **Bernard Lodge** (including **Innswood**) in 2002. The survey revealed an average of 15.3% internodes bored at **Bernard Lodge** and **Innswood** combined and **New Yarmouth** registered an average of 13.0%. These levels of damage are considerably above the 5% threshold considered tolerable in sugar cane and justify the resumption of the biological control programme. For several years during the 1990's internode damage fluctuated around the 10% level for the industry as a whole.

Both estates showed individual fields with unusually high damage levels. The highest readings were in a field, Sec 45, of BJ8226 at Great Salt Pond, **Bernard Lodge** (34.4%) and in Section 64, in BJ7504, Farm 2, **New Yarmouth** (31.6%), *Table 4.1*.

These high readings, which would undoubtedly contribute to poor juice quality at harvest, are not necessarily a direct consequence of the variety, as BJ8226, for instance, was not only 2nd highest but also 3rd lowest as seen in Sec 47, **New Yarmouth**, Farm 1, where only 6.3% of internodes were bored, *Table 4.2*. Some locations have always been more prone to borer attack.

Laboratory Rearing

Rearing procedure used for the host was based on a natural diet of corn cobs kept in 1-quart plastic ice cream containers. The borer seems equally adapted to corn as to cane but, for

Table 4.1: Top three fields showing highest borer damage in spot survey, 2002

Estate	Farm	Field	Variety	Cycle	% Internodes Bored
B/Lodge	Great Salt Pond	Sec 45	BJ8226	3rd Ratoon	34.4
N/Yarmouth	Farm 2	Sec 64	BJ7504	8th Ratoon	31.6
N/Yarmouth	Farm 3	Sec 20	BJ7504	6th Ratoon	27.1

Table 4.2; Top three fields showing lowest borer damage in spot survey, 2002

Estate	Farm	Field	Variety	Cycle	% Internodes Bored
N/Yarmouth	Farm 1	Sec 38	BJ8252	Plant cane	5.2
B/Lodge	Innswood	Sec 10	BJ8388	1st Ratoon	6.1
N/Yarmouth	Farm 1	Sec 47	BJ8226	Plant cane	6.3

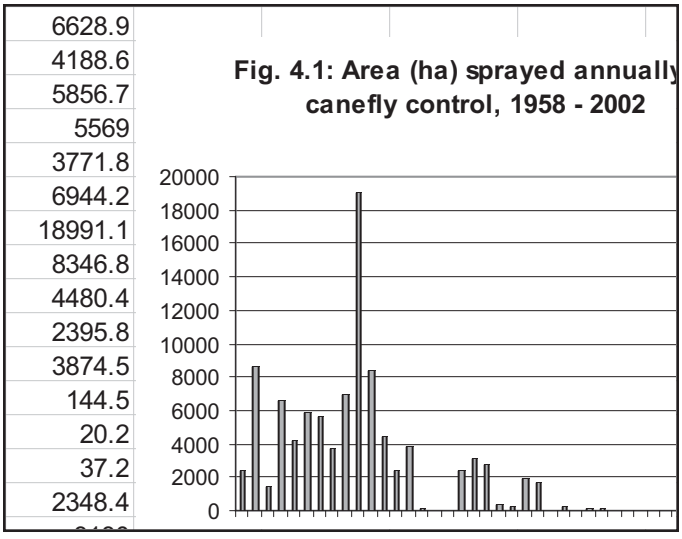
laboratory purposes, corn has been proven to be the more convenient feed, as the sugars in cane ferment within a few days rendering the feed unsuitable. Pupae were transferred to glass jars for adult emergence, feeding and mating. Feed comprised droplets of honey and water. The inner wall of the jars were lined with waxed paper as a surface for egg laying. Mature eggs were transferred to corn cobs so that as larvae emerged there was a ready source of feed.

Individual borers were exposed to the parasite, *Cotesia*, at about the 3rd to 4th instar stage. Two to three female parasites were usually allowed to deposit their eggs within a borer which was then reared in cotton stoppered test tubes until death and emergence of a batch of typically 20-50 parasites emerge from the carcass about 10 days after parasitization.

By the end of the day of emergence, adult *Cotesia* are ready to parasitise a new set of borers, thus renewing the cycle. Batches of mated adults are then taken to the cane field and released in search of borers.

Canefly (*Saccharosydne saccharivora*)

Significant outbreaks of the canefly were restricted to the Mid-Clarendon/St Jago area during 2002. A first attempt at aerial spraying brought mixed results as power lines and trees reduced the efficiency of aircraft operation in a critical zone. This necessitated a second aerial application accompanied by ground level (mist blower) spraying of zones inaccessible to the aircraft. Even with this double application total area sprayed during the year was still under 500 ha. This compares unfavourably with the 1960's when, at the height of canefly outbreaks, the industry sprayed 18 890 ha in a single year (1967), *Fig 4.1*.



4.2 WEED CONTROL

Pre-emergent Weed Control

With continued emphasis on pre-emergent weed control practices throughout the industry, demonstrations to rivet the concept in the minds of farmers were set out at five locations

Table 4.3: Commercial applications of chemical ripeners at eight locations in 2002

Farm	Area Treated (ha)
Frome	1881.51
Galloway Farm	31.18
Holland	468.02
Appleton	805.55
New Yarmouth	535.27
St Thomas Sugar	94.08
Fred M Jones	67.64
Potosi Farm	11.55
Total	**3894.80**

- Negril Spots in the **Frome** area, Lucky Valley in Upper Clarendon, Caymanas South at **Bernard Lodge**, **St Thomas Sugar** in the East, and at Springfield and Vizzard Run at **Monymusk**. The demonstrations on the Clarendon Plains (Springfield, Vizzard Run) were to show a more effective post-emergent weed control than traditionally done within that zone. There was also a preliminary pre-emergent test of Crew (a preparation containing 33% trifluralin) at **St Thomas Sugar**, and a post-emergent test of Krismat (a preparation containing 73.15% ametryn and 1.85% trifloxysulfuron) at Caymanas South.

The combinations used in the pre-emergent demonstrations on the Plains included the recent additions to the effective herbicide list, clomazone 480 (Command) at 2 L/ha and metolachlor 960 (Dual) at 1.5 -1.75 L/ha, both with atrazine 50 (Atranex) at 2 L/ha. Both treatments showed effective control by reducing the total weed count to less than 5% of populations of the untreated plots. The standard pre-emergent treatment of ametryn + atrazine with 2,4-D gave equally effective results in fields where moisture was adequate during the early growth period. The evaluation of phytotoxic effects on commercial varieties was incomplete as the experiment was ruined before data could be obtained.

At Caymanas South and Lucky Valley, all pre-emergent treatments gave effective control of weeds present, and were persistent beyond 50 days of application. The experiment at Negril Spots was abandoned after 25 days, following unscheduled operations carried out in the plots.

The preliminary investigation of Crew at **St. Thomas Sugar** was inconclusive as heavy rains, causing field damage, occurred shortly after application. The fate of Krismat at Caymanas South was similar. Here rains actually started while the final treatment was being applied.

Late season control of wild pangola, guinea grass, and rice grass, which became problematic in pre-emerged fields, was adequately achieved with terbutryn + diuron, hexazinone + diuron, or paraquat + diuron.

Chemical Ripening

Artificial (chemical) ripening is still not entrenched as a necessary cultural practice within large sections of the industry. Its use is limited to the J Wray & Nephew farms and certain areas within the Sugar Co of Jamaica group of estates. Among independent cane farms, only **Fred M. Jones Estate** in St. Thomas, and **Galloway Farms** in Westmoreland show any interest.

Applications in 2002 were restricted to the popular commercial formulations of glyphosate (mainly Roundup) and fluazifop (Fusilade). The recently tested ripeners - Nitrate Balancer (a nutrient solution containing boron and molybdenum), and Moddus (trinexapac) - were not applied, probably due to variable results from use of the former, and the high cost of the latter. The bulk of fields treated were at **Frome** and the J Wray & Nephew Farms at **Appleton/Holland/New Yarmouth**, *Table 4.3*.

5 AGRICULTURAL ENGINEERING

5.1 DRIP IRRIGATION

Pineapple Row Spacing

High density planting in the pattern often described as "pineapple rows" was laid down as a device to reduce use of drip irrigation tubing for purposes of cost saving on the SIRI Experiment Farm, Springfield, in 1999. A line of tubing was thus made to wet two rows of cane, as against the traditional approach in which there was a drip tube for each cane row. In this unconventional row spacing, mechanical operations would have proven challenging. However with reduced weed growth from drip irrigation, spot spraying was sufficient to provide satisfactory control. To reduce potential field damage during harvesting, plots were laid out in flat culture rather than the typical ridge and furrow pattern and since this profile was not designed to accommodate mechanical harvesters, cutting was done manually.

Cane yield at harvest during March was 81 tc/ha. Given the fact that water use with drip irrigation is much less than with furrow irrigation and this yield was achieved by using half the normal quantity of tubing, the economics of this approach was relatively attractive.

Apparent water use was distorted by flooding in May (604 mm of rainfall) and again in September (539mm) resulting in a total water application (rainfall and irrigation) of approximately 2105 mm for the year. This was far in excess of the evapotranspiration requirement of approximately 900 mm, *Fig. 5.1*.

Demonstration Plot (Bernard Lodge Block A)

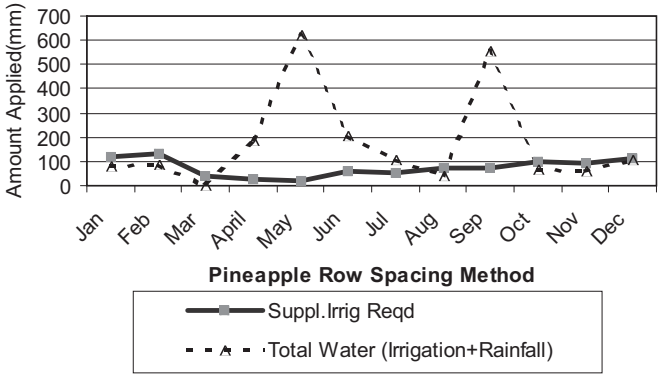
The 3.7 ha pineapple-row drip irrigation plot at Block A, **Bernard Lodge**, harvested at 2nd ratoon stage, yielded 112 tc/ha, wet by the Australian T-Tape Brand of tube and 124 tc/ha, wet by the Netafim cylindrical Brand of tubes. The adjacent sprinkler irrigated field, also in the 2nd ratoon stage yielded 60 tc/ha. The drip irrigated results show a slight increase from 105 tc/ha (T-Tape) and 135 tc/ha from the 1st ratoon crop in 2001.

Approximately 2 500 m of water (irrigation + rainfall) per hectare were delivered during the period. This supply was way in excess of the 1 500 mm needed under normal conditions. Approximately 1598 mm was due to rainfall, with a significant portion, 1143 mm resulting from the May and June flood rains. There was very little sign of stress as the drainage was adequate.

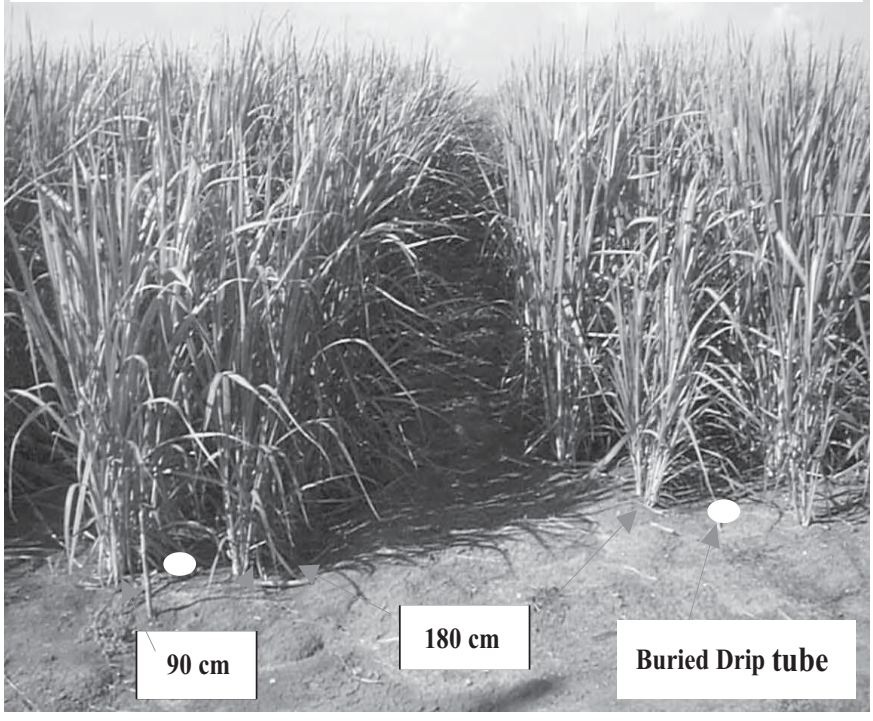
Drip Irrigated Minimum Tillage Trial

The newly established 1.73 ha reduced tillage trial in Field 1271A, Springfield, was laid out for drip irrigation with "Netafim" brand tubes. These are of design 20 mm in diameter, oval shaped with 60 cm emitter spacing. Tubes were laid by means of a tractor-drawn S-shaped pipe layer and placed along with seed pieces in planting furrows 1.67 m apart (the traditional inter-row spacing) prior to covering. The capital cost of the drip tube was only J$71,000 per hectare since sub-mains were already established.

Figure 5.1 Water Balance, Field 1240 B



Pineapple row spacing at three months



Semi - Commercial Production

The first drip irrigated plot at Section 1241B, Springfield, now serves mainly as a test for the longevity of drip irrigation in commercial production. Harvested at the 6th ratoon stage, cane yield was at an acceptable 87 tc/ha. Re-growth was vigorous and field population at a level suggesting that further ratooning would be feasible.

The net water balance for the year was 1554 mm with rainfall accounting for most of this amount. Drying off for harvesting in April shows up as deficits for February, *Fig 5.2*. The deficit during October followed an exceptionally rainy September and was directly related to a delay in restarting the irrigation pumps - a decision taken at the estate level.

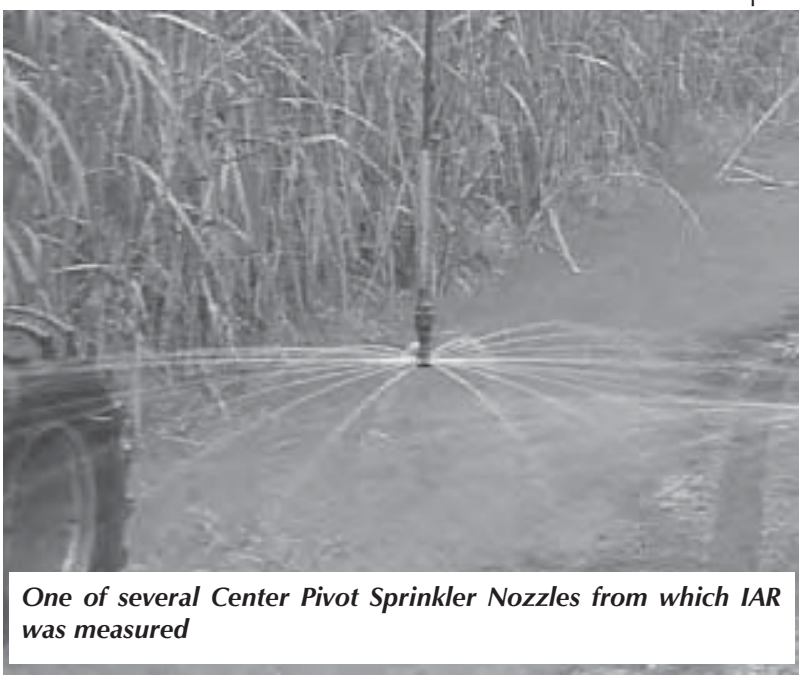
Irrigating with Dunder

Just over 243 ha at **Long Pond** were earmarked for irrigation using distillery waste (dunder) and rainfall run-off collected in the pond near to the factory. The cane area is generally hilly and undulating making portable sprinkler irrigation the more practical means of wetting. Water quality was quite turbid but chemically acceptable for irrigation purposes.

Available water was only 37.5 L/s while in excess of 50 L/s would be needed to adequately cover the 253 ha. However there were plans to rehabilitate an abandoned well, to augment this supply.

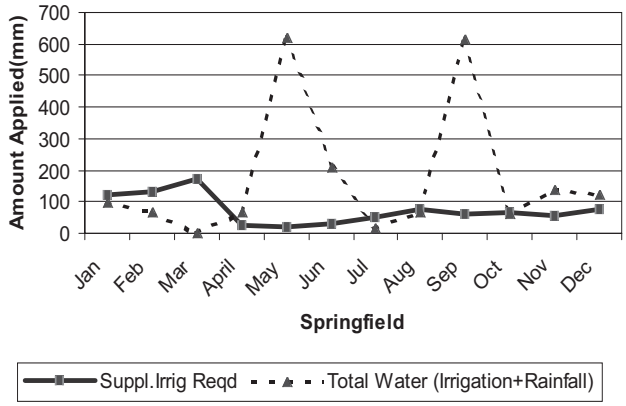
There was a draft proposal for utilizing this water involving pumping from the pond at various locations, laying over 9 km of pipeline, and using two traveling big gun carts for irrigation.

Laboratory analysis indicated that soil within the vicinity of the pond is appropriate for forming the proposed embankment. The project would be developed in phases, based on the availability of funds.



One of several Center Pivot Sprinkler Nozzles from which IAR was measured

Figure 5.2 Water Balance , Field 1241 A



Evaluation of Center Pivot Sprinkler Irrigation -New Yarmouth

Twelve electrically driven center pivot irrigation systems covering over 821 ha were installed at **New Yarmouth Estate**. As center pivots are new to the Jamaican industry, the opportunity was taken to examine their operation and to assess their functioning and their adaptation to local conditions.

For the most part, the pivots appeared to mark a significant improvement in the delivery of irrigation water as yields under the first systems installed averaged 127.8 tc/ha in 2002 as against 83.24 tc/ha when the same fields were wet by furrow irrigation the previous year.

Among challenges observed was a tendency for pivots to get bogged down when tracks became soggy. Improved tracking was achieved by spreading gravel along the tracks, or use of sand bags in some instances. The former gave better results.

The Instantaneous Application Rates (I.A.R.) measured as outputs from individual sprinklers shown below, varied along the length of the pivots, being lowest near the point of origin and highest towards the tip. This is necessary to compensate for the greater distance traveled by sprinklers the further they are towards the tip especially as some center pivots were over 300 m long. For example, sprinklers near the point of origin were releasing water at a rate of 9.47 mm/hr while at the 6th sprinkler output increased to 41.5 mm/hr.

A pivot completing a full circle was often set to deliver between 8 and 16 mm of water per revolution, often taking two days, evenly across the span of area traveled. There was, nonetheless, some variation in the volume of water applied to the crop along the length of the pivot. Measurements of I.A.R. averaged 12.7 mm (range 10.3 to 16.7 mm), the lower figure recorded towards the middle of the last tower where the nearby booster pump driving the end gun tended to cause a loss of water pressure.

5.2 AGRICULTURAL MECHANIZATION

Reduced Tillage

The Institute established another plot demonstrating principles of reduced tillage at its Springfield Experimental Farm, in 2002. Four weeks after harvesting, glyphosate was applied by a tractor drawn boom sprayer to sprouts in a 2.02 ha block, *Table 5.1*. Some two weeks later, with the foliage dying, one pass of the double row reduced tillage machine (RTM 3.0), *Fig. 5.3a*, connected to a Massy Ferguson 299 tractor, was used to open the furrows. *Fig. 5.3b* shows the result of making one pass with the double row reduced tillage machine. Measurements showed soil shattering took place to a depth of approximately 35 cm, *Fig. 5.3c*. *Fig. 5.4* shows the profile at different stages of land preparation with the double row reduced tillage machine.

Drip tube lines were placed below the bottom of the furrow, *Fig. 5.3d*, and connected to the existing drip irrigation network. Seed cane, primarily BJ82156, was then dropped in the furrows, *Fig. 5.3e*. Small plots of approximately six rows each of BJ8252, and BJ78100 were also planted at opposite ends of the field. Fertilizer was added to the furrows before covering using a standard covering disc tool, *Fig. 5.3f*. While the new sprouts were emerging, the old canes on the banks were dying, *Fig. 5.3g*. Deep inter-row cultivation was done to enhance root development and aeration, *Fig.5.3h*. About 3 months after planting, inter-row cultivation was done with a disc ridger, *Fig. 5.3i*.

High Density Planting

In Jamaica, a conventional planting distance of 1.68 m (5'6") between rows accommodates tractor wheels and allows enough space for cane to maximise production while facilitating movement of harvesting and transport equipment. However, in producing seed cane, to be harvested in 6-9 months, greater productivity could be achieved from the same land area with narrower row spacing, sometimes referred to as high density planting. At Springfield, a field was prepared with furrows just 0.9 m (3') apart with inter-row space of 1.82 m (6') and planted with BJ9501, BJ8281 and BJ9186 for use as seed cane.

The area was prepared with a single pass of a heavy harrow and two passes with a light harrow. With no equipment available to produce the desired row configuration, three spring tines with furrow opener, were set at 0.9 m apart. Two spring tines were aligned with the centre of the tractor tyre and the third to the centre of the tractor, for the furrow opening operation, *Fig. 5.5*. A trailer with the same track width as the inter-row space was used to transport the seed material into the field and four men dropped the seed material in the furrows for planting. Fertilizing and covering were done simultaneously using a Bonel Fertiliser Applicator attached with spring tines and furrow openers, *Fig. 5.6*.

Herbicide was applied to the field with a Boom Sprayer covering 6 rows per pass. Deep inter-row cultivation was done with a ripping machine with three shanks working three rows per pass, and moulding was done using the same spring tines. The field was given six flood-irrigation treatments. Growth was vigorous and the field canopied quite early, *Fig. 5.7*.

A 2.8 ha section of the field was harvested at 7 months for seed cane and the rest left as stand-over cane which was sent to the factory at 17 months. The latter combined with the 2.8 ha re-growth, was harvested for commercial sugar production. Seed cane yield was 73 tc/ha while commercial cane yield was 80 tc/ha, *Table 5.3*. Cane cutters, doing six rows per pair, harvested the field. A cane loader and haulage trucks straddling two rows, with their standard track width of 1.9 m (6') that matched the inter-row space of the field, were used in harvesting without undue damage to the stools.

Table 5.1: Operations and work rates for the reduced tillage trial at Springfield

Operations	Description	Work rate (ha/h)
Glyphosate Application	Four weeks after reaping	3.6
Opening furrow	One pass RTM 3.0, 2 rows	1.4
Laying Drip Tubes	Below the bottom of furrow	0.3
Planting & Fertilising	Manually	--
Covering	With the disc ridger	1.0
Deep Inter-row cultivation	Four shanks ripping 2 rows	1.2
Inter-row cultivation	With the disk ridger	1.0

Table 5.2: Machine operations in high density planting for seed cane production

Operation	Farm Machinery	Work Rate (ha/h)	Working width / Rows per pass
Ploughing	Heavy harrow	1.0	3 m working width
Harrowing	2 passes light harrow	1.0	3 m working width
Open Furrow	Spring tines with furrower	0.9	2 rows per pass
Drop seed cane	Trailer & 4 labourers		6 rows per pass
Fertilizing & Covering (simultaneously)	Fertilizer bander with Spring tines and furrow opener attached	0.6	3 rows per pass
Herbicide treatment	Boom sprayer	3.6	5 rows per pass
Ripping	Ripping machine with three shanks	0.8	3 rows per pass
Moulding	Spring tines with furrower	0.9	3rows per pass

Fig. 5.3: Pictures illustrating the different operations for the reduced tillage technology

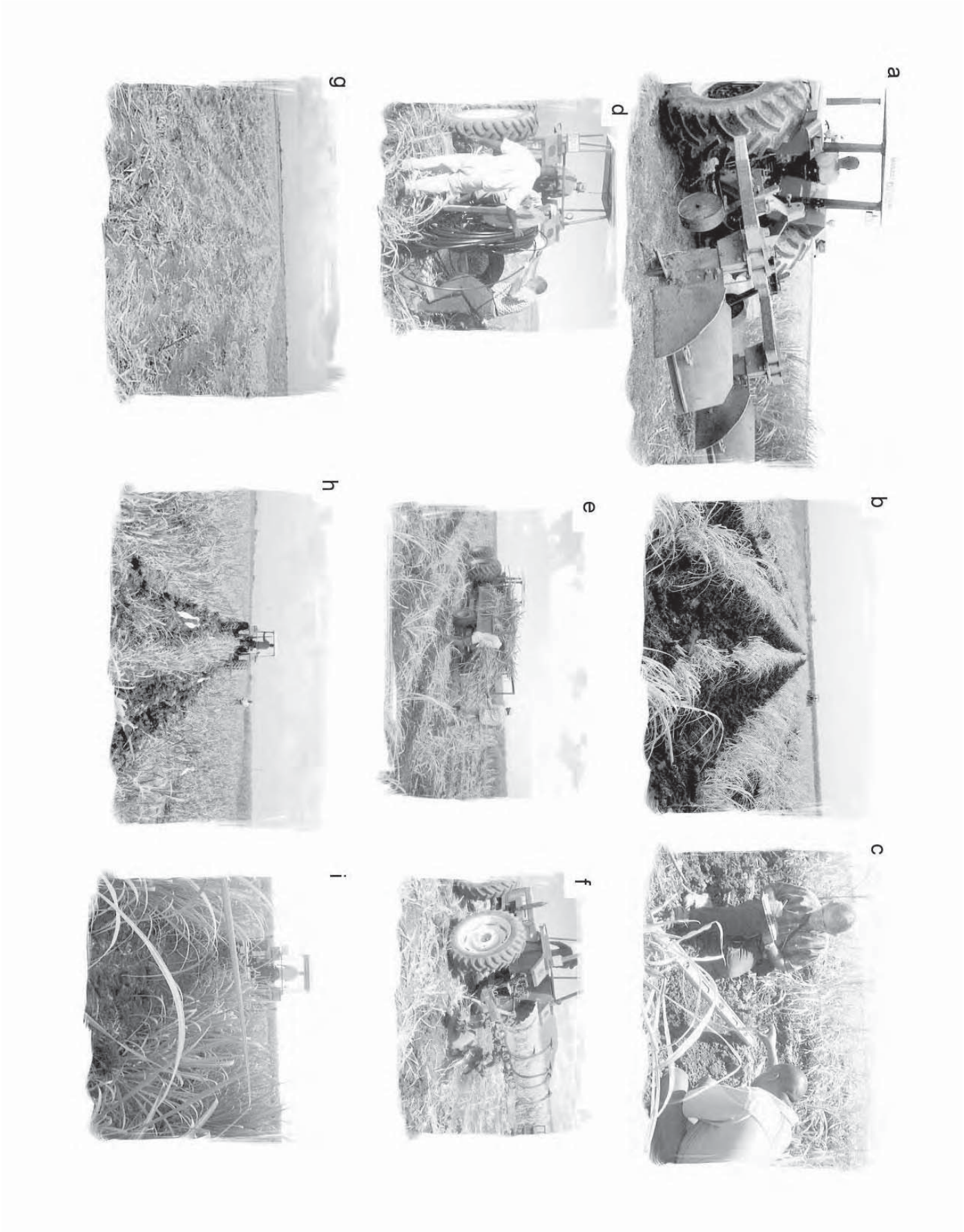


Fig. 5.4: Profile at different stages of land preparation.

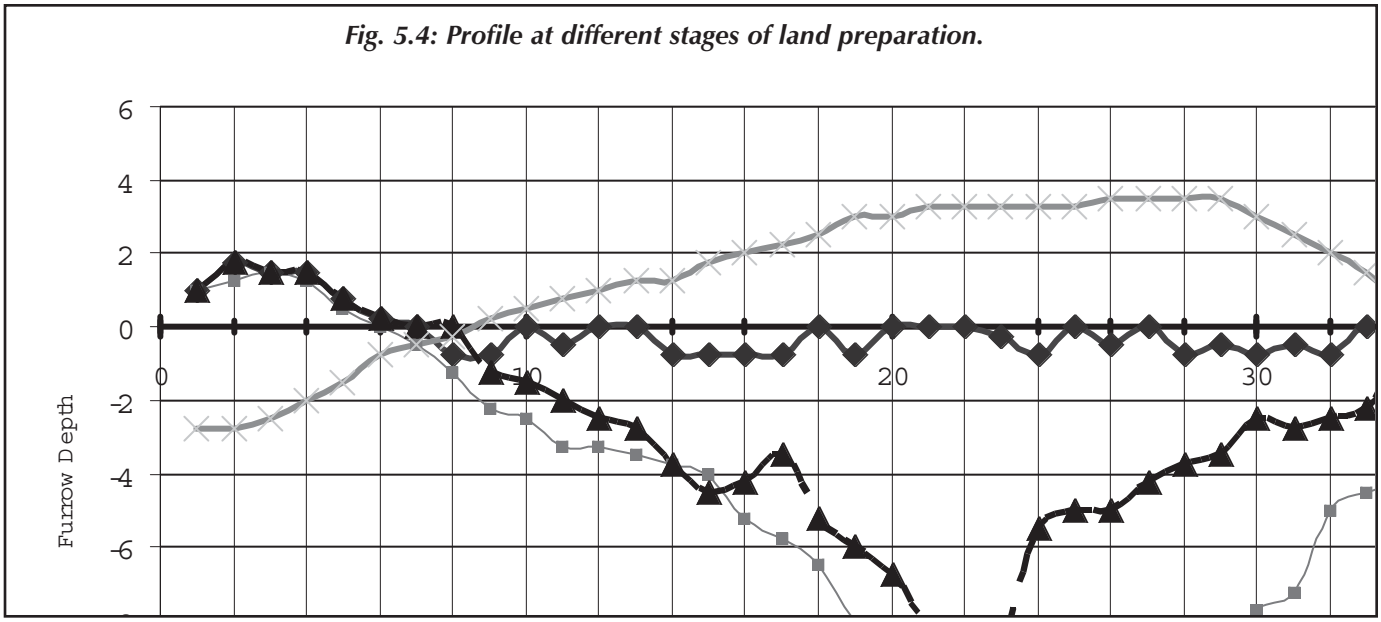


Fig. 5.5: Three spring tines, with furrower, were set at 0.9m from the centre of a frame.

Table 5.3: Results of high density planting, Springfield

Variety	Age at harvest (month)	Yield Harvested for	(tc/ha)	JRCS
BJ9501	7	Seed cane	73	N/a
BJ9186	7	Seed cane	73	N/a
BJ8281+ BJ9501+BJ9186	17	Factory processing	80	11.64

The trial showed that simple modifications to settings of implements on the toolbar could provide equipment suitable to give the desired row spacing for high density planting and that the resultant yield was quite satisfactory for seed cane production. However, overcrowding reduced this advantage should the cane be allowed to mature for factory processing.

Design of Inter-row Cultivation Machine

The design of the inter-row cultivation machine for Cambria Farms was done but the fabrication was delayed due the closure of the SIRI workshop in **Bernard Lodge.** This machine will effectively cultivate two inter-row spaces per pass. *Fig. 5.8* shows the drawing of the machine.

Other Activities

1. Calibration of a Vicon fertiliser broadcaster with a SIRI designed bander was done at Noel Lowe's Farm to dispense 7.5 bags/ha in ratoons.
2. Calibration of Boom Sprayers at Retreat Ltd., **SCJ - Monymusk**, Dr. Wright's farm and Holland Estate.
3. A ditcher and rear blade were recovered and put to work on Springfield farm. The objective is to prepare drains so that there is easy access for the mechanical harvester and other farm machinery while operating.
4. The Engineering Department worked closely with the 1000 ha replanting project in **SCJ - Monymusk.** The RTM 3.0 was used to open furrows and the rear blade was used to prepare drains.

Fig. 5.6: Covering and fertilizing being done simultaneously.

Fig. 5.7: The 0.9m inter-row space field after two month planted.

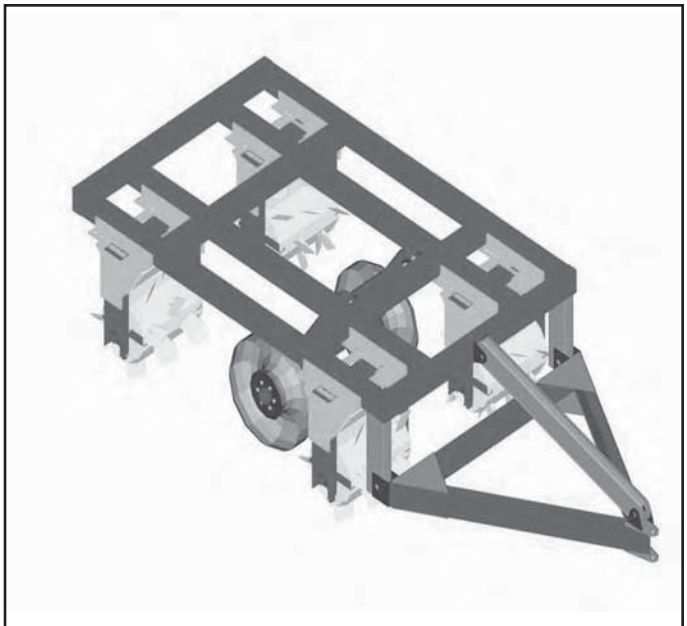


Fig. 5.8: The design of the inter-row cultivation machine for Cambria Farms.

6 VARIETY IMPROVEMENT

6.1 SEEDLING PRODUCTION

In keeping with efforts to increase the quality of commercial varieties, a large proportion of the seedlings was derived from crosses of families with high intrinsic sucrose content. The Cane Breeding Station does these crosses in response to Jamaica's need to maximise earnings for growers who are paid on the basis of quality. The latter is influenced largely by sucrose content as measured at the core laboratory. The subsequent selection process seeks to isolate from that seedling population those individuals combining the desired sucrose levels with high cane yield, disease resistance and acceptable agronomic features. A relatively low number of seedlings, 37 200, was produced in 2002 as a consequence of loss of viability of fuzz (1823.3 grams) during prolonged storage, *Table 6.1*.

6.2 COMMERCIAL VARIETIES

A low rate of replanting in the industry resulted in only slight shifts in the relative positions of commercial varieties grown. Despite a reduction in area planted in 2002, BJ7504 (27%) remained the most widely grown variety with BJ8226 (12%) second in importance. The latter has been succumbing to smut, tends to be drought sensitive and is therefore being gradually withdrawn from cultivation. BJ7015 (11%) and BJ7465 (8%) were in third and fourth place respectively, *Fig 6.1*.

In the Irrigated Area, particularly at **Bernard Lodge** and **Monymusk**, area planted to UCW5465 (2%) was reduced in favour of BJ78100 which has been consistent in performance over the cropping cycle and has exhibited tolerance to drought stress.

Relatively recently released varieties BJ7938, BJ8252, BJ78100 and BJ82156 were further propagated during the year. At **Long Pond** good cane yield from BJ78100 in the 2000/01 crop influenced the accelerated planting of this variety in particular, where BJ7015 and BJ7504 were predominant. Further propagation of BJ82156 took it to the 1% level with the largest concentration remaining at **Worthy Park** but marginal increases taking place at **Frome** and **The St. Thomas Sugar Co.** Its characteristic erect growth habit and resultant slow canopying tend to favour early weed growth making it relatively unattractive to some growers. However, it is an ideal variety for high density planting when this is promoted as a technique to give the desired canopy as well as increased yield per hectare. Other recently released varieties propagated at **Frome** were BJ7355 and BJ8252.

Despite a propensity to arrow which could adversely affect juice quality, the rate of expansion of BJ82102 increased at **Monymusk**, **Holland** and **Bernard Lodge**. The feature making it most attractive is its adaptability to clay soils. At **Appleton** there was a trend towards extension of BJ8252 and BJ7938. BJ8231 was introduced to the area for field scale assessment.

With increasing use of centre pivot irrigation and mechanical harvesters, varieties such as BJ8252 and BJ7465 were being more widely grown to take advantage of inherent good juice quality when satisfactory yield can be ensured and provide erectness required by chopper harvesters. Also field scale assessment of BJ8207 and BJ7314, high sucrose varieties adapted to high rainfall areas, was also initiated at **Appleton**.

6.3 NEW VARIETIES

Four new varieties, J9501, BJ8532, BJ8534 and BJ8783, were evaluated in semi-commercial nurseries. In trials these have shown considerable potential, yielding between 0.90 and 1.25 tonnes sugar per hectare per month (ts/ha/mo), *Table 6.2*. Their main features are as follows:

J9501
Parentage: BJ84124 x Eros

This is a moderate yielding mid-season variety with good juice quality. It is resistant to smut, erect and suited for mechanical harvesting. It appears to have good ratooning ability on clay loam soils.

BJ8532
Parentage: B73405 x B73785

BJ8532 is a vigorous growing erect variety with medium to thick stalk and good inherent juice quality The variety is adapted to a wide range of ecological conditions, appears to ratoon well and is resistant to smut.

BJ8534
Parentage: B73405 x B73785

Stalks are thin to medium in girth with good inherent juice quality. BJ8534 is potentially high yielding, resistant to smut

Table 6.1: Seedlings produced (x1000) for period 1998 - 2002

Year	1998	1999	2000	2001	2002
# of seedlings	37	52	52	48	37

Table 6.2: Potential yield (tc/ha & ts/ha/mth) of new varieties per hectare

Variety	tc/ha	ts/ha/mth
J9501	80	0.90
BJ8532	80	1.00
BJ8534	85	1.10
BJ8783	90	1.25

Table 6.3: Productivity of Twenty One Promising Varieties

Variety Reaped	Times	Cane Yield	% Standard Sucrose Quality	Yield x Quality	Flower	Ratoon	Erect	Special Features
BJ8707	1	96	117	114	L	G	I	Good juice, medium stalk
BJ8723	1	95	111	105	L	G	I	Vigorous, recumbent
BJ90103	2	140	91	129	L	G	G	High cane yield
BJ9012	2	101	104	104	L	G	I	medium to thin stalk
BJ9033	4	129	99	129	L	I	G	Moderate performer
BJ92117	2	100	100	101	L	G	I	Rigorous growth
BJ9221	2	103	105	110	L	G	I	Medium stalk erect
BJ9222	3	94	106	101	L	I	G	Erect good tillering
BJ9248	3	105	96	100	L	G	I	Good cane yield
BJ9252	2	104	98	103	L	G	I	Moderate juice quality
BJ9270	1	98	119	118	L	G	I	Good cane yield
BJ9329	2	99	108	108	L	G	I	Good early growth
BJ9374	2	91	112	103	L	G	G	Good tillering, good juice quality
BR7928	2	102	119	122	L	G	G	Good juice quality
BT72409	2	105	118	124	L	G	I	Erect thick stalk
BT80311	2	125	121	152	L	G	G	Good yielder, thick erect stalk
BT87603	2	98	110	109	L	G	G	Good performer in irrigated area
CR87220	2	121	117	147	M	G	G	Good general purpose cane
CR892023	2	113	112	128	L	G	G	Erect good quality
DB7047	2	102	118	122	L	G	G	Erect good quality
DB7532	2	114	118	137	L	G	G	Good early coverage

L - Light
G - Good
I - Intermedate
M - Moderate

and rust, appears to have good ratooning ability, particularly in the irrigated area.

BJ8783
Parentage: B78697 x B75368

This is a vigorous high yielding variety of above average sucrose content that shows promise under a wide range of ecological conditions. It is also smut resistant and shows good ratooning ability.

6.4 YIELD TRIALS

Complete results were recorded for twelve variety trials reaped while four were lost due to unplanned burning. Several promising varieties were tested, some of foreign origin, eg BT 80311 which was the best performer with satisfactory cane yield and good juice quality, *Table 6.3*.

6.5 COMMERCIAL VARIETY PRODUCTIVITY

The leading commercial varieties displayed wide variations in the levels of productivity (tc/ha and ts/ha/mo) over the five ecological areas, *Table 6.4* . At **Frome** the best performer was BJ7465 (74.91 tc/ha and 0.70 ts/ha/mo.) while BJ82102 (63.92 tc/ha and 0.79 ts/ha/mo) was the most productive variety at **Appleton** though BJ7451 (78 tc/ha) gave better cane yield. At **Holland**, BJ82156 (97 tc/ha and 0.85 ts./ha/mo) ranked first in overall performance, but on a relatively small acreage. BJ7504 was the outstanding variety at **Worthy Park** (86 tc/ha and 0.94 ts/ha/mo) and **New Yarmouth** (58 tc/ha and 0.62 ts/ha/mo). The performance of BJ7627 was below expectation at Cambria where it was outperformed by BJ8252 (82 tc/ha and 0.90 ts/ha/mo) BJ78100 with cane yield of (134 tc/ha and 0.85 ts/ha/mo) followed by BJ7451 (72 tc/ha and 0.76 ts/ha/mo) were

superior to BJ7504 and BJ7015 at **Long Pond** while at **St. Thomas Sugar Co.** BJ7314 (81 tc/ha and 0.78 ts/ha/mo) was ranked first in overall yield.

6.6 SELECTION

Stage I (BJ2003)

Selections from Stage I nurseries at **Frome** and **Monymusk** yielded a total of 2800 clones which were promoted to Stage II.

Stage II (BJ2002)

The selection and assessment of Stage II nurseries at **Frome** and **Monymusk** resulted in 629 clones being promoted to Stage III.

Stage III (BJ2001)

The plant cane evaluation and assessment of Stage III nurseries located in three different regions were successfully conducted.

Planting of Nurseries
Stage I (BJ2004)

The Stage I nursery, comprising 37 200 seedlings, was planted at **Frome**. From this a total of 7 500 seedlings, representing 150 families, was selected and planted in family selection plots. At selection, whole families, as against individual clones, will be brixed and weighed so as to arrive at mean family values for yield and quality.

Stage II (BJ2003)

Two Stage II nurseries comprising 2 800 clones were planted, one each at **Monymusk** and **Frome**.

Stage III (BJ2002)

Stage III nurseries, each comprising 380 clones, were set up at **Monymusk** and **Hampden**.

Experiments Planted

The planting programme was severely affected by flood rains which affected land preparation for the critical period of May to August. Consequently, only eight variety experiments representing the BJ92 and BJ93 series as well as imported varieties were planted in five ecological areas.

Planting Recommendations

Variety recommendations do not include newer varieties such as J9501, BJ8532, BJ8534 and BJ88783 only because these are still in the multiplication phase and would be insufficient to form a meaningful part of the replanting programme. Nonetheless, growers having these in their possession are encouraged to further propagate them in designated nurseries so that by the following year they can be enough for commercial planting.

6.7 Variety Exchange
Export

Thirty varieties were exported to the Cane Breeding Station as single bud cuttings for use in the Breeding Programme.

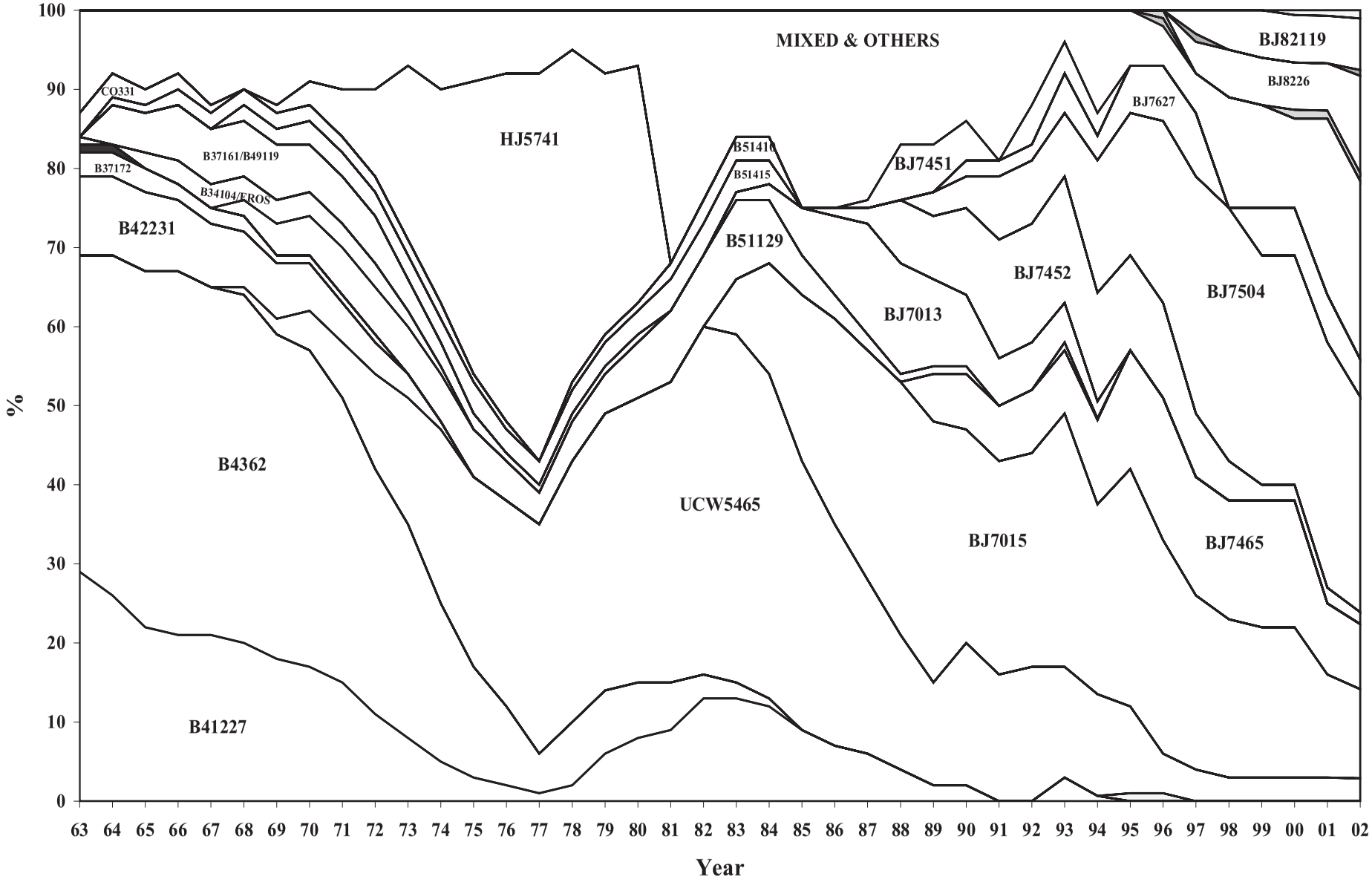
Imports

A further 35 varieties were imported as in vitro plantlets from the Cane Breeding Station. The Scientific Research Council of Jamaica was contracted to harden the plantlets in their tissue culture facilities prior to passing them on for growth in the SIRI glasshouse. A similar treatment was given to variety LCP85-384, imported from Louisiana, USA. Results of this process have been highly satisfactory as there was minimal loss during transfer from growth medium to soil and subsequent hardening. LCP85-384, a high yielding variety, has transformed the Louisiana industry in recent years taking that industry to the highest levels of productivity it has ever enjoyed. While Louisiana bred varieties rarely perform well in Jamaica's latitude, it was thought useful to test it locally and have it form part of the gene pool in the breeding programme.

Table 6.4: Average Yield of best varieties in tc/ha and ts/ha/mo

Varieties	tc/ha	ts/ha/mo
BJ7314	81	0.78
BJ7451	72	0.76
BJ7465	74	0.70
BJ7504	72	0.78
BJ78100	134	0.85
BJ8252	82	0.90
BJ82102	63	0.70
BJ82156	97	0.85

Fig 6.1 Percentage area under different varieties, 1963 - 2002



7 ECONOMICS & MANAGEMENT

7.1 CANE PRICE AND PROFITABILITY

Cane price for the 2002 crop increased by an average J$24/tonne (t) moving to $1094/t, up from $1070s/t in the previous crop, *Table 7.1*. This increase was largely attributed to a marginal increase in sugar price as with generally lower cane quality, measured by the Jamaica Recoverable Cane Sugar (JRCS) at the core laboratories, the price/tonne cane (tc) at five of the eight sugar factories was less than during the previous crop. At **Monymusk** and **Bernard Lodge** cane price slipped by $150.65 and $110.65/tc to roughly $1061 and $985/tc, respectively. In contrast cane price at **Frome, Worthy Park** and **Long Pond**, registered quite significant increases ranging from $110.61 to $205.31/t. Average cane price ranged from $984.55 at **Bernard Lodge** to $1409.67/t at **Worthy Park**.

Studies on the profitability of cane growing in Irrigated Areas showed that cash flow would be negative, even at the relatively high cane price of $1061/tc, at 9.86 JRCS, obtained at **Monymusk**, assuming an average yield of 80 tc/ha over plant canes and five ratoons, *Table 7.2*. The studies assumed average cane yields of roughly 80 tc/ha from plant cane to 5th ratoons, loans representing 80% of establishment cost at interest of 9.5% and a repayment period of three years.

Table 7.2 shows that at 9.86 JRCS and 80 tc/ha a third ratoon field would yield a net return of just $5882/ha but that same cane yield with a JRCS of say 10.5, a figure often achieved at **Monymusk**, would have brought a much more substantial net return of $14 700/ha.

A similar determination was made for Rainfed Areas, where production costs tend to be lower. Using **Frome's** cane price of $1068/t (at a JRCS of 9.90) and assuming average productivity of 70 tc/ha over plant cane and five ratoons, annual returns are positive for five of six years, with a high of over $20 018/ha in the fourth year, *Table 7.3*. At this level of productivity cumulative cash flow would be positive for the entire period, yielding a 15% return on investment.

Total Production

These analyses also demonstrated the potential for increased profitability in Rain-fed Areas, as some growers obtained prices of as much as $1410/tc - much above the average price for the **Frome** area.

7.2 COST OF PRODUCTION 2001

Preliminary analysis of the 2001 cost of production survey data showed the national average cost of cane production,

Table 7.1: Comparison of cane price at various factories, 2002 vs 2001

Factory	Cane Price J$/t		
	2001	2002	Difference
Frome	957.52	1068.13	110.61
Monymusk	1211.63	1060.98	-150.65
Bernard Lodge	1095.8	984.55	-111.25
Long Pond	975.81	1181.12	205.31
Appleton	1063.28	1038.48	-24.80
Worthy Park	1264.46	1409.67	145.21
Hampden	1151.56	1169.63	18.18
St. Thomas Sugar	1026.80	1026.33	-0.47
Average	**1069.68**	**1094.07**	**24.39**

Table 7.2: Net Returns (J$) per hectare, assuming JRCS of 9.86 and sugar price of $1061/t - Irrigated Areas

Items	Year 1 Plants	Year 2 1R	Year 3 2R	Year 4 3R	Year 5 4R	Year 6 5R
Total Production (t)	122 500	81 502	81 502	78 996	76 491	73 985
Avg yield (tc/ha)	80	85	85	80	75	70
Cane Price (J$/t)	1 061	1 061	1 061	1 061	1 061	1 061
Prod Cost/tonne (J$/t)	1 026	1 310	1 282	987	1 020	1 057
Net return/ha (J$/ha)	2 817	-21 132	-18 752	5 882	3 083	284
Cash Flow (J$/an)	2 817	-18 315	-37 067	- 31 185	- 28 102	-27 818

Table 7.3: Net Returns (J$) per hectare, assuming JRCS of 9.90 and sugar price of $1068/t - Rainfed Areas

Items	Year 1 Plants	Year 2 1R	Year 3 2R	Year 4 3R	Year 5 4R	Year 6 5R
Total Production (t)	101 292	62 298	62 298	60 092	57 886	55 680
Average yield\ha (tc/ha)	75	80	80	75	70	65
Cane Price (J$/t)	1 068	1 068	1 068	1 068	1 068	1 068
Prod Cost/tc (J$/t)	917	1 080	1 056	801	827	857
Net return/ha (J$/ha)	11 365	-937	987	20 018	16 883	13 748
Cash Flow (J$/an)	11 365	10 428	11 415	31 433	48 316	62 064

including harvesting, at $82 577/ha and $1206/tc. On a per hectare basis, this was above the $79 748/ha obtained the previous year. On a per tonne basis, unit cost was also higher in 2001 ($1 345/tc) compared to 2000 ($1206/tc), *Table 7.4.* The survey showed that the higher per hectare cost resulted mainly from higher expenditure on field development on a few estates and large farms, while the lower cost per tonne resulted from increased yields of 68.44tc/ha, up from 59.80 in 2000.

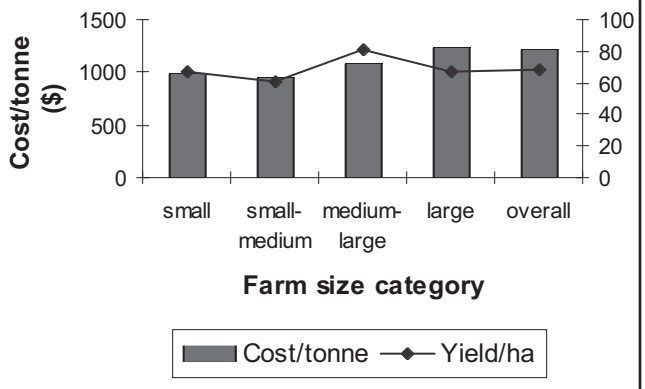
Cost by Farm Size

The survey showed a trend towards increased cost of production with increasing farm size. Small farms were found to have the lowest cost at $954.31/tc. Cost increased to $1089 and $1 316/tc on medium-large and large farms, respectively, *Fig 7.1*.

Table 7.4: Cost per hectare and tonne cane, 2001 and 2000

Crop year	Cost/ha	Cost/tc	Cane yield/ha
2001	$82 597	1 206	68.44
2000	$79 748	1 345	59.80

Fig. 7.1: Cost & yield by farm size category, 2001



Small and medium-sized farms tend to have minimal overheads and so incur lower costs. Large farms, on the other hand, by virtue of their size, tend to have high overheads but not necessarily any higher yield and therefore unit costs tend to be higher. In order to reduce cost, large farms must improve cane yield above the 67.56 tc/ha achieved to somewhere in the region of 85 tc/ha. With average cane price at $1068.69 for the 2001 crop, mainly the small and medium sized farms in the survey would have realised profits.

7.3 HARVESTING RATES - 2002

There were increases in harvesting rates across the industry in 2002, consequent on a union-negotiated 7% wage increase, which moved basic cane cutting rate to $113/t, from $104/t in the previous crop. As usual, the negotiated rate was applied mainly on estates and a few large farms. In some cases, rates were supplemented by monetary productivity incentives. Where canes were reaped by contractors, cutting rates ranged from $140 to in excess of $160/t in efforts to compensate for the absence of certain employment benefits available to workers employed to estates and large farms.

Harvesting cost thus ranged from an average of $378/tc at **Frome** to $567/tc in upper Clarendon, *Table 7.5*. The latter rate occurred among growers on hilly terrain, which does not lend itself to mechanization and where operations include infield bundling and animal transport to suitable points for road transport.

With annual increases, harvesting rates tend to claim an ever rising percentage of cane price. At **Bernard Lodge**, for instance, although harvesting cost remained virtually unchanged at roughly $403/tc, it claimed 37% of cane price in 2001 compared with 41% in 2002 (when there was a drop in average cane price of $110/t). Meanwhile, at **Monymusk,** while harvesting cost increased from $403 to $427/tc, average cane price declined from $1211.63 to $1060.98/t.

Table 7.5: Contractor harvesting rates in relation to cane price, 2001 & 2002

	2001			2002		
Factory area	Cane price J$/tc	Harvesting J$/tc	Harv. as % of cane price J$/tc	Cane price J$/tc	Harvesting J$/tc	Harv. as % of cane price J$/tc
Appleton	1,063.28	348.00	33	1,038.48	370.00	36
St. Thomas Sugar	1,026.80	375.00	36	1,026.33	375.00	37
Monymusk	1,211.63	403.41	33	1,060.98	426.00	40
Frome	957.52	360.00	38	1,068.13	375.00	35
Long Pond	975.81	325.00	33	1,181.12	380.00	32
Worthy Park	1,264.46	469.00	37	1,409.67	567.00	40
Bernard Lodge	1,095.80	403.00	37	984.55	404.00	41

7.4 CANE YIELD SURVEY 2002

Farms and estates sampled in the 2002 Cane Yield Survey, yielded an average of 64.05 tc/ha, or 3.5 tc/ha below the previous year's 67.06 tc/ha. The survey covered some 954 517 tc from 15 006 ha. This represented 58% of cane harvested and just under 57% of total area reaped.

Holland's yield slipped to 61.96 tc/ha, some 11.77 tc/ha below the previous year's. **Bernard Lodge, Frome** and **New Yarmouth** also registered marked decreases, though of lesser magnitudes, *Table 7.6*. These reductions could only be partially accounted for by flood rains which occurred in late May. Among estates showing yield increases was **Long Pond,** up by over 10 tc/ha to 65.29.

Sugar Yield

It is generally accepted that fields grown under irrigation should produce at least 8.5 tonnes sugar per hectare (ts/ha) and those in rain-fed areas in the region of 7.5 ts/ha to be profitable. The 2002 survey showed only two farms, Cambria (9.7 ts/ha) and Worthy Park Farm (10.0 ts/ha), both rain-fed, realising yields above 8.5 ts/ha, *Fig 7.2*. The average farm, particularly in the irrigated area, therefore fell well below the economic threshold.

Results of the 2002 Cane Yield Survey are given in a series of appendices at the end of this Annual Report.

Cost Management Seminars

In order to assist growers to better manage their resources and improve farm income, seminars which focussed on cost management and record keeping were held in the **Frome**, St. Elizabeth and Clarendon areas. A record keeping handbook developed by the Economics Department was the main instrument used in these seminars.

Fig. 7.2: Sugar yeild per hectare by estates/farms, 2002

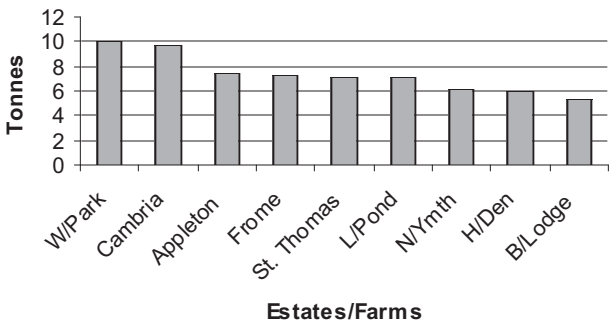


Table 7.6: Cane Yield Comparison 2001 vs 2002

Estates/Farms	2001	2002	Difference
Appleton	71.85	72.74	0.89
Bernard Lodge	64.58	54.18	(10.40)
Cambria	83.59	84.19	0.80
Frome	77.20	70.02	(7.18)
Long Pond	54.72	65.29	10.57
New Yarmouth	62.21	58.36	(6.19)
Holland	73.73	61.96	(11.77)
St. Thomas Sugar	71.49	72.93	1.44
Worthy Park	79.66	78.45	(1.21)

8 AGRICULTURAL PRODUCTION & EXTENSION SERVICES

8.1 PRODUCTION

Sugar cane production declined to less than 2 million tonnes for the first time in the last 50 years. Sugar produced fell also to 175 252 tonnes, the lowest since 1945. When compared with the 2001 crop, cane harvested fell by 254 618 tonnes (11.4%) and sugar output by 29 716 tonnes (14.5%).

An estimated total of 1 988 519 t cane was harvested from 33 611 ha (85% of total cane area and 92% of area that could have been reaped) *Table 8.1*. Cane actually milled was 1 974 309 t at a conversion of 11.26 tc/ts. The Jamaican Recoverable Cane Sugar (JRCS), measured at the core averaged 10.05, *Table 8.2*.

Table 8.1: Average Jamaican cane production over the last 6 years vs 2002

	Cane area (ha)	Area reaped (ha)	Cane reaped (t)	tc/ha
6 yr avg.	45240	37113	2337307	63.0
2002	39761	33611	1988520	59.2
Difference	5479	3502	348787	3.8

Fig. 8.1: Productivity of respective cane growing areas, 2002

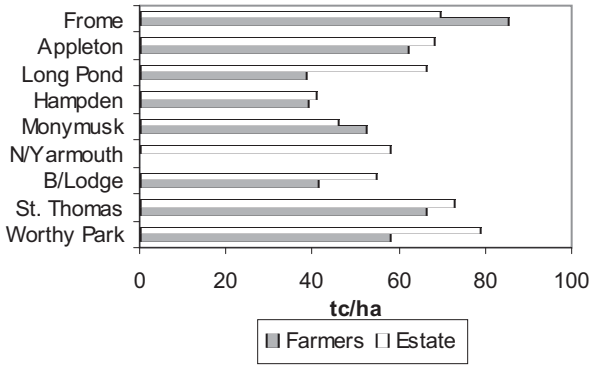
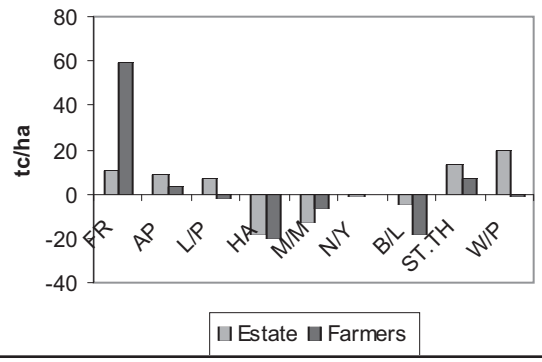


Fig. 8.2: Deviation of factory areas from island average - 59.2 tc/ha



Production Trend

Over the last six years there has been an accelerated decline in cane area and yields with a resultant fall in cane and sugar production. Area reaped in 2002 declined by 3500 ha (9%) while yields declined by almost 4%, *Table 8.1*.

IIn 2002 cane yields ranged between a low of 38.2 tc/ha by the **Long Pond** farmers and a high of 78.5 tc/ha achieved at **Worthy Park** estate, *Fig. 8.1*. Of the 7 factory areas, **Worthy Park**, **St Thomas Sugar**, **Appleton**, **Long Pond** and **Frome** exceeded the Industry average of 59.2 tc/ha, *Fig. 8.2*. Farmers associated with these factories, except for those at **Long Pond** and **Worthy Park**, also tended to be above average.

Heavy rainfall towards the end of May extending into early June, disrupted harvesting and sugar processing and caused considerable loss to the industry. There was severe damage to fields and infrastructure in some areas. In addition to the loss of approximately two weeks of production, operations never returned to normal for the remainder of the crop, contributing further to the low outturn.

Flooding recurred in September, by which time the 2002 crop was completed, causing further field damage and retarding growth in canes to be harvested in 2003. Areas most severely affected were: St. Elizabeth, Clarendon, St. Catherine and the North Coast.

Table 8.2: Jamaican Production and Productivity 2001 and 2002

		2002	2001
Area in Cane (ha)		39 761	40 779
Area Harvested (ha)	Estates	18 467	19 259
	Farmers	15 144	15 743
	Total	33 611	35 002
Cane Harvested (t)	Estates	1 130486	1 129 708
	Farmers	858 033	947 429
	Total	1 988 519	2 243 137
Productivity (tc/ha)	Estates	61.20	67.3
	Farmers	56.70	60.20
	Average	59.20	64.10
Sugar (ts/ha)		5.21	5.86
Cane Milled (t)		1 974 309	2 237 176
Sugar Produced (t)		175 252	204 968
tc/ts		11.26	10.91
JRCS		10.05	10.10
Fibre % Cane (Core)		16.79	16.68

Replanting

Once again the replanting programme fell well short of the target of 16% of cane area as growers experienced difficulties in accessing loan funds. By the end of the 2002 replanting season a total of 3 578 ha, or only 53% of the replanting target, was replanted, *Table 8.3*. Estates achieved approximately 77% while farmers realised just 24% of their respective targets. With a continuing reduction in land under cane, area replanted represented 9% of total cane area in 2002. This largely made a mockery of the Extension Department's provision of technical assistance to growers.

In addition to this replanting, some 199 ha of new lands were brought into cane production giving a grand total planted of 3 777 ha as under:

Frome Farmers	64 ha
Worthy Park Estate	45 ha
Worthy Park Farmers	10 ha
St. Elizabeth Farmers	80 ha
Total	**199 ha**

Summary

Re-plants	3 578 ha
New Plants	199 ha
Grand Total	3 777 ha

Fertilizer/Nutrition

Extension records indicate that up to the end of October approximately 31 740 ha, or 94% of area harvested, had received fertilizer, *Table 8.4*. However this statistic tends to mask the real state of nutrition within the industry as while estates were more or less able to maintain schedules, an estimated 40% of farmers' area experienced treatment delays, often in excess of three months. Delays were largely a consequence of deficiencies in the fertilizer distribution system. This was compounded by some growers applying less than recommended dosages.

The system in place allows the farmer a bag of fertilizer for a fixed number of tonnes of cane delivered. This arrangement, linking fertilizer credits to the previous year's cane supply, could result in a grower applying less and less fertilizer in circumstances where dosages should be maintained or increased. Unless he has resources to purchase additional supplies, a grower could find that a drop in yield in any one year would tend to be self-sustaining as he automatically becomes eligible for a smaller fertilizer input. Extension often goes through the whole process of collecting and analysing soil and leaf samples and giving appropriate recommendations and yet sees the farmer apply a lower dosage of fertilizer, in accordance with what his credit will permit.

Table 8.4: Hectares Fertilized, 2002

Areas	Estates	Farmers	Total
Frome	4983	5425	10408
Appleton	2530	950	3480
Monymusk	3743	1844	5587
New Yarmouth	1575	-	1575
Worthy Park	1046	2136	3182
Bernard Lodge	3121	835	3956
St. Thomas Sugar	880	850	1730
Long Pond	744	388	1132
Hampden	406	283	689
Total	**19028**	**12711**	**31739**

Table 8.3: Area (ha) replanted during 2002 planting season

		Estates		Farmers	
Areas	Planted (ha)	16% Target	Planted (ha)	16% Target	Total Planted
Frome	534	882	297	983	831
Monymusk	777	606	143	480	920
N/Yarmouth	298	282	-	-	298
B/Lodge	497	718	51	326	548
Long Pond	58	275	49	219	107
St. Thomas	95	198	69	220	164
Appleton	335	406	92	298	427
Worthy Park	162	162	45	407	207
Hampden	60	120	16	213	76
Total	**2,816**	**3,649**	**762**	**3,146**	**3,578**

8.2 EXTENSION ACTIVITIES

JRCS Study

Although weather is a prime factor in cane ripening, the consequences of unscheduled burning, stale cane deliveries, improper cutting and loading practices as well as other inefficiencies in the harvesting process often result in marked deterioration in cane quality between field and factory. The **Frome** area in particular has had several years of such low cane prices as to make the economics of cane farming very marginal at best. For the last five years average quality has exceeded the standard, of approximately 10 JRCS, on only one occasion (in 2000) at that factory, resulting in a growing debt crisis among farmers in the area. There was therefore a question as to whether cane in the field was of intrinsically poor quality or whether there was significant loss of quality in the harvesting process. For this reason, the Extension team conducted a study comparing pre-harvest cane quality with test results obtained in the normal course of harvesting. Some samples were taken prior to burning, some after canes were burnt and cut in the field. Samples were properly base-cut and topped then taken free of extraneous matter in bundles of 4 stalks each from four sections of the field to the core laboratory for analysis. These results were compared with the routine core sampling of cane loads in haulage units entering the factory yard.

Fig. 8.3: Dual row planting.

Pre-harvest green cane samples turned out to be on average 3.87 JRCS points higher in quality than canes delivered commercially. Whereas pre-harvest samples were processed within four hours after collection, there was delay, ranging from 24-48 hours before all loads from a field were cut, loaded, delivered and tested. From 39 such comparisons, green cane samples gave a JRCS of 13.13, on average, as against 9.26 from commercial harvesting. The drop in quality from field to factory would have translated to a loss of over $400/tc to the grower, under prevailing conditions in 2002. *Table 8.5*. The deterioration in quality after cane was burnt was equivalent to 3.23 JRCS units, or just under $350/tc.

Observations of the harvesting process, not just at **Frome** but at many places within the industry, reveal that much of the loss in quality occurs as a result of incorporation of extraneous matter in the form of tops, suckers, soil and trash during cane cutting and loading. Generally, there tends to be excessive pushing of canes by the grab loaders during which process much of the debris is incorporated into the loads. The higher than normal incidence of unplanned cane fires in the **Frome** area also results in chaotic harvesting and a tendency towards delivery of up to 40% of the cane as three-day old, rather than freshly, cut canes. Some cutting gangs also do not exercise sufficient care in proper stumping and compound this by not removing enough of the top. If these practices are successfully addressed the gap between quality of cane in the field and that delivered to the core should be substantially reduced.

Table 8.5: Comparing JRCS of cane from pre-harvest samples with commercial harvest results

Commercial harvest JRCS	**=**	**9.26 (7.24-11.57)**
Green cane sample JRCS	**=**	**13.13 (9.96-15.45)**
Burnt cane sample JRCS	**=**	**12.49 (9.26-14.94)**
Diff. between harvest and green cane sample JRCS	**=**	**3.87**
Diff. between harvest and burnt cane sample JRCS	**=**	**3.23**
J$ loss between green cane sample and harvest	**=**	**$415.78**
J$ loss between burnt cane sample and harvest	**=**	**$347.02**

Meanwhile, in the **Bernard Lodge** area an evaluation of canes sent to the factory by two chopper harvesters supplying green cane revealed that generally the stumping was good but the vegetable matter tended to reach unacceptable levels. Tests conducted on 103 tonnes of cane so delivered revealed vegetable extraneous matter ranging from 11 to 33%. Removal of this improved JRCS by 1.4 - 2.1 units.

Dual Row Planting

At **Worthy Park** there was an ongoing investigation of dual row planting as a means of increasing cane yield per hectare. Two rows of cane were planted 0.45 m (18 in) apart on each bank in a block of just over 5 ha and performance was compared with the conventional system of a single row per bank 1.6 m apart. Just under 2 ha were planted in dual row fashion and 3.5 in conventional style. The variety used was the very erect BJ82156 which canopies very slowly. An obvious benefit from the dual row planting with this variety was greater ground cover and reduced weed pressure. Measurements in growth stations during the year showed all indications of greater yield in dual row plots and this was confirmed at harvest. In the plant cane phase, dual row yielded 77.46 tc/ha, 22.5% greater than yield from conventional planting, which was 63.22 tc/ha. Observations continue into the ratoon phase.

Variety Expansion

Efforts by Extension Officers throughout the year to promote wide scale use of newer recommended varieties were stymied by the low level of replanting achieved by the industry. Nonetheless, where replanting was done, emphasis was placed on establishing pure-stand fields, and use of varieties recommended for the various regions. Some of the varieties extended were J9501, BJ8859, J8808, BJ8252, BJ78100, BJ7938 and BJ9186.

Certified Seed Cane Nurseries

The Certified Seed Cane Project, designed to ensure a supply of pure-stand disease-free seed cane of recommended varieties, entered its third year of production. Extension Officers were involved in identifying suitable growers, giving guidance in land preparation, weed control, fertilizing and roguing on the various plots distributed across the industry. With the low level of replanting most of the certified seed cane was again allowed to mature and ended in factories for processing. This marked the second year of failure to use certified seed cane for its intended purpose and caused a slowing down in establishment of new plots. Varieties in the programme included J9501, BJ7355, BJ8252, BJ8808 and BJ8859, BJ82119, BJ82156 and BJ7938.

Other Nurseries

The Institute has for a number of years maintained a seed cane nursery in the McNie area of Upper Clarendon to serve growers supplying cane to the **Worthy Park** factory. During 2002 the 0.81 ha nursery was planted mainly to BJ78100, being propagated in that

zone. However, due to the low levels of replanting the nursery matured and canes were sold to the **Worthy Park** Factory.

Weed Control

An integrated approach to weed control was advocated throughout the Industry. This embraced mechanical methods such as chiselling and moulding as well as use of herbicides. With the high rainfall during the second half of the year however, weed infestations became a major concern throughout much of the industry. This necessitated an intensification of efforts by Extension to ensure that growers carried out the most cost effective practices.

Training sessions in the mixing of chemicals, and choosing the type and rate of application were conducted for growers and their staff across the industry. The impact of chemicals on the environment and procedures for safe handling and disposal of containers were also emphasised. Pre-emergence application of herbicides was promoted as the more efficient means of developing a weed-free environment. Recommendations were reinforced by a number of field demonstrations in various ecological areas.

Viability Project

Increasingly, growers have been complaining about low income from cane farming and there has indeed been a steady attrition from the ranks, as year by year more farmers go out of production. In 1992 an estimated 47 000 ha were in cane production. A decade later that figure had fallen to just 39 761 of which only 33 611 ha were harvested. This trend meant that the industry was falling further and further behind its target of increasing sugar production to meet domestic and export demands. The decline in fact appeared to be accelerating despite all efforts to boost output. Therefore, questions of the profitability of sugar cane farming arose. In efforts to answer these questions Extension undertook to carry out investigations on the viability of cane growing provided all inputs are supplied in a timely manner and recommended practices are followed.

For this study, with the cooperation of a grower, a field was obtained on a farm showing declining productivity. In this instance the grower was Lucius Jackson, a typical farmer supplying cane to the **Frome** factory in Westmoreland. This farm was then producing at less than a quarter of previous output.

A field block of 2.8 ha was obtained and planted to two recommended varieties, BJ82156 and BJ7465. During land preparation filter cake was obtained from the factory and incorporated in the soil. After germination, supplying was carried out to ensure a satisfactory field population while weed control and other cultivation activities were effected as needed. Careful accounting of all expenditure was maintained. As a field is not expected to show profit in the first year, the project will be carried through the ratoon cycle, keeping records of income and expenditure to determine viability. The first harvest was scheduled for April, 2003.

Divested Lands

Farms on lands distributed under Government's divestment programme in 1994 continued to have mixed results. From its inception, the scheme at **Monymusk** hardly got off the ground as the necessary infrastructure development was never completed. At **Bernard Lodge**, a continuing decline in output led to only four of the original nine farms surviving in 2002. However the group of farms at **Frome** continued their outstanding performance with average yields of 71.13 tc/ha as against 65.1 tc/ha for farmers supplying cane to that factory. The most outstanding was that of the Tingling Brothers with productivity of 86.83 tc/ha, *Table 8.6*. Extension works with these (and all farms) in providing technical advice.

Training

Extension organised a series of training sessions for growers across the industry as part of a major thrust, involving the Sugar Industry Authority, to introduce concepts of "Best Practices In Cane Production" in an effort to stimulate a turn around in the industry to set it once more on a growth path.

Table 8.6: Production data, divested farms, Frome area, 2001- 2002

Farmers		Area (ha)		Cane		
& Location	**Estimate (t)**	**Replanted**	**Reaped**	**Reaped(t)**	**tc/ha**	**JRCS**
Barham Cane Farmers Group (Waterground)	4550		60.30	3985.24	66.09	10.18
4 West Producers (Roaring River)	4095		64.94	4047.98	62.33	9.97
Prospect Cane Holdings (Prospect)	4270	3.65	59.50	4524.60	76.04	9.13
Errol Pinkney (Bull Head)	3200	14.58	48.00	3090.03	64.37	9.33
Karl Salabie (Bull Head)	4500	6.00	61.00	4295.39	70.41	9.85
Peggy Barry (Mint)	4800	10.10	83.30	4247.48	50.99	9.71
Western Sugar Investment (Mint)	4200		50.00	3719.73	74.39	10.63
Evergreen Farms (Kew)	2450	2.83	23.00	1602.09	69.65	9.39
Tingling Brothers (Masemure)	8208	1.20	102.00	8856.94	86.83	10.41
K.L.A. & C (Masemure)	4165		50.00	4030.08	80.60	10.67
Westmoreland Quality Farmers (Masemure)	2760		36.50	2791.22	76.47	10.39
Mesmac (Masemure)	3633	6.10	45.00	3430.73	76.23	9.96
Total/Avg	**50831**	**44.46**	**683.54**	**48621.51**	**71.13**	

This was a follow-up to a series of Seminars held in 2001. This new series took the form of field demonstrations followed by open discussions at **Frome, Appleton**, **New Yarmouth**, **Monymusk** and **Bernard Lodge**. Activities demonstrated included cane harvesting, ratoon maintenance, land preparation, planting, fertilizing, irrigation, drainage and weed control practices.

In addition, several training sessions were conducted among growers, within their respective areas, with focus on practices which would assist in achieving viable cane production. There were continued efforts to educate farmers in interpreting core reports and understanding the relationship between these results and payments received. Participants were encouraged to see links between results obtained and conditions that prevailed during harvest so that core results could be used as a tool to monitor performance. Also, in conjunction with the SIRI Economist, a number of training sessions were conducted among small groups of farmers across the industry, introducing a booklet produced by the Institute on Record Keeping. Growers were carefully taken through the various steps and shown the importance and benefits of record keeping.

8.3 SIRI EXPERIMENT FARM - SPRINGFIELD

AGRONOMIC STUDIES

During the year the Institute initiated studies at its Springfield Experiment Farm on various aspects of conservation agriculture. Studies included effect of green cane harvesting/trash blanket retention, crop rotation and reduced tillage.

Retained Trash Blanket

The trash blanket was retained on a 1st ratoon chopper-harvested field to assess the impact of trash cover on ratoon re-growth and yield. Trash was removed from the top of banks in selected 6-row strips for comparison with others where the blanket was left undisturbed. The trial was superimposed on a field that had been planted to three varieties - BJ9127, J9501 and BJ8252.

Early re-growth was noticeably faster in strips where trash had been removed from the banks. However after sprouts emerged from trash-blanketed plots there was a rapid catching up so that by three months, growth differences were no longer evident. However, severe flooding in May and September became the over-riding influence on growth so that treatment differences tended to be masked. There was a definite benefit in weed control, which was restricted to just spot spraying in trash blanketed plots, while a more general spraying was required where trash was removed. However as trash cleared from the top of the banks was piled in the adjacent furrow, there tended to be increased impedance of water flow during furrow irrigation.

Crop Rotation

Crop rotation has long been recognised as a means of restoring productivity in soils depleted after many years of monoculture. Yet the industry has hardly practiced this, perhaps because of demands to keep every available hectare of land under cane to maintain factory throughput and of a less than certain market for alternate crops. The Institute embarked on its study of crop rotation primarily as a means of measuring the boost in yield that comes from a break in continuous cane cropping. No attempt was made to vary the length of time cane would be removed from the soil. For convenience it was decided to take out cane for a single year. Expectations were that while alternate crops occupied the plots, the complex of soil organisms that collectively tend to depress cane yield would be depleted and, to the extent that cane might be a selective feeder, there would also be an opportunity to restore depleted soil nutrients.

At Springfield, a typical field that had gone through many cycles of continuous cane cropping was divided into six parallel strips, each approximately 0.4 hectare in size. In a random pattern half the strips would be ploughed in 2002 and planted to alternate crops, while the other set would be retained in cane until 2003 when the entire field would be replanted to sugar cane. Effect of crop rotation should be evident from growth differences in rotated plots and plots subjected to uninterrupted cane cultivation.

Original plans were to plant cowpeas followed by Sea Island cotton, which would be reaped just in time to permit replanting to sugar cane by the next April. The cowpeas was planted and harvested as planned but the imported cottonseed turned out to be almost totally non-viable. After the germination failure, a decision was taken to usefully occupy the land with a crop of sorrel. This too failed to give satisfactory land cover and so gaps were filled out with cucumber.

Satisfactory ground cover was provided by the cowpea although the crop was adversely affected by the May flood. Quite good yields were obtained even though the plot was ploughed out before harvesting was complete. Similarly the sorrel, and cucumber gave good yield. The former was to be sold under contract to the Scientific Research Council for conversion to chutney, while the latter was being sold as fresh produce to markets and supermarkets mainly within the parish of Manchester. The experience showed that with just one hectare of cucumber it was possible to create a local glut on the market. Cucumber harvested was estimated at over 9000 lb, while perhaps 1/10 of the crop was left in the field. By year-end, harvesting of the sorrel was just begun, but there were indications that handling, particularly stripping of the calices for marketing would be challenging without some form of mechanisation.

It was anticipated that by April, following completion of harvesting of the sorrel, and adjoining sugar cane plots, the whole field would be ploughed out and re-established in sugar cane for measuring the effect of the rotation.

Reduced Tillage

A field at Springfield was also devoted to an experiment in reduced tillage, the objective of which was to develop a more cost effective method of cane planting that would be no less productive and adaptable by the average cane grower. A secondary objective was to adopt principles of

conservation agriculture whereby farming practices would be more environmentally friendly, in this case minimising soil disturbance thus reducing the risk of erosion during the process of land preparation. The establishment and plant cane growth were very satisfactory in this trial, more fully described under Agricultural Engineering.

Harvesting

Cane sent to the factory from Springfield during the crop totalled 2290.28 tonnes from 39.74 hectares at 57.63 tc/ha and an average 11.04 JRCS, *Table 8.7*. Of that total 8.39 hectares was reaped green, using the chopper harvester. The chopper-harvested portion of 577.25 tonnes average 9.58 JRCS (range 8.48-10.61). In contrast the hand cut cane ranged in quality from 9.95 to 13.48 JRCS. The extended cropping period resulted in a number of the fields being reaped beyond the twelve-month stage with a crop average age of 13.05 months.

The low productivity was in large measure due to problems associated with water supply during the growing season. Water supply, at best considered barely adequate at Springfield, worsened in 2002 when sections of the main canal broke away, reducing the conveyance and starving the farm of its main source. This was compounded by receipt of only 766 mm of rain during the growing season.

Table 8.7 Springfield Yield Data - 2002

Field #	Area (ha)	Date Reaped	Age	Cycle	Cane Seed (t)	Sold to Factory (t)	JRCS
1240A	3.50	19-03-02	12.25	2R		137.03	10.31
1240B	2.47	20-03-02	12.25	2R		140.45	10.99
1241A	*1.73	12-04-02	11.75	5R		81.93	10.03
1241B	*1.48	11-04-02	11.75	6R		113.99	9.85
1242A	3.39	25-04-02	11.75	4R		152.42	9.95
1242B	3.50	25-04-02	11.75	4R		153.35	10.85
1243	*0.75	16-07-02	13.00	PL	373	60.15	8.48
	3.56						
1270	*3.71	15-07-02	14.50	4R		205.55	8.66
1271	*3.23	13-04-02	12.00	1R		223.51	10.61
1271B	2.43	10-05-02	12.50	2R		116.29	11.32
1272	*1.20	16-07-02	12.00	PL		97.67	8.95
1273	5.06	20-03-02	16.25	PL	152.58	369.59	11.64
1273A	0.35	10-05-02	18.00	2R	5.0	33.24	13.48
	0. 05						
1274	6.94	11-04-02	13.00	3R		405.11	11.22
Tot./ Avg.	**39.74**		**13.05**		**530.58**	**2290.28**	**11.04**

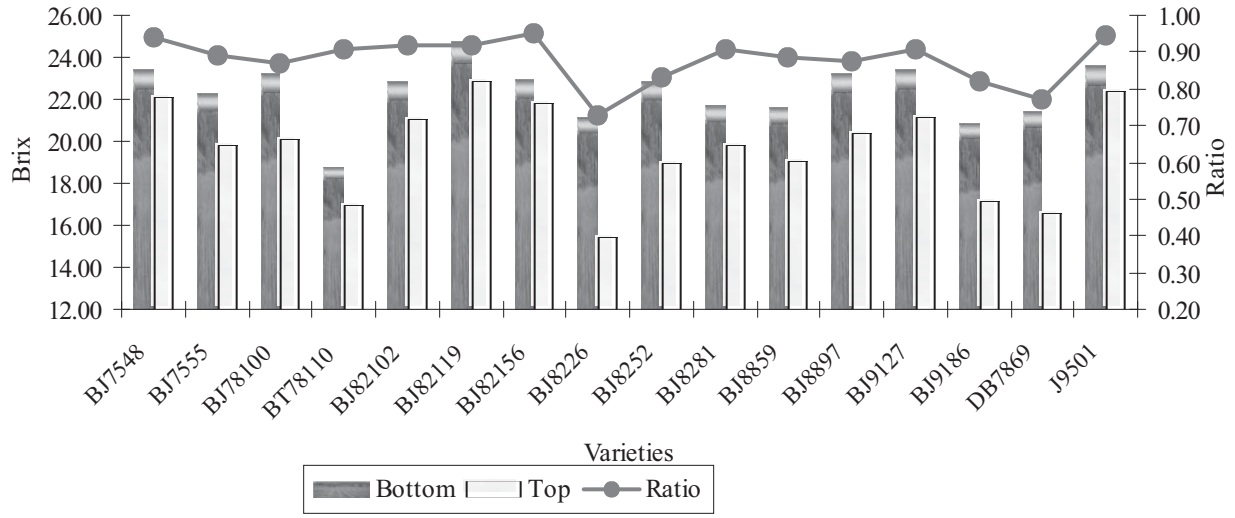
Seed Cane

A total of 530.58 tonnes of seed cane was distributed during the crop, *Table 8.7*, with the bulk, 373 t, of this going to the SCJ, **Monymusk** Division. Varieties distributed included BJ8252, BJ82156, and BJ9186.

Variety Performance

Maturity testing was routinely conducted from the 10-month growth stage, on all fields on the Experiment Farm. Results at the 12-month stage, *Fig 8.4*, showed BJ82119 to be carrying the highest brix at stalk bottom of approximately 25, though the most mature with a top/bottom ratio closest to 1, was BJ82156. However, it should be recognised that the tests were carried out at different stages of the harvesting season.

Fig. 8.4: Maturity Testing at 12 Months, Springfield, 2002



9 INFORMATION SYSTEMS

Reinitialization and preparation of the Core Program for the 2001/2002 sugar crop were done at six factories between January and February and for the 2002/2003 crop at two factories in December. A similar procedure was carried out at **Worthy Park**, Ocho Rios and Marcus Garvey Drive, sites where the Scale Program was in operation.

General trouble-shooting and modifications as per requests from the various factories were done on a continuous basis.. Program fixes and modifications were done to most in-house databases and user support and training were given where necessary.

The following publications were completed during the year:

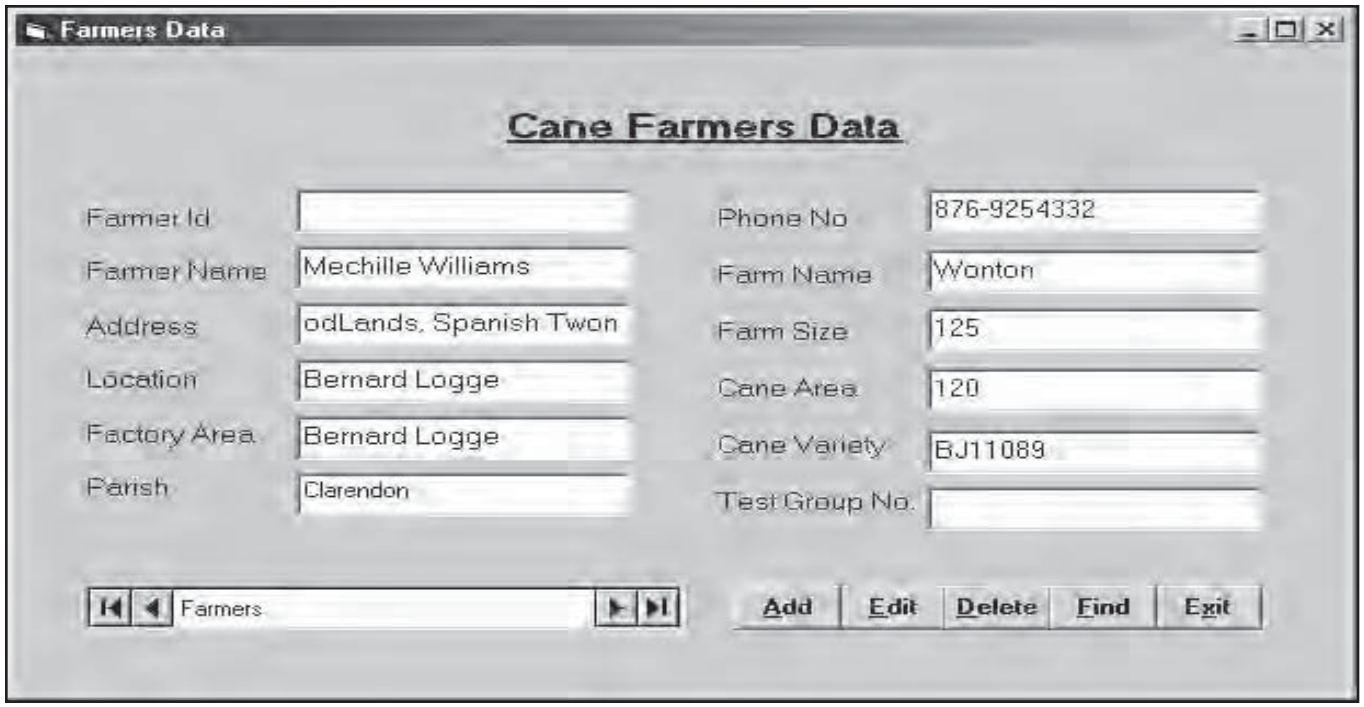
- Sugar Cane Magazines
- SIRI 2000 Annual Report
- Extension & JAST Newsletters

The weekly Factory, Sugar, Molasses, Core Audit, Revenue and Cane Quality reports were compiled and disseminated during the crop period. General and technical support were given and slide presentations and conference brochure prepared and compiled for the annual JAST Conference.

Support was provide for the Core Program at all core labs. This included fixing of problems and making changes to the program as requested by the factories. Modifications were made to **Long Pond's** core program to facilitate quality based payment to cutters, loaders and shunting operators.

Additional work was done on the New Scale program. This included modification to critical error handling and recovery; procedures to speed up transaction processing; help implementation; additional documentation; communication with new model scale; preparation to use report printer as the ticket printer; and completion of core data export and import modules. The New Scale Program was installed at the **Worthy Park** Farmers scale and also at the **Long Pond** scale. Users were trained and familiarized with the operating protocols.

Coding commenced for the SIA cane farmers registration system and the factory laboratory reporting system. New versions of the Cane Farmers Database Management Program and the Library Database Program, written in Visual Basic, were created and installed at **SIRI, Frome**. and at the SIRI Library. Programming also began on a new version of the SIA Factory Operations Program.



10 REVIEW OF FACTORY OPERATIONS

The 2001/02 crop lasted 247 days from December 7,2001, when **Frome** started to August 10, 2002 when **St. Thomas Sugar** finished. This was 29 days less than the 2000/01 crop. The production of 175,252 tonnes 96 sugar (including 625 tonnes to distillery) was recovered from 1,974,309 tonnes of cane at 11.26 tc/ts. This compares with 204,968 tonnes sugar from 2,237,176 tonnes cane at 10.91 tc/ts for the previous crop.

The decrease in sugar production of 29,716 tonnes or 14.50% below 2001 is indeed very significant. This is due to a decline not only in cane production and factory efficiency but also to a lesser extent in cane quality as shown by an overall decrease in JRCS.

The overall reduction in sugar production has been quantified at 36,584 tonnes and is attributed to:

- a decline in cane production at six factories amounting to a corresponding fall in production of 23,395 tonnes sugar;
- failure to achieve the minimum Factory Recovery Index (FRI) of 91 at six factories which accounted for an additional shortfall of 6,981 tonnes sugar; and
- a decline in or failure to maintain last year's average JRCS at five factories, resulting in a further shortfall of 6,208 tonnes sugar.

An additional factor of major significance was the effect of the flood rains experienced in May which caused the temporary closure of some factories during the harvesting period and further adversely affected harvesting as a number of fields became water-logged.

This 2002 crop will be recorded as the worst since 1947 when the industry produced 172,886 tonnes and is even lower than in 1945 when 180,742 tonnes were realised.

The Industry's revenue will decline by J$449.930 million or 11.74% below 2001earnings. When the 2002 earnings are compared to 1996, (when peak production and price were recorded) this shows a decline of J$1.532 billion or 31.17% below 1996 earnings.

The increase in the price per tonne of cane of $24.39 or 2.28% above the figure of $1069.68 for the 2001 crop, is due to an increase of 3.23% in the price of sugar (from $18,697.00 to $19,300.00).

Factory time efficiency fell to an all time low of 55.99%, due to increases in both factory and non-factory downtime.

A decline in sugar quality completes the picture of the most dismal crop for the past 57 years.

Cropping Time

Although the length of crop was reduced, this was nonetheless a long drawn out crop due to the inclement weather experienced during 11 days in May and the very late start by some factories. Only three factories (**Frome**, **Bernard Lodge** and **Hampden**) reported a shorter cropping time. The other five factories had longer cropping times ranging from 9 days at **Worthy Park** to 40 days at **St. Thomas Sugar** (*Table 10.I*).

Cane and Sugar Production

Three factories - **Long Pond**, **Worthy Park** and **St.Thomas Sugar** - improved on their production over the previous crop with a combined increase of 1,985 tonnes; all other factories had a combined decline of 31,701 tonnes, resulting in a net decline of 29,716 tonnes. Of this amount, **Monymusk**, **Bernard Lodge** and **Frome** were responsible for 9893, 8520 and 7544 tonnes respectively. While this was due largely to a decline in cane production, the tc/ts ratio

Table 10.1: Comparative Cropping time 2000/01 vs 2001/02

		Fro	M/M	B/L	L/P	App	W/P	Hamp	St. Thomas	Span
2001	Start	14/12/00	25/2/01	23/1/01	28/4/01	27/12/00	17/1/01	26/3/01	17/1/01	
	Finished	16/6/01	08/7/01	18/7/01	31/8/01	10/6/01	21/6/01	18/8/01	18/6/01	
	No. days	184	134	176	126	155	156	146	152	276
2002	Start	07/12/01	22/02/02	09/02/02	08/03/02	14/01/02	09/01/02	04/04/02	31/01/02	
	Finished	25/05/02	20/07/02	25/07/02	27/07/02	04/08/02	23/06/02	29/07/02	10/08/02	
	No. days	170	149	166	14 0	188	165	117	192	247
Diff. in days (2001 vs 2002)		(14)	15	(10)	14	33	9	(29)	40	(29)

Table 10.2: Cane and sugar production (2000/2001 vs. 2001/2002 production)

	2001/2002			2000/2001			Diff. in production 2001/ 2002	
	Cane (t)	Sugar (t)	tc/ts	Cane (t)	*Sugar (t)	tc/ts	Cane (t)	*Sugar
Frome	668,301	56,534	11.82	745,269	64,078	11.63	(76,968)	(7,544)
M/Musk	255,498	22,666	11.27	327,796	32,559	10.07	(72,298)	(9,893)
B/Lodge	231,528	19,671	11.77	314,405	28,191	11.15	(82,877)	(8,520)
L/Pond	111,809	9,872	11.32	109,999	8,967	12.27	1810	905
Appleton	306,498	27,082	11.27	325,724	30,935	10.52	(19,226)	(3,853)
W/Park	198,711	23,066	8.61	198,837	22,339	8.90	(126)	727
Hampden	65,193	5,393	12.06	85,560	7,284	11.60	(20,367)	(1,891)
St. Thomas	136,584	10,968	12.45	129,586	10,615	12.21	6,998	353
Total avg.	**1,974,309**	**175,252**	**11.26**	**2,237,176**	**204,968**	**10.91**	**(262,867)**	**(29,716)**
Total % diff.							**(11.75)**	**(14.50)**

***Including sugar to distillery**

was a major contributory factor due to the low FRI. As a result sugar production fell by 14.50% while cane production fell by 11.75% (*Table 10.2*).

It is most interesting to note that **Monymusk** and **Bernard Lodge,** factories with much larger capacities, were relegated to third and fourth position by **Appleton** and **Worthy Park** respectively in sugar production levels.

Efficiency Levels

The poor tc/ts ratio is a function of both cane quality and factory efficiency. As shown in *Table 10.3*, there was a slight decline in cane quality on average, while the FRI declined significantly on average. Major declines in JRCS were reported at two factories, **Monymusk**, and **Bernard Lodge**. All factories, except **Bernard Lodge** recorded significant declines in FRI levels which, in the case of **Frome**, **Monymusk**, **Long Pond**, **Hampden** and **St. Thomas** were at unacceptably low levels. (*Table 10.3*)

Table 10.3: Comparison of Cane Quality/FRI (2001/2002 vs. 2000/2001)

	2001/02		2000/01		Diff. in efficiency 2001/02	
	JRCS	FRI	JRCS	FRI	JRCS	FRI
Frome	9.90	85.23	9.44	91.14	0.46	(5.91)
M/Musk	9.86	90.58	10.94	91.83	(1.08)	(1.25)
B/Lodge	9.42	90.13	10.26	87.51	(0.84)	2.62
L/Pond	10.54	86.67	9.55	87.54	0.99	(0.87)
Appleton	9.73	91.19	10.06	95.25	(0.33)	(4.06)
W/Park	11.84	98.02	11.25	100.03	0.59	(2.01)
Hampden	10.48	79.23	10.58	80.64	(0.10)	(1.41)
St. Thomas	9.66	83.06	9.85	84.73	(0.19)	(1.67)
Total avg.	**10.05**	**88.44**	**10.10**	**91.17**	**(0.05)**	**(2.73)**

Quantifying Sugar Decline

The decline in cane production at six factories amounted to 271,862 tonnes. Using the tc/ts achieved, this shows a decline in production of 23,395 tonnes sugar (*Table 10.4*). The drop in JRCS below the 2000/01 average at four factories was responsible for a shortfall of 6,208 tonnes sugar and the failure to achieve the 91% minimum FRI resulted in a further decline in production of 6,981 tonnes. The overall decline in production was 36,584 tonnes sugar.

Cane and Sugar Production/Productivity

Comparison of the corresponding period 2000/01 versus 2001/2002 shows that:-

1. the difference in cane processed was 262,867 tonnes less, with the daily through-put at 7,987 tonnes compared to 8,105 tonnes in 2001. Daily throughput was 9,070 tonnes in 2000.

2. sugar produced decreased by 29,716 tonnes below 2001 output. The daily production was at 710 tonnes compared to 743 tonnes in 2001 and 968 tonnes in 2000.

Industry Revenue (Sugar only)

Viability in an industry is achieved when its revenue exceeds costs, with enough of a surplus for the continued maintenance and upgrading of facilities. For the sugar industry this revenue is subject to the volume of sugar made and the price received.

Table 10.4: Quantifiable sugar decline due to inefficiencies in cane production/cane quality/factory efficiency 2001/02 vs. 2000/2001

	Lost cane tonnage	tc/ts	Total (t) sugar loss due to cane	Due to lower JRCS	Due to shortfall from Std FRI	Total sugar decline
Frome	76,968	11.82	6,512	N/A	3,830	10,342
Monymusk	72,298	11.27	6,415	2,511	259	9,185
B/Lodge	82,877	11.77	7,041	1,601	176	8,819
Long Pond	N/A	N/A	N/A	N/A	853	853
Appleton	19,226	11.29	1,703	976	N/A	2,679
Worthy Park	126	8.61	15	N/A	N/A	15
Hampden	20,367	11.92	1,709	884	824	3,417
St. Thomas	N/A	N/A	N/A	236	1,039	1,275
Total/avg.	**271,862**	**11.62**	**23,395**	**6,208**	**6,981**	**36,584**

N/A Not applicable

The price of sugar peaked in 1996 at $20,546 per tonne and has been fluctuating at lower levels since then. To maintain the desired levels of revenue where there is a decline in price, production levels will have to be increased subject to the markets available.

For the period 1996 to 2002 the price per tonne sugar, sugar produced, and gross revenue are compared in *Table 10.5.*

It will be noted that the Revenue for 2002 falls by J$449.930 M or 11.74% below 2001 levels:

J$761.345 M or 18.37% below 2000
J$524.504 M or 13.42% below 1999
J$265.433 M or 8.51% above 1998
J$652.268 M or 16.17% below 1997
J$1,532.068 M or 31.17% below 1996

The industry has therefore lost an accummulated J$7.122,375 billion or 144.92 percent (of the 1996 earnings) over the past six years due to both declining price and production. The accumulated decline in production for 1997 - 2002 from the 1996 level was 209,120 tonnes. During the same period, JCPS imported 144,031.69 tonnes of raw sugar costing US$40,121,468. The revenue that would have been available to the industry for this quantity of sugar at the annual prices paid per tonne amounts to J$2.644 244 billion or 37.13% of the accumulated losses stated above.

Cane Quality/Price per Tonne

The industry failed to approach the excellent quality experience by factories in 1999/2000 of 11.22 JRCS units. In 2002 quality averaged 10.05, or 1.17 JRCS units below 2000 levels.

The price per tonne cane which increased by $24.39 or 2.28% on average over the previous crop was due to the sugar price which increased by 3.23%. Notwithstanding this improvement, there was a shortfall in price of $6.42 below the standard price, which will cost growers J$12,675,064. The significant shortfalls reported were for **Monymusk**, **Bernard Lodge**, **Appleton** and **Hampden** (*Table 10.6*). In contrast, there were price increases at **Frome**, **Long Pond** and **Worthy Park.**

Standard Cane

Quality/Distribution of Proceeds

The standard JRCS for the 2002/03 crop will be 10.0128 and will be lower than that (10.1064) for 2001/02. The sharing of proceeds has been shifting in accordance with the performance of field and factory sectors. Over the past six years, the growers have exceeded the 62% standard split three times i.e. 2000, 2001 and 2002 crops.

The manufacturers have exceeded the standard split three times - in 1997, 1998 and 1999. This was not due to high factory efficiency, but to the faiure of growers to achieve the standard quality (*Table 10.7*).

Impact of Poor Factory Efficiency

As shown in *Table 10.4*, the cumulative shortfall in sugar production due to low factory efficiency (i.e. FRI <91) at six factories was 6981 tonnes. This is one of the factors

Table 10.5: Comparison of Industry Production and Revenue 1996-2002 (for sugar only)

Year	Sugar tonne	$/tonne Ja. $	Tot. Revenue (Ja. $B)	% Reduction below 1996 level
1996	239,192	20,546	4.914432	Nil
1997	237,331	17,000	4.034632	17.90
1998	186,978	16,670	3.116931	36.58
1999	204,634	19,092	3.906868	20.50
2000	216,869	19,107	4.143709	15.68
2001	204,968	18,697	3.832294	22.02
2002	175,252	19,300	3.382364	31.17
Total accumulated decline 1997 to 2002 below the 1996 level				
	209,120		**7.122375**	**144.92**

contributing to the significant decline in production and revenue as stated in *Table 10.5*. Over the past six years, 1997 to 2002, the quantities of sugar not recovered due to low FRI are tabulated in *Table 10.8*. Significant losses are evident for **Frome**, **Hampden, St. Thomas Sugar**, **Long Pond**, **Bernard Lodge** and **Appleton**, with a cumulative loss of 19,099 tonnes for the period.

Using the actual price paid, the total of 19,099 tonnes due to poor efficiency (over the period 1997 to 2002) amounted to J$352.603 M or 4.9% of the total decline in earnings of $7.122375 B shown in *Table 10.5*.

Table 10.6: Comparison of JRCS price per tonne (2000 vs. 2001)

	2001/2002		2000/2001			Diff. in
	JRCS	Price/tc $	JRCS	Price/tc $	Price/t	%
Frome	9.90	1068.13	9.44	957.52	110.61	11.55
M/Musk	9.86	1060.98	10.94	1,211.63	(150.65)	(8.04)
B/Lodge	9.42	984.55	10.26	1,095.80	(111.25)	(9.85)
L/Pond	10.54	1,181.12	9.55	975.81	205.31	21.04
Appleton	9.73	1,038.48	10.07	1,063.28	(24.80)	(2.33)
W/Park	11.84	1,409.67	11.25	1,264.46	145.21	11.48
Hampden	10.48	1,169.63	10.58	1,151.56	(18.18)	(1.57)
St. Thomas	9.66	1,026.33	9.85	1,026.80	(0.47)	(0.05)
Average	**10.05**	**1,094.07**	**10.10**	**1,069.68**	**24.39**	**2.28**
Price/tonne sugar 2001/02 @ $19,300.00 & 2000/2001 @ $18,697.00					**$603.00**	**3.23**

Factory Operating/Downtime

The significant achievement in 1999/2000 of 70.61% operating time was not sustained but dropped to 55.99% in 2002. The non-factory downtime increased by 9.61% due to shortage of cane and weather.

Although factory downtime decreased by 0.89%, this continued to be very high (in excess of 17.0%), *Table 10.9*. This is unacceptable as overall factory operating time should not be less than 85% with the factory downtime below 10%.

Table 10.7: Comparison of the standard cane quality and distribution of proceeds (1997-2002)

	1997	1998	1999	2000	2001	2002
Std JRCS	9.8970	9.9476	9.9154	9.8396	10.0422	10.1064
Price/t. at std. JRCS	959.87	934.47	1068.39	1060.73	1059.34	1100.49
JRCS (Rpt)	10.4922	9.3166	9.5167	11.2159	10.0994	10.0454
Price/t	1052.71	836.77	999.64	1299.74	1069.68	1094.07
Diff. in price/t	92.84	(97.70)	(68.75)	239.01	10.34	(6.42)
Growers	61.86	60.38	58.70	63.68	62.08	63.81
FRI rept.	95.38	91.10	94.54	95.30	91.17	88.44
Fact share	38.14	39.62	41.30	36.32	37.92	36.19

Sugar Quality

The industry made a significant improvement in sugar quality in the 2000 crop (over the 1999 crop) after the S.I.A standards were introduced.

The main quality factors are the pol % and dextran, as there is a premium on pol and significant penalty/and or complaints if dextran levels in raw sugar exceed 250 mau. Both factors deteriorated during the 2002 crop, the most significant being dextran levels which increased by 146% and 151%. *(Table 10)*. As a result the complaints have increased in Europe while premium earnings on Polarisation declined.

Summary

The outcome of the 2001/2002 crop must be seen as most dismal, with a significant downturn in cane production at all factories, very poor cane quality and, very poor factory efficiency. Income has decreased significantly with a corresponding increase in cost of production.

Notwithstanding the need for resources, cane production has been established to be the single, most significant factor as when this falls, so does the industry's earnings, impacting negatively on revenue from which the costs for the maintenance and upgrading of the industry (both field and factory) must be met.

The production level of 239,192 tonnes realised in 1996 remains the peak for the period 1981 to 2002. Since January 2000 there has been an industry plan designed not only to return to this level but to exceed it. There has been little progress in this area and the reality is that instead of moving up the industry has slipped further behind. Hopefully, the 2002/2003 crop will show some improvement on the crop just completed.

Table 10.8: Comparative sugar loss due to poor FRI (below 91)

Year	1997	1998	1999	2000	2001	2002	Total
Frome	N/A	647	N/A	N/A	N/A	3830	4,477
M/musk	N/A	N/A	N/A	N/A	N/A	259	259
B/ Lodge	N/A	N/A	N/A	N/A	1,153	176	1,329
Long Pond	N/A	557	260	N/A	392	853	2,062
Appleton	N/A	1012	N/A	N/A	N/A	N/A	1,012
W/Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Hampden	722	1110	964	365	957	824	4,942
St. Thomas	1077	704	1,045	356	797	1039	5018
Total	**1799**	**4030**	**2,269**	**721**	**3,299**	**6,981**	**19,099**

N/A- Not Applicable

Table 10.9: Comparison of factory operating time/downtime and non-factory-downtime

	2000/2001 (final)			2001/02 (final)		
	Downtime		Operating	Downtime		Operating
Factory	Non-fact	fact	time	non fact	fact	time
Frome #1	15.13	19.74	65.13	17.73	18.10	66.92
Frome #2	12.71	21.56	65.73	18.21	20.63	64.26
M/Musk	21.97	10.88	67.15	43.64	6.56	52.08
B/Lodge	28.29	16.49	55.22	41.91	13.94	45.63
L/Pond	26.36	19.89	53.75	30.03	20.85	51.52
St. Thomas	25.44	23.44	51.12	25.94	29.67	46.62
Appleton	11.25	6.95	81.80	33.56	11.75	55.43
W/Park	19.05	2.27	78.68	23.21	3.28	78.22
Hamp	12.89	44.87	42.24	24.79	33.50	43.91
Average	**19.23**	**18.46**	**62.31**	**28.83**	**17.57**	**55.99**

Table 10.10: Comparison of Export sugar quality (1999 to 2002) - Factory out-turn results

Year	Pol (%)	Moist (%)	Safety factor	Colour aff raw (IU)	Colour W. raw (IU)	Insol solids (mg/kg)	Dextran (mau)	Ash (%)	Reducing Sugars (%)
1999	97.64	0.63	0.27	1498.32	4567.29	602.77	386.25	0.45	1.10
SIA std	98.50	0.35	0.25	1300.00	3000.00	<500	<250	30	0.50
2000	98.13	0.54	0.29	1348.79	4113.57	620.59	154.01	0.41	1.06
2001	98.03	0.50	0.26	1335.50	3977.57	264.84	379.38	0.58	1.07
2002	97.85	0.51	0.24	1477.39	4008.62	323.79	386.35	0.38	0.64

11 SUGAR TECHNOLOGY

11.1 CORE LABORATORY

Collaborative Cane Testing

Collaborative cane testing was conducted three times during 2001/02. However, only one set of testing was done when all the factories were in operation. The standard deviation for each parameter was very good among all laboratories as shown below:

				Pol %	Fiber %	
	Brix	**Pol**	**Purity**	**Cane**	**Cane**	**JRCS**
Std. Dev.	0.50	0.52	1.64	1.54	0.96	0.55
Mean	16.52	13.46	81.43	11.28	12.96	9.90

This emphasizes the repeatability of the existing method of testing and the reproducibility of cane quality results for the same sample of cane.

Audits

With each visit to a Core Laboratory an audit was conducted. These are sometimes done randomly or systematically. Most audits revealed that the Core Laboratories operated in a satisfactory manner and the state of instruments and equipment was satisfactorily maintained in keeping with the manual of procedures.

Replacement of lead Subacetate

The use of lead subacetate as a clarifying agent was phased out at all core laboratories in the first week of March 2002 with the introduction of a commercial product, Octapol, as a clarifying agent.

Training

Training seminars were conducted at all laboratories.The seminars were presented in an interactive format designed to facilitate feedback from the participants. The level of participation was quite high and participants expressed a willingness to carry out their functions according to the stipulated guidelines. Personnel at the factory laboratories were invited to participate in the seminars and special attention was given to the sampling of all products, the importance of accuracy and the care and use of instruments.

11.2. CENTRAL LABORATORY

Dextran Determination

A paper entitled "Dextran: A Comparative Investigation of Three Methods", was presented at the 65th annual JAST Conference. In this paper the findings of work that was conducted at the SIRI Central Laboratory to determine the level of accuracy and precision of the three methods of analysis were presented. These are the Optical Activity DASA test, the Midland Sucrose test and the Modified Alcohol Haze test. Most of the testing involved the use of standard dextran solutions.

Preliminary results obtained for the determination of dextran levels in samples of cane juice and raw sugar indicate that the Midland Sucrotest shows greatest precision and accuracy, followed by the Modified Alcohol Haze Test then the DASA method. Correlation is best between the Sucrotest and Haze methods for the determination of dextran in raw sugar. However, further studies are necessary and will be continued during the coming year.

Daily analysis of dextran in sugar by the Haze method were done on samples from **Frome** as the factory continues to monitor the quality of sugar.

Sugar Polarization

Studies were initiated on the comparative determination of polarimetric measurements of sugar and process solutions using lead subacetate and Octapol as clarifying agents and direct measurements, i.e. without the intervention of clarifying agents, by NIR spectrometry. The aim of the study is the eventual elimination of all chemical agents currently used to clarify solutions prior to polarimetric measurements. These studies are continuing

Reducing Sugars

During the crop, reducing sugar analyses were conducted on the daily special samples from **Frome**. The method of analysis used was the Berlin Test that has been streamlined and adapted to be used on a routine basis. The method has generated repeatable results.

International Collaboration

The laboratory participated in an international collaboration in the analysis of reducing sugars in final molasses. This was coordinated by the Bureau of Sugar Experimental Stations (BSES) in Australia among ten laboratories world wide. This study is part of the programme of developing methods undertaken on behalf of the International Commission for Uniform Methods of Sugar Analysis (ICUMSA).

11.3 FACTORY AUDIT

The **Frome Sugar Factory** experienced significant loss of sugar during process operations and, as a result, personnel from the Factory Services Division of the Institute conducted a comprehensive audit. The factory was investigated to determine the cause of the very poor performance as indicated by reported FRI values of 86.34. The findings suggested that all unit areas were operating at low levels of efficiency. This was coupled with apparent errors in cane weights and the over statement of pol arriving in cane inflated by the level of dextran in juice.

An evaluation and assessment of the operation of the **Appleton** Factory showed significant improvements for the period 2000 to 2002 over 1995 to 1997 in all areas of operation. These are:

a) tonnes cane ground per hour and per day

b) factory recovery index (FRI). This was due to the upgrading of all stations, in particular, milling stations.

11.4 POLLUTION CONTROL PROGRAMME

Wastewater Sampling and Analyses

The sampling and analyses of wastewater for factories were carried out as prescribed. The Pollution Control forms with the wastewater results were sent to the all factories and the National Enviroment Planning Agency (NEPA) within the prescribed time.

Emergency Response Plans

Frome and **Appleton** developed and obtained approval for their Emergency Response Plan (ERP). The ERPs for St. **Thomas Sugar**, **Bernard Lodge** and **Hampden** were completed and were to be submitted to the ODPEM for approval. **Long Pond** is yet to complete an ERP. The concerns expressed by NEPA with the fire prevention plan for **Frome** were addressed.

Motor Vehicle Emission

NEPA had requested that information be provided to them on the number of off-road vehicles (vehicles not licenced by the All Island Traffic Authority) and equipment operated by the factories. Only **Appleton**, **Frome** and **St. Thomas Sugar** responded.

Seminars

Three environmental seminars were held during the year.

(i) Presentations were made by NEPA, SRC and SIRI as a part of the Summer training conducted by SIA/SIRI.

(ii) A presentation on Factory Operations and the Environment was made at a production seminar held at the **Appleton** Sugar Factory. This meeting was attended by Shift Managers, Process Supervisors and Engineers.

(iii) A similar presentation initiated by the Environmental Committee at **St. Thomas Sugar** and SIRI on Factory Operations and the Environment was given at the **St. Thomas Sugar** Company. Other interested bodies such as NEPA and St. Thomas Environmental Protection Association (STEPA) also participated.

The aim was to increase the awareness of factory workers and management on matters concerning the environment. The recent fish kill at Holland Bay was a major concern for the residents and was brought to the attention of NEPA. St. Thomas Sugar plans to construct a new canal for factory waste water. Effluent would then be led to settling ponds, which the Factory also plans to construct, and eventually used for irrigation.

11.5 RESEARCH PROJECTS

Coliform Bacteria in Wastewater

The investigation of high levels of Coliform bacteria in the wastewater at factories started at **Appleton Estate**. Sampling and analyses of the river water, canewash water and process house wastewater were done. The project will continue in the 2002/2003 crop year.

12 ENGINEERING

Core Sampler

During the period, maintenance which entailed the repairing or replacing of damaged components and setting the press gaps and sequence cycles was carried out just before the start of the crop at all factories.

During the crop, problems were experienced with:

(1) Hydraulic press cylinders
(2) Core sampler borer motor
(3) Carriage cylinders
(4) Leaking seals
(5) Press starters, switches solenoid valves and coils
(6) One of the 50 Hp pumps
(7) Ejector cylinder
(8) Shredder motor

Preventative Maintenance

Laser Alignment

Laser alignment of Steam Turbines was carried out at **Appleton**, **St. Thomas Sugar Company** and **Long Pond.**

Dynamic Balancing

Dynamic balancing of boiler fans was carried out at **Frome**, **Worthy Park**, **Appleton**, **St. Thomas Sugar Company**, **Bernard Lodge**, **Monymusk** and **Long Pond**. Dynamic balancing was also done on centrifugal baskets at **Appleton**, **Frome** and **Worthy Park**.

Vibration Measurements

A number of vibration measurement surveys were carried out at **Long Pond**, **Worthy Park** and **Monymusk**.

Ultrasonic Thickness Testing

This service was utilised by **St. Thomas Sugar Company**, **Worthy Park**, **Monymusk** and **Hampden**.

Wet Scrubber

The installation of a wet scrubber on the Numbers 5 and 6 Boiler Stacks at **Bernard Lodge** was carried out. The scrubber achieved a 90% separation and retention of particulates and points to the efficiency of the system in reducing particle emission into the atmosphere.

Mill Tribology Study

Experimental work continued with an investigation into improving the quality of mill rollers. An update on the project was presented at JAST 2002. This project is being carried out in conjunction with the University of Technology Engineering Department and is extended to the arcing of mill rollers to improving throughput and extraction.

Instrumentation

The Department concentrated on repairs and calibrations of all core and factory laboratory equipment. Most instruments were ready, on time for the start of each factory.

Fairbank Scale Upgrade

The new Fairbank Intalogic Scale display unit was installed and commissioned at **Bernard Lodge**. It was passed by the Bureau of Standards and put into operation. It operated trouble-free for the entire crop. A second unit was installed at **Monymusk** on the eight load-cell platform scale. This is used very often by both the Factory and the Distillery and had a soil/foundation-based problem. After getting these faults corrected, the Intalogic display unit was installed and commissioned by the Department. The scale operators were taught how to operate these units

Level Control System

This was installed on the evaporators at **Monymusk**. After completion the system was commissioned and put into operation and performed very satisfactorily during the entire crop.

pH Control Systems

The installation and commissioning of a new automatic pH control system was done at **St. Thomas Sugar.** At first there were problems with the old control actuator. The solution was to install a second hand replacement from **Long Pond** Factory. The system worked very well for the latter half of the crop.

Core Laboratory Interface

The interface systems at **Worthy Park** and **Appleton** operated to their full potential. **Bernard Lodge**, **Monymusk** and **Frome** Core Labs had problems with software implementation. **Long Pond** and **Hampden** had problems with their polarimeter and RP-10 units. These problems were resolved by the Computing Department, SIRI.

Scales

Assistance was provided in repairing, calibrating and certifying all truck scales including those at Ocho Rios and Marcus Garvey Warehouse.

END TABLES

End Table 1 : Monthly Average Rainfall In Millimetres - 2000

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Group A													
Bernard Lodge	5	11	21	13	78	22	18	48	188	67	17	92	580
Innswood	4	17	9	24	104	19	11	55	223	73	14	107	660
Monymusk	7	33	15	30	31	16	51	45	352	94	25	132	831
New Yarmouth	12	13	14	18	20	28	51	54	333	126	11	154	834
Mean	7	19	15	21	58	21	33	51	274	90	17	121	726.3
30 Year Mean	30	33	38	57	102	62	33	81	117	152	83	42	830
Group B													
Appleton	50	37	15	151	527	89	274	90	184	270	21	124	1832
Frome	13	54	26	91	276	169	201	171	145	154	58	213	1571
Holland	55	68	2	113	540	62	213	118	232	238	10	118	1769
Mean	39	53	14	118	448	107	229	126	187	221	30	152	1724
30 Year Mean	53	77	84	134	243	137	150	196	177	230	104	51	1636
Group C													
Barnett	44	20	-	26	158	49	46	104	329	149	16	280	1221
Hampden	39	37	10	42	171	83	66	109	398	158	52	296	1461
Long Pond	74	46	4	50	75	35	34	37	121	60	41	158	735
Mean	52	34	7	39	135	56	49	83	283	122	36	245	1141
30 Year Mean	73	74	50	73	149	107	71	105	146	147	114	100	1209
Group D													
Tropicana	34	6	31	7	160	36	84	92	305	49	252	607	1663
Mean	34	6	31	7	160	36	84	92	305	49	252	607	1663
30 Year Mean	101	92	62	102	176	116	113	149	188	243	256	139	1737
Group E													
United Estates	30	39	23	69	95	142	111	132	273	145	202	176	1437
Worthy Park	23	20	30	62	121	115	58	45	228	183	131	156	1172
Mean	27	30	27	66	108	129	85	89	251	164	167	166	1305
30 Year Mean	66	66	61	105	202	152	123	148	169	219	121	79	1511

* No Report Received
Nil - No Rainfall

End Table 2 : Monthly Average Rainfall In Millimetres - 2001

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Group A													
Bernard Lodge	12	5	11	46	108	2	35	1	124	120	206	126	796
Innswood	7	0	11	41	113	22	27	9	78	137	142	149	736
Monymusk	45	0	22	22	171	2	44	17	47	184	224	94	872
New Yarmouth	47	0	16	17	218	4	55	2	39	217	272	153	1040
Mean	28	1	15	32	153	8	40	7	72	165	211	131	861
30 Year Mean	31	33	38	58	106	62	34	81	119	158	88	45	853
Group B													
Appleton	21	59	125	300	160	62	163	73	215	234	207	100	1719
Frome	22	55	58	209	138	99	232	202	273	222	83	56	1649
Holland	57	57	60	151	126	59	156	63	146	182	154	89	1300
Mean	33	57	81	220	141	73	184	113	211	213	148	82	1556
30 Year Mean	53	76	84	137	232	134	148	193	178	227	106	52	1620
Group C													
Barnett	264	0	113	12	247	41	83	88	187	239	226	65	1565
Hampden	176	10	58	62	228	58	88	23	130	120	185	156	1294
Long Pond	454	24	43	33	182	35	146	37	111	297	173	168	1703
Mean	298	17	71	36	219	45	106	49	143	219	195	130	1526
30 Year Mean	82	70	51	70	153	105	72	100	146	148	113	104	1214
Group D													
Tropicana	210	30	95	113	496	10	76	23	19	306	258	102	1738
Mean	210	30	95	113	496	10	76	23	19	306	258	102	1738
30 Year Mean	108	90	62	103	191	116	113	139	181	246	246	140	1735
Group E													
United Estates	93	28	75	192	216	55	192	129	212	325	155	107	1779
Worthy Park	66	40	64	60	252	44	118	77	135	157	253	63	1329
Mean	80	34	70	126	234	50	155	103	174	241	204	85	1554
30 Year Mean	69	65	62	106	199	151	124	146	169	217	122	81	1511

*** No Report Received**
Nil - No Rainfall

End Table 3: Monthly Average Rainfall In Millimetres - 2002

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Group A													
Bernard Lodge	14	6	11	84	474	79	0	23	670	79	68	45	1553
Innswood	14	11	13	69	537	91	15	0	579	110	66	69	1574
Monymusk	44	20	24	51	684	204	5	8	555	81	15	38	1729
New Yarmouth	35	25	10	51	733	227	15	15	556	102	17	67	1853
Mean	27	16	15	64	607	150	9	12	590	93	42	55	1677
30 Year Mean	31	33	37	60	125	67	35	80	146	163	99	50	926
Group B													
Appleton	19	75	49	240	460	246	178	197	716	307	105	68	2660
Frome	71	86	58	68	359	181	186	244	617	232	113	113	2328
Holland	21	93	48	233	554	147	184	213	689	332	105	131	2750
Mean	37	85	52	180	458	191	183	218	674	290	108	104	2579
30 Year Mean	55	79	86	143	247	141	155	200	260	283	133	68	1850
Group C													
Barnett	149	26	10	37	354	377	108	65	499	87	185	61	1958
Hampden	48	5	11	24	200	147	8	129	346	87	97	53	1155
Long Pond	44	11	31	57	230	121	21	31	506	47	44	52	1195
Mean	80	17	17	39	261	215	46	75	450	74	109	55	1439
30 Year Mean	85	71	51	72	161	112	73	103	169	163	122	114	1296
Group D													
Tropicana	51	41	46	67	567	195	36	44	717	128	220	187	2299
Mean	51	41	46	67	567	195	36	44	717	128	220	187	2299
30 Year Mean	110	91	64	105	210	123	87	141	205	250	253	146	1785
Group E													
United Estates	61	28	81	102	603	107	173	182	672	145	89	66	2309
Worthy Park	59	26	41	65	747	180	136	117	603	155	44	92	2265
Mean	60	27	61	84	675	144	155	150	638	150	67	79	2287
30 Year Mean	71	66	64	109	222	156	130	151	199	222	141	89	1620

* No Report Received
Nil - No Rainfall

End Table 4: Number of Days on which average precipitation exceeded 10 millimetres

	2000												2001												2002											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Group A																																				
Bernard Lodge	0	0	0	1	3	1	0	1	7	3	1	4	0	0	1	4	4	0	3	0	3	4	4	3	1	0	1	4	9	3	-	1	11	2	2	2
Innswood	0	1	0	1	4	1	1	2	7	3	0	4	0	-	1	2	5	1	3	0	3	4	5	4	1	0	1	3	9	3	1	-	8	3	2	3
Monymusk	0	2	1	1	1	1	1	1	11	2	2	3	1	-	1	0	4	0	2	1	2	8	6	3	3	1	1	2	9	4	0	0	10	2	0	2
New Yarmouth	0	0	0	0	0	0	0	0	12	4	2	6	3	-	2	2	10	0	4	0	3	10	7	5	3	3	2	3	11	7	3	2	11	5	2	4
Group B																																				
Appleton	2	0	0	8	19	3	7	2	11	8	0	2	0	2	3	12	6	2	7	3	9	8	9	3	0	2	1	6	11	5	7	10	14	12	4	2
Frome	0	2	0	3	8	7	11	4	4	5	1	5	1	2	2	9	6	3	7	9	10	5	5	2	2	2	2	2	11	7	7	9	10	7	2	5
Holland	3	4	0	6	15	1	7	6	10	10	1	4	2	2	1	8	2	2	6	3	7	9	7	6	1	3	2	5	11	2	3	4	8	5	4	3
Group C																																				
Barnett	1	0	L	0	5	2	3	4	12	5	0	6	6	-	2	0	8	2	4	6	11	8	4	0	3	1	1	2	4	8	4	2	5	4	4	2
Hampden	1	2	0	1	5	2	3	4	13	6	1	6	4	0	3	2	7	2	3	0	4	3	6	5	1	0	0	0	8	3	0	5	9	4	2	1
Long Pond	2	2	0	2	3	1	0	2	4	1	1	4	7	0	1	1	7	0	7	1	3	8	5	5	1	0	1	2	7	3	1	0	6	1	1	2
Group D																																				
Tropicana	1	0	1	2	2	1	2	3	10	1	5	11	3	0	3	5	2	0	2	0	0	8	5	3	1	1	1	3	9	2	1	2	14	4	5	7
Group E																																				
United Estate	0	1	1	2	4	6	4	4	8	4	5	4	2	1	2	5	7	1	6	6	10	8	5	4	2	0	3	6	11	3	6	7	13	5	2	1
Worthy Park	0	0	1	3	3	5	3	1	8	7	5	5	2	1	3	1	8	1	3	3	6	6	8	3	2	0	2	2	11	4	5	4	13	7	0	2

*** No Report Received**

CYS TABLES

Table I: Cane production, 1993 - 2002

Crop Year	Total Tonnes	% Increase or Decrease on Previous Crop	Tonnes Delivered by Factory Owned Estates	% Increase or Decrease on Previous Crop	Tonnes Delivered by Other Growers	% Increase or Decrease on Previous Crop	Cane Purchased by Factories % Total
1993	2 701 440	6.09	1 145 918	0.88	1 555 521	10.28	58
1994	2 500 197	(7.45)	1 058 098	(7.66)	1 440 299	(7.41)	58
1995	2 328 308	(6.88)	1 246 048	17.76	1 082 260	(24.86)	46
1996	2 633 413	13.10	1 329 344	6.68	1 304 169	20.50	50
1997	2 422 966	(7.99)	1 138 831	(14.33)	1 284 134	(1.54)	53
1998	2 256 946	(6.85)	1 062 245	(6.72)	1 222 450	(4.80)	53
1999	2 306 835	2.21	1 115 279	4.99	1 203 761	(1.53)	52
2000	2 023 633	(12.28)	1 111 070	(0.38)	919 904	(23.58)	45
2001	2 237 176	10.55	1 288 923	16.01	948 253	3.08	42
2002	1 975 205	(11.71)	1,123,496	(12.83)	851,709	(10.18)	43

Table II: Hectares reaped by estates/farm,1993 - 2002

Estates/Farms	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Appleton	1 531	1 420	1 053	1 267	1 185	539	1 287	1 214	1365	1336
Bernard Lodge	1 887	1 533	2 479	3 200	3 538	3 700	3 891	3 621	3746	3467
Cambria	120	119	118	152	214	222	229	240	264	291
Frome	5 532	4 766	5 323	4 524	4 947	4 948	4 832	4 807	4710	4685
Hampden	858	734	728	629	789	701	470	-	604	-
Innswood*	1 898	-	*	*	*	*	*	*	*	*
Long Pond	1 367	1 104	1 398	1 346	1 461	1 439	1 438	1 447	1088	1073
Monymusk	3 930	3 575	3 265	3 286	4 313	3 841	3 592	3 508	3637	3633
New Yarmouth	1 683	1 543	1 780	1 417	1 149	1 580	1 453	1 644	1518	1447
Newton Cane Farms	430	299	589	646	591	175	805	936	815	853
Retreat	371	370	284	342	292	-	-	-	-	-
Tropicana	1 079	1 016	1 214	899	753	626	862	904	827	886
Worthy Park	711	712	711	742	799	863	907	937	971	1002
Total	21 397	17 191	18 942	18 450	20 031	18 634	19 767	19 257	19 545	18673

- Data not available
*Data incorporated in Bernard Lodge figures for years 1995 - 2002

Table III: Tonnes cane per hectare by estates/farm, 1993 - 2002

Estates/Farms	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Appleton	65.10	68.61	70.76	72.54	74.16	69.12	75.61	47.03	71.85	72.60
Bernard Lodge	61.96	46.27	58.08	75.71	65.15	62.96	63.18	57.60	64.58	54.94
Cambria	94.87	79.46	77.17	81.86	98.13	90.20	84.96	74.52	83.39	84.19
Frome	66.94	74.61	69.49	70.72	67.59	70.65	64.27	54.63	77.20	69.28
Hampden	67.89	66.82	54.24	71.98	63.31	54.04	62.44	-	48.43	-
Innswood*	76.31	-	*	*	*	*	*	*	*	*
Long Pond	69.36	76.81	55.51	68.58	63.82	51.04	53.07	63.04	54.72	65.29
Monymusk	59.40	57.95	62.41	63.47	53.36	49.67	61.45	60.25	56.47	42.34
New Yarmouth	72.16	77.48	69.16	62.94	56.20	67.47	59.47	58.92	62.21	58.00
Newton Cane Farms	58.12	53.24	55.60	81.21	72.33	72.39	91.72	55.69	73.73	60.94
Retreat	71.43	79.30	66.13	84.21	71.32	-	-	-	-	-
Tropicana	71.97	86.95	73.91	85.55	75.18	55.43	57.83	62.47	71.49	73.03
Worthy Park	111.15	81.20	77.37	97.54	84.35	96.81	83.96	81.49	79.66	78.45
Total	67.51	68.88	65.13	72.23	64.86	63.33	65.05	59.42	67.07	61.03

- Data not available
*Data incorporated in Bernard Lodge figures for years 1995 - 2002

Table IV: Average tc/t 96°s and JRCS by estates/farm, 1998 - 2002

	1998		1999		2000		2001		2002	
Estates/Farms	tc/t 96°s	JRCS	tc/t 96°s	JRCS	tc/t 96°s	JRCS	tc/t 96°s	JRCS	tc/t 96°s	JRCS
Appleton	10.88	9.19	11.29	8.86	8.5	11.76	8.98	11.14	10.03	9.97
Bernard Lodge	10.61	9.43	10.40	9.62	8.81	11.35	9.27	10.79	10.05	9.95
Cambria	9.03	11.07	8.53	11.72	7.71	12.97	8.67	11.53	8.68	11.52
Frome	10.42	9.60	10.40	9.62	9.03	11.07	10.14	9.86	9.46	10.57
Hampden	10.77	9.29	-	-	-	-	9.80	10.20	-	-
Long Pond	9.57	10.45	9.75	10.26	8.79	11.38	10.21	9.79	9.22	10.85
Monymusk	10.90	9.17	10.35	9.66	8.65	11.56	8.82	11.34	10.08	9.92
Newton Cane Farms	10.95	9.13	13.35	7.49	10.22	9.78	9.91	10.09	10.17	9.83
New Yarmouth	-	-	-	-	8.30	12.05	9.27	10.79	10.12	9.88
Tropicana	10.58	9.45	9.21	10.86	8.03	12.45	9.21	10.86	10.24	9.77
Worthy Park	8.86	11.29	8.51	11.75	7.17	13.95	8.4	11.90	7.82	12.79
Average	10.26	9.75	10.31	9.70	8.6	11.63	9.41	10.63	9.63	10.38

- Data not available
* Includes data for Caymanas & Innswood for years 1998 - 2002
Note: tc/t 96°s - tonnes cane per tonne 96° sugar JRCS - Jamaica Recoverable Cane Sugar

Table V: Tonnes theoretical 96° sugar per hectare by estates/farm, 1998 - 2002					
Estates/Farms	**1998**	**1999**	**2000**	**2001**	**2002**
Appleton	**6.57**	**6.70**	**5.54**	**8.00**	**7.24**
Bernard Lodge*	**5.98**	**6.07**	**6.54**	**6.96**	**5.47**
Cambria	**9.99**	**9.96**	**9.67**	**9.64**	**9.70**
Frome	**7.16**	**6.21**	**6.08**	**7.61**	**7.32**
Hampden	**4.95**	**-**	**-**	**4.94**	**-**
Long Pond	**5.33**	**5.44**	**7.17**	**5.36**	**7.08**
Monymusk	**4.54**	**5.98**	**6.97**	**6.40**	**4.2**
Newton Cane Farms	**-**	**6.86**	**6.22**	**7.44**	**5.99**
New Yarmouth	**6.60**	**-**	**7.1**	**6.71**	**5.73**
Tropicana	**6.29**	**6.32**	**7.98**	**7.76**	**7.13**
Worthy Park	**10.93**	**9.87**	**7.17**	**9.48**	**10.03**
Average	**6.32**	**6.38**	**6.86**	**7.13**	**6.34**

- Data not available
*** Includes data for Caymanas & Innswood for years 1998 - 2002**

Table VI: Tonnes theoretical 96° sugar per hectare per month by estates/farms, 1998 - 2002

Estates/Farms	1998			1999			2000			2001			2002		
Appleton	0.46	-90	82*	0.39	-78	46*	0.52	(85)	93*	0.62	(113)	105*	0.57	-112	98*
Frome	0.58	-114	104*	0.51	-102	111*	0.56	(100)	92*	0.58	(105)	98*	0.60	-118	103*
Newton Cane Farms	0.43	-84	77*	0.35	-70	76*	0.56	(100)	92*	0.62	(113)	105*	0.49	-96	84*
Wet West	0.56			0.46			0.56			0.59			0.58		
Hampden	0.40	-78	95*	-	-	-	-	-	-	0.37	(67)	97.4*	-	-	-
Long Pond	0.43	-84	102*	0.46	-92	100*	0.54	(89)	100*	0.39	(71)	103*	0.52	-102	100*
Dry North Coast	0.43			0.46			0.54			0.38			0.52		
Tropicana	0.49	-96	100*	0.57	-114	100*	0.64	(105)	98*	0.64	(116)	100*	0.48	-94	100*
Wet East	0.49			0.57			0.65			0.64			0.48		
Bernard Lodge**	0.51	-100	116*	0.50	-100	100*	0.59	(97)	97*	0.53	(96)	104*	0.45	-88	110*
Monymusk	0.36	-50	82*	0.50	-100	100*	0.60	(98)	98*	0.48	(87)	94*	0.35	-69	85*
New Yarmouth	-			-			0.66	(108)	108*	0.55	(100)	108*	0.47	-92	115*
Irrigated	0.44			0.50			0.61			0.51			0.41		
Cambria	0.81	-159	93*	0.85	-170	97*	0.90	(148)	94*	0.79	(144)	101*	0.82	-161	96*
Worthy Park	0.89	-174	102*	0.89	-178	101*	0.97	(159)	101*	0.77	(140)	99*	0.86	-169	101*
Central	0.87			0.88			0.96			0.78			0.85		
Average	0.51			0.50			0.61			0.55			0.51		

Figures in brackets = tonnes theoretical sugar per hectare per month expressed as a percentage of the island's average in the same year

Figures marked with * = tonnes theoretical sugar per hectare per month expressed as a percentage for the ecological area in the same year

- Data not available

**** Includes data for Caymanas & Innswood for years 1998-2002**

Table VII: Percent hectarage reaped under respective varieties, 1998 - 2002

	BJ8226					BJ7015					BJ7627					BJ7465					BJ7504					BJ7452					UCW5465					BJ82119					Mixed & Others				
Estates/Farms	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02
Appleton	1	2	3	9	13	12	16	14	9	7	2	2	1	4	6	13	16	13	7	6	10	12	10	8	5	*	1	*	1	1	+	+	+	+	+	3	3	6	12	11	59	48	53	43	51
Frome	5	6	10	16	14	23	22	23	20	19	2	2	2	1	1	5	5	7	10	11	53	52	44	35	33	5	6	4	1	1	+	+	+	+	+	3	2	3	7	7	4	5	7	+	14
Newton Cane Farms	12	13	12	10	12	5	4	3	2	3	20	6	6	6	5	11	19	12	6	5	15	40	31	29	28	7	4	4	4	3	+	+	+	+	+	5	4	7	13	16	25	10	25	24	28
Retreat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-		-	-	-	-	-	-	-
Wet West	5	6	9	14	14	21	19	19	16	15	3	2	2	2	2	6	6	9	9	9	47	43	36	29	27	5	5	4	1	1	+	+	+	+	+	3	3	4	8	9	10	16	17	12	23
Hampden	1	8	-	8	-	11	10	-	8	-	5	6	-	5	-	6	7	-	11	-	31	27	-	40	-	14	10	-	3	-	+	1	-	1	-	+	*	-	1	-	32	31	-	13	-
Long Pond	*	4	6	7	5	22	19	22	22	21	*	*	*	+	+	4	4	2	1	1	42	39	39	40	38	23	24	18	15	14	+	+	+	+	+	+	1	2	3	2	9	9	11	11	19
Dry North Coast	1	5	6	8	5	18	17	22	17	21	2	2	*	2	+	4	5	2	5	1	31	36	39	40	38	20	21	18	10	14	+	*	+	*	+	+	1	2	2	2	24	13	11	11	19
Bernard Lodge**	3	13	21	20	18	4	1	1	1	1	6	5	6	5	5	27	19	12	10	9	18	18	16	15	13	1	1	+	+	+	16	13	10	9	10	*	*	1	1	1	25	30	33	29	43
Monymusk	*	2	5	6	6	25	21	19	17	16	1	2	3	3	3	14	10	7	5	5	40	50	45	41	38	*	*	*	*	*	10	7	6	6	7	*	1	3	7	8	10	7	12	10	17
New Yarmouth	1	2	7	11	17	11	12	8	6	3	12	14	14	13	10	6	3	2	2	3	35	28	19	16	15	+	+	+	+	+	+	+	+	+	+	13	19	21	18	16	22	23	29	32	36
Irrigated	2	7	12	13	13	14	11	9	8	7	5	5	6	6	5	18	13	8	7	6	30	32	28	26	24	1	*	*	*	*	11	8	6	6	7	2	4	6	6	6	17	20	25	21	32
Tropicana	+	+	+	+	+	18	20	15	12	12	+	1	2	3	3	26	24	26	27	26	6	6	5	4	3	5	2	2	1	1	4	4	2	*	*	3	3	2	3	3	38	40	46	23	52
Wet East	+	+	+	+	+	18	20	15	12	12	+	1	2	3	3	26	24	26	27	26	6	6	5	4	3	5	2	2	1	1	4	4	2	*	*	3	3	2	3	3	38	40	46	23	52
Cambria	14	14	13	12	11	+	+	+	+	+	34	34	34	37	33	22	22	21	19	19	9	8	8	8	7	8	7	7	6	6	+	+	+	+	+	+	3	5	8	10	13	12	12	10	14
Worthy Park	15	18	18	16	14	*	*	*	*	1	14	12	12	12	9	2	2	1	1	*	31	29	30	31	33	1	1	*	+	*	*	*	*	+	+	4	5	5	8	8	34	33	34	32	35
Central	15	17	17	15	13	*	*	*	*	1	18	16	17	17	15	7	6	5	5	5	27	35	25	26	27	3	2	2	1	1	*	*	*	+	+	4	4	5	7	8	26	30	29	29	30
Island Average	3	7	10	12	12	16	14	13	11	11	5	4	5	5	4	12	11	9	8	8	35	23	31	27	25	4	4	3	2	2	6	4	3	3	3	2	3	5	6	7	17	18	21	26	28

+ No entry in this category

*** Less than 1 percent**

- Data not available

**** Includes data for Caymanas & Innswood for years 1998 -2002**

Table VIII: Percent of plant cane hectarage devoted to each variety in ecological zones, 1998 - 2002

	BJ8226					BJ7015					BJ7627					BJ7465					BJ7504					BJ7452					UCW5465					BJ82119					Mixed & Others				
Estates/Farms	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02	98	99	00	01	02
Appleton	9	11	+	20	45	+	+	5	5	7	11	+	+	10	10	+	+	+	+	3	+	+	+	+	1	3	+	+	+	+	+	+	+	+	+	18	17	14	24	+	59	72	81	41	34
Frome	39	58	9	6	14	6	+	29	12	2	+	+	2	5	4	17	28	30	1	4	23	+	5	13	2	+	+	+	6	+	+	+	+	+	+	13	10	1	15	1	2	4	24	42	73
Newton Cane Farms	+	+	+	+	16	+	+	+	+	+	57	+	+	+	+	+	+	+	5	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	34	43	84	43	+	66	52	+
Retreat	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wet West	23	31	4	11	30	3	+	13	8	4	14	+	1	7	6	9	12	13	1	3	12	+	2	6	1	1	+	+	3	+	+	+	+	+	+	12	14	16	22	14	26	43	51	42	42
Hampden	13	18	-	12	-	11	11	-	8	-	+	20	-	3	-	17	19	-	22	+	22	7		36	-	+	+	-	3	-	+	+	-	+	-	+	+	-	+	-	37	25	-	16	-
Long Pond	6	22	18	+	+	22	19	35	47	10	3	+	+	+	+	11	3	+	+	+	21	10	38	24	37	32	22	2	7	+	+	+	+	+	+	+	7	4	13	+	5	17	3	9	53
Dry North Coast	8	21	18	7	+	18	16	35	23	10	2	6	+	2	+	13	8	+	13	+	21	9	38	32	37	20	16	2	5	+	+	+	+	+	+	+	5	4	5	+	18	19	3	13	53
Bernard Lodge**	9	43	44	1	+	+	2	+	2	2	6	6	1	4	14	1	4	*	10	5	31	7	2	4	10	1	1	+	+	+	11	10	4	8	16	1	+	3	+	+	40	27	46	71	53
Monymusk	2	6	22	8	+	17	18	17	13	14	5	2	7	6	+	2	+	+	+	+	65	57	2	20	15	+	+	+	+	+	5	5	6	11	7	1	2	19	19	17	3	10	27	23	47
New Yarmouth	2	2	24	29	30	3	+	+	+	+	13	15	16	+	+	2	+	+	+	+	2	+	2	+	+	+	+	+	+	+	+	+	+	+	+	50	40	31	+	6	28	43	27	71	64
Irrigated	5	22	31	7	8	9	9	7	7	5	6	5	7	5	5	2	2	*	4	2	43	29	2	11	9	*	*	+	+	+	7	7	4	9	8	7	5	15	10	7	21	19	34	47	56
Tropicana	+	+	+	+	+	+	+	+	+	+	+	27	+	13	*	+	13	5	25	10	+	+	+	+	+	+	+	+	+	+	+	3	+	*	+	+	+	6	+	8	+	57	89	62	82
Wet East	+	+	+	+	+	+	+	+	+	+	+	27	+	13	*	+	13	5	25	10	+	+	+	+	+	+	+	+	+	+	+	3	+	*	+	+	+	6	+	8	+	57	89	62	82
Cambria	+	+	+	+	+	+	+	+	+	+	90	29	39	49	3	+	+	+	+	21	+	+	+	7	+	+	+	+	+	6	+	+	+	+	+	+	71	42	37	20	10	+	19	7	50
Worthy Park	21	36	5	+	+	+	+	+	+	6	7	+	22	15	5	+	+	+	+	+	17	4	22	32	28	+	+	+	+	+	+	+	+	+	+	10	11	10	25	20	45	49	41	28	41
Central	21	33	4	+	+	+	+	+	+	5	9	3	25	22	4	+	+	+	+	4	16	4	18	26	22	+	+	+	+	1	+	+	+	+	+	10	17	15	28	20	44	43	38	24	44
Island Average	8	22	22	8	11	8	9	10	8	5	7	5	5	6	5	3	3	3	4	3	36	23	5	12	11	1	2	*	1	*	5	5	3	4	4	8	6	14	14	10	24	25	38	43	51

+ No entry in this category
*** Less than 1 percent**
- Data not available
**** Includes data for Caymanas & Innswood for years 1998 -2002**

Table IX: Tonnes cane per hectare per variety by estates/farms in each ecological group, 2002

Estates/Farms	BJ7627	BJ8226	BJ7015	BJ7465	BJ7504	BJ82119	BJ7452	UCW5465	Mixed	Weighted Avg.
Appleton	77.26	77.55	79.50	73.13	63.63	70.32	64.94	+	72.89	72.60
Frome	51.45	59.29	66.17	70.58	74.83	66.66	72.81	+	71.73	69.28
Newton Cane Farms	45.48	59.65	55.66	57.54	61.72	73.80	40.31	+	52.86	60.94
Retreat	-	-	-	-	-	-	-	-	-	-
Wet West*	61.22	62.68	67.16	70.01	72.75	69.11	62.90	-	70.47	68.89
Hampden	-	-	-	-	-	-	-	-	-	-
Long Pond	+	61.86	60.69	57.81	64.77	61.96	60.30	+	78.89	65.29
Dry North Coast*	+	61.86	60.69	57.81	64.77	61.96	60.30	+	78.89	65.29
Bernard Lodge**	58.58	47.89	62.46	57.51	54.79	61.67	+	55.69	57.61	54.94
Monymusk	49.05	40.45	45.17	39.25	40.16	43.43	46.55	39.74	40.62	42.34
New Yarmouth	45.78	47.44	78.52	77.76	72.96	53.52	+	+	60.44	58.00
Irrigated*	52.01	46.27	47.99	52.38	46.87	48.66	46.55	48.98	55.07	50.10
Tropicana	65.94	+	85.66	63.81	70.97	69.78	89.21	70.16	68.47	73.03
Wet East*	65.94	+	85.66	63.81	70.97	69.78	89.21	70.16	68.47	73.03
Cambria	81.09	77.30	+	92.45	91.78	86.14	91.08	+	77.96	84.19
Worthy Park	77.08	63.53	63.19	72.98	86.96	78.71	+	+	75.61	78.45
Central*	79.13	66.00	63.19	91.41	87.24	80.48	91.08	+	75.92	79.74
Island Average	60.50	55.03	61.21	63.40	61.79	61.60	63.49	49.03	63.27	61.03

+ No entry in this category
- Data not available
* Regional Averages
** Includes data for Caymanas & Innswood

Table X: Tonnes cane per tonne 96° sugar per variety by estates/farms in each ecological group, 2002

Estates/Farms	BJ7627	BJ8226	BJ7015	BJ7465	BJ7504	BJ82119	BJ7452	UCW5465	Mixed	Weighted Avg.
Appleton	10.02	10.13	9.73	10.08	10.03	10.69	11.19	+	9.84	10.03
Frome	9.14	9.83	9.48	9.09	9.63	9.03	9.07	+	9.31	9.46
Newton Cane Farms	10.11	10.61	10.52	9.82	10.27	10.07	9.14	+	10.17	10.17
Retreat	-	-	-	-	-	-	-	-	-	-
Wet West*	9.81	9.98	9.52	9.25	9.71	9.63	9.25	+	9.60	9.65
Hampden	-	-	-	-	-	-	-	-	-	-
Long Pond	+	9.22	9.31	9.06	9.27	9.61	9.18	+	8.94	9.20
Dry North Coast*	+	9.22	9.31	9.06	9.27	9.61	9.18	+	8.94	9.20
Bernard Lodge**	9.53	10.10	9.65	9.72	10.67	11.36	+	10.18	9.88	10.05
Monymusk	8.99	10.33	10.22	8.96	10.52	9.42	9.85	9.69	9.84	10.08
New Yarmouth	10.29	9.79	10.64	10.17	10.80	10.03	+	+	10.04	10.12
Irrigated*	9.57	10.07	10.24	9.55	10.60	9.80	9.85	10.01	9.91	10.08
Tropicana	9.47	+	10.19	10.79	12.09	9.96	-	9.91	10.26	10.24
Wet East*	9.47	+	10.19	10.79	12.09	9.96	-	9.91	10.26	10.24
Cambria	8.59	8.68	+	9.16	8.73	8.76	8.99	+	8.00	8.68
Worthy Park	7.58	8.24	7.46	8.01	8.03	7.69	+	+	7.58	7.82
Central*	8.07	8.33	7.46	9.10	8.07	7.93	8.99	+	7.65	8.01
Island Average	9.11	9.81	9.70	9.55	9.74	9.47	9.30	10.01	9.55	9.63

- Data not available
+ No entry in this category
* Regional Averages
** Includes data for Caymanas & Innswood

Table XI: Tonnes 96° sugar per hectare for each variety by estates/farms in each ecological group, 2002

Estates/Farms	BJ7627	BJ8226	BJ7015	BJ7465	BJ7504	BJ82119	BJ7452	UCW5465	Mixed	Weighted Avg.
Appleton	7.71	7.65	8.17	7.25	6.34	6.58	5.80	+	7.41	7.24
Frome	5.63	6.03	6.98	7.77	7.77	7.39	8.30	+	7.70	7.32
Newton Cane Farms	4.50	5.62	5.29	5.86	6.01	7.33	4.41	+	5.20	5.99
Retreat	-	-	-	-	-	-	-	-	-	-
Wet West*	6.24	6.28	7.05	7.57	7.49	7.18	6.80	+	7.34	7.14
Hampden	-	-	-	-	-	-	-	-	-	-
Long Pond	+	6.71	6.52	6.38	6.99	6.45	6.57	+	8.80	7.09
Dry North Coast*	+	6.71	6.52	6.38	6.99	6.45	6.57	+	8.80	7.09
Bernard Lodge**	6.15	4.74	6.47	5.97	5.14	5.43	+	5.47	5.83	5.47
Monymusk	5.46	3.91	4.42	4.38	3.82	4.61	4.73	4.10	4.13	4.20
New Yarmouth	4.45	4.84	7.38	7.64	6.76	5.33	+	+	6.02	5.73
Irrigated*	5.43	4.59	4.69	5.52	4.42	4.96	4.73	4.90	5.56	4.97
Tropicana	6.96	+	8.40	5.92	5.87	7.00	5.53	7.08	6.67	7.13
Wet East*	6.96	+	8.40	5.92	5.87	7.00	5.53	7.08	6.67	7.13
Cambria	9.44	8.90	+	10.09	10.51	9.84	10.13	+	9.69	9.70
Worthy Park	10.18	7.71	8.47	9.11	10.83	10.24	+	+	9.98	10.03
Central*	9.80	7.92	8.47	10.04	10.81	10.14	10.13	+	9.93	9.96
Island Average	6.64	5.61	6.31	6.65	6.34	6.51	6.82	4.90	6.62	6.34

+ No entry in this category
- Data not available
*** Regional Averages**
**** Includes data for Caymanas & Innswood**

Table XII: Tonnes 96° sugar per hectare per month for each variety by estates/farms in each ecological group, 2002

Estates/Farms	BJ7627	BJ8226	BJ7015	BJ7465	BJ7504	BJ82119	BJ7452	UCW5465	Mixed	Weighted Average
Appleton	0.61	0.58	0.65	0.59	0.52	0.52	0.45	+	0.58	0.57
Frome	0.44	0.49	0.58	0.66	0.63	0.62	0.64	+	0.63	0.60
Newton Cane Farms	0.37	0.43	0.44	0.50	0.49	0.61	0.36	+	0.42	0.49
Retreat	-	-	-	-	-	-	-	-	-	-
Wet West*	0.50	0.50	0.58	0.64	0.61	0.59	0.54	+	0.59	0.58
Hampden	-	-	-	-	-	-	-	-	-	-
Long Pond	+	0.57	0.50	0.59	0.50	0.44	0.45	+	0.61	0.52
Dry North Coast*	+	0.57	0.50	0.59	0.50	0.44	0.45	+	0.61	0.52
Bernard Lodge**	0.50	0.38	0.53	0.49	0.42	0.45	+	0.43	0.48	0.45
Monymusk	0.46	0.33	0.37	0.36	0.31	0.37	0.40	0.33	0.34	0.35
New Yarmouth	0.37	0.40	0.61	0.63	0.55	0.45	+	+	0.49	0.47
Irrigated*	0.45	0.38	0.39	0.45	0.36	0.41	0.40	0.39	0.45	0.41
Tropicana	0.54	+	0.50	0.40	0.40	0.49	0.39	0.53	0.47	0.48
Wet East*	0.54	+	0.50	0.40	0.40	0.49	0.39	0.53	0.47	0.48
Cambria	0.82	0.74	+	0.85	0.89	0.78	0.86	+	0.83	0.82
Worthy Park	0.88	0.67	0.64	0.78	0.94	0.86	+	+	0.85	0.86
Central*	0.85	0.69	0.64	0.84	0.94	0.84	0.86	+	0.85	0.85
Island Average	0.55	0.46	0.51	0.54	0.51	0.53	0.50	0.39	0.53	0.51

+ No entry in this category
- Data not available
* Regional Averages
** Includes data for Caymanas & Innswood

Table XIII: Comparison of varieties showing yields expressed as a percentage of BJ7015 - crop 2002								
	BJ7015	BJ8226	BJ7504	BJ7452	UCW5465	BJ7465	BJ7627	BJ82119
Tonnes cane per hectare/month	4.93(100) 4.94 (100) 4.91(100) 4.10(100) 4.94 (100) 4.98 (100) 4.94 (100)	4.48 (91)	5.01 (101)	4.68 (95)	3.93 (96)	5.10 (103)	5.01 (101)	5.03 (102)
Tonnes sugar per hectare/month	0.51 (100) 0.51 (100) 0.50 (100) 0.40 (100) 0.51 (100) 0.51 (100) 0.51 (100)	0.46 (90)	0.51 (100)	0.50 (100)	0.39(98)	0.54 (106)	0.55 (108)	0.53 (104)
Tonnes cane/tonne sugar	9.66 (100) 9.70 (100) 9.69 (100) 10.19 (100) 9.70 (100) 9.75 (100) 9.70 (100)	9.81 (102)	9.74 (100)	9.30 (96)	10.01 (98)	9.55 (98)	9.11 (94)	9.47 (98)

Table XIV: Tonnes cane per hectare for estates/farms by cane class in each ecological group, 2002

Estates/Farms	Fall Plants	Spring Plants	Stand Over	First Ratoon	Second Ratoon	Third Ratoon	Old Cane	Weighted Avg.
Appleton	81.23	81.46	+	70.37	70.30	70.40	73.80	72.60
Frome	73.33	84.39	80.76	72.70	73.67	62.12	68.98	69.28
Newton Cane Farms	+	74.81	+	81.40	62.21	58.70	56.35	60.94
Retreat	-	-	-	-	-	-	-	-
Wet West	73.40	81.30	80.76	72.58	71.56	63.29	67.84	68.89
Hampden	-	-	-	-	-	-	-	-
Long Pond	97.10	68.52	67.98	72.13	70.07	61.88	57.22	65.29
Dry North Coast*	97.10	68.52	67.98	72.13	70.07	61.88	57.22	65.29
Bernard Lodge**	59.16	63.72	62.73	59.15	49.46	49.87	55.67	54.94
Monymusk	60.23	49.58	+	43.41	42.97	40.05	40.49	42.34
New Yarmouth	+	62.84	+	51.29	55.23	44.03	64.43	58.00
Irrigated	59.96	61.52	62.73	51.58	48.49	44.76	50.25	50.10
Tropicana	+	71.06	106.67	79.50	68.36	63.92	64.36	73.03
Wet East	+	71.06	106.67	79.50	68.36	63.92	64.36	73.03
Cambria	+	79.02	+	99.59	90.30	60.88	83.77	84.19
Worthy Park	+	74.47	+	93.15	78.52	71.60	78.33	78.45
Central	+	75.39	+	94.52	81.33	70.70	79.68	79.74
Island Average	69.02	69.93	84.48	61.55	60.81	53.88	61.06	61.03

+ No entry in this category
- Data not available
** Includes data for Caymanas & Innswood

Table XV: Tonnes cane per tonne 96° sugar for estates/farms by cane class in each ecological group, 2002

Estates/Farms	Fall Plants	Spring Plants	Stand Over	First Ratoon	Second Ratoon	Third Ratoon	Old Cane	Weighted Avg.
Appleton	10.55	10.35	+	10.24	10.30	9.80	9.75	10.03
Frome	9.87	9.71	10.67	9.14	9.27	9.43	9.52	9.46
Newton Cane Farms	+	10.09	+	10.22	9.77	9.92	10.37	10.17
Retreat	-	-	-	-	-	-	-	-
Wet West	10.20	10.10	10.67	9.73	9.50	9.55	9.64	9.65
Hampden	-	-	-	-	-	-	-	-
Long Pond	8.83	9.41	8.98	9.04	9.70	9.37	9.23	9.20
Dry North Coast*	8.83	9.41	8.98	9.04	9.70	9.37	9.23	9.20
Bernard Lodge**	8.89	9.83	9.81	10.00	10.21	10.23	10.05	10.05
Monymusk	10.89	10.00	+	9.98	9.82	10.60	9.88	10.08
New Yarmouth	+	9.70	+	9.58	9.94	10.04	10.47	10.12
Irrigated	10.32	9.79	9.81	9.95	10.01	10.34	10.07	10.08
Tropicana	+	10.25	11.23	9.25	10.23	10.27	9.90	10.24
Wet East	+	10.25	11.23	9.25	10.23	10.27	9.90	10.24
Cambria	+	8.89	+	8.33	8.26	8.96	8.73	8.68
Worthy Park	+	7.62	+	7.61	7.75	7.88	7.88	7.82
Central	+	7.86	+	7.76	7.88	7.95	8.09	8.01
Island Average	9.81	9.53	10.29	9.63	9.65	9.78	9.54	9.63

+ No entry in this category
- Data not available
**** Includes data for Caymanas & Innswood**

Table XVI: Tonnes theoretical 96° sugar per hectare for estates/farms by cane class in each ecological group, 2002

Estates/Farms	Fall Plants	Spring Plants	Stand Over	First Ratoon	Second Ratoon	Third Ratoon	Old Cane	Weighted Avg.
Appleton	7.70	7.87	+	6.87	6.83	7.18	7.57	7.24
Frome	7.43	8.63	7.57	7.95	7.94	6.59	7.25	7.32
Newton Cane Farms	+	7.41	+	7.96	6.37	5.92	5.43	5.99
Retreat	-	-	-	-	-	-	-	-
Wet West	7.56	8.05	7.57	7.46	7.53	6.63	7.04	7.14
Hampden	-	-	-	-	-	-	-	-
Long Pond	10.99	7.28	7.53	7.98	7.22	6.60	6.20	7.09
Dry North Coast*	10.99	7.28	7.53	7.98	7.22	6.60	6.20	7.09
Bernard Lodge**	6.65	6.48	6.40	5.91	4.84	4.88	5.55	5.47
Monymusk	5.53	4.96	+	4.35	4.37	3.78	4.10	4.20
New Yarmouth	+	6.48	+	5.35	5.55	4.38	6.15	5.73
Irrigated	5.81	6.28	6.40	5.18	4.85	4.33	4.99	4.97
Tropicana	+	6.93	9.50	8.59	6.68	6.22	6.50	7.13
Wet East	+	6.93	9.50	8.59	6.68	6.22	6.50	7.13
Cambria	+	8.89	+	11.96	10.93	6.80	9.59	9.70
Worthy Park	+	9.77	+	12.24	10.13	9.09	9.94	10.03
Central	+	9.59	+	12.18	10.32	8.90	9.85	9.96
Island Average	7.04	7.34	8.21	6.39	6.30	5.51	6.40	6.34

+ No entry in this category
- Data not available
** Includes data for Caymanas & Innswood

Table XVII: Tonnes theoretical 96° sugar per hectare per month for estates/farms by cane class in each ecological group, 2002

Estates/Farms	Fall Plants	Spring Plants	Stand Over	First Ratoon	Second Ratoon	Third Ratoon	Old Cane	Weighted Avg.
Appleton	0.51	0.53	+	0.57	0.55	0.56	0.60	0.57
Frome	0.47	0.57	35.00	0.70	0.67	0.56	0.60	0.60
Newton Cane Farms	+	0.60	+	0.67	0.51	0.45	0.44	0.49
Retreat	-	-	-	-	-	-	-	-
Wet West	0.49	0.56	0.36	0.63	0.63	0.55	0.58	0.58
Hampden	-	-	-	-	-	-	-	-
Long Pond	0.67	0.56	0.33	0.70	0.61	0.55	0.54	0.52
Dry North Coast*	0.67	0.56	0.33	0.70	0.61	0.55	0.54	0.52
Bernard Lodge**	0.41	0.51	0.46	0.49	0.41	0.39	0.46	0.45
Monymusk	0.40	0.33	+	0.37	0.36	0.31	0.34	0.35
New Yarmouth	+	0.50	+	0.46	0.47	0.36	0.51	0.47
Irrigated	0.40	0.48	0.46	0.44	0.40	0.35	0.41	0.41
Tropicana	+	0.56	0.41	0.67	0.51	0.43	0.49	0.48
Wet East	+	0.56	0.41	0.67	0.51	0.43	0.49	0.48
Cambria	+	0.77	+	1.02	0.94	0.59	0.81	0.82
Worthy Park	+	0.80	+	1.02	0.87	0.79	0.86	0.86
Central	+	0.79	+	1.05	0.89	0.77	0.85	0.85
Island Average	0.47	0.55	0.36	0.54	0.52	0.45	0.53	0.51

+ No entry in this category
- Data not available
** Includes data for Caymanas & Innswood

Table XVIII: Percent hectares reaped by cane class for estates/farms and ecological group & average growth in months, 2002

Estates/Farms	Fall Plants	Spring Plants	Stand Over	First Ratoon	Second Ratoon	Third Ratoon	Old Cane	Avg. Length of Growth (mo.)
Appleton	1	10	+	28	15	16	30	12.69
Frome	*	2	2	8	15	18	55	12.15
Newton Cane Farms	*	3	1	10	15	17	54	12.36
Retreat	-	-	-	-	-	-	-	-
Wet West	*	4	1	12	15	17	51	12.28
Hampden	-	-	-	-	-	-	-	-
Long Pond	7	4	16	8	10	14	41	13.75
Dry North Coast*	7	4	16	8	10	14	41	13.75
Bernard Lodge**	2	6	*	19	13	19	41	12.29
Monymusk	5	2	*	17	12	19	45	12.17
New Yarmouth	+	13	+	9	20	15	43	12.16
Irrigated	3	5	*	16	14	18	44	12.21
Tropicana	+	6	17	4	14	5	54	14.94
Wet East	+	6	17	4	14	5	54	14.94
Cambria	+	9	+	8	6	3	74	11.80
Worthy Park	+	11	+	8	6	10	65	11.66
Central	+	11	+	8	6	9	66	11.69
Island Average	2	5	2	13	14	16	48	
Average age (mo.)	14.95	13.31	22.75	11.81	12.03	12.21	12.11	12.42

- Data not available
+ No entry in this category
* Less than 1%
** Includes data for Caymanas & Innswood

Table XIX: Hectares fertilized as a % of total hectares reaped - plants and ratoons, 1998 - 2002

Ecological Groups	Year	Nitrogen		Phosphate		Potash	
		Plants	Ratoons	Plants	Ratoons	Plants	Ratoons
		%	%	%	%	%	%
Wet West	**1998**	96	94	96	86	96	94
Dry North Coast		71	85	61	21	61	85
Irrigated		-	-	-	-	-	-
Wet East		0	97	0	35	0	97
Central		100	100	94	29	94	100
Wet West	**1999**	67	95	63	85	63	95
Dry North Coast		67	74	54	13	54	74
Irrigated		72	68	46	12	46	48
Wet East		100	98	100	21	100	98
Central		100	100	62	21	62	100
Wet West	**2000**	95	96	84	87	84	96
Dry North Coast		100	98	100	20	100	98
Irrigated		80	74	47	16	47	56
Wet East		100	96	9	43	9	96
Central		100	99	92	20	92	99
Wet West	**2001**	95	94	69	55	69	88
Dry North Coast		46	75	39	22	39	75
Irrigated		86	96	22	21	22	84
Wet East		100	97	0	15	0	97
Central		100	99	59	21	59	99
Wet West	**2002**	81	96	52	35	52	78
Dry North Coast		96	98	44	14	44	98
Irrigated		65	88	33	13	33	76
Wet East		38	86	38	7	38	86
Central		100	100	93	23	93	100

- Data not available

Table XX: Percent hectares fertilized with N, P, K by cane class, 1998 - 2002

Fertilizer	Year	Fall Plants	Spring Plants	First Ratoons	Second Ratoons	Third Ratoons	Old Cane	Mean
		%	%	%	%	%	%	%
Nitrogen	1998	72	47	57	60	69	78	65
	1999	48	74	76	83	80	84	81
	2000	79	87	82	87	85	92	87
	2001	58	93	94	91	93	93	93
	2002	70	80	87	0	93	94	91
Phosphate	1998	72	41	33	40	42	51	43
	1999	33	50	21	37	43	47	42
	2000	41	61	41	40	39	52	46
	2001	24	44	36	41	29	31	34
	2002	39	52	19	0	26	20	24
Potash	1998	72	45	54	59	69	78	64
	1999	36	70	59	70	72	80	73
	2000	79	83	70	80	76	86	79
	2001	32	91	86	85	87	85	85
	2002	68	75	69	0	81	84	79

Table XXI: Average N, P, K, Applications (kg) per hectare for plants and ratoons by ecological groups, 1998 - 2002

		1998			1999			2000			2001			2002		
		N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
Wet West	Plants	97	75	101	92	67	96	75	90	75	108	92	104	161	91	99
	Ratoons	92	58	102	94	57	103	94	56	104	113	60	86	119	59	109
Dry North Coast	Plants	83	69	88	74	81	75	77	78	79	82	75	85	85	89	92
	Ratoons	88	58	91	83	42	86	83	50	85	84	46	86	87	47	98
Irrigated	Plants	-	-	-	86	90	74	102	82	87	108	83	105	108	75	89
	Ratoons	-	-	-	102	51	100	116	62	96	119	60	108	122	72	113
Wet East	Plants	+	+	+	96	86	100	61	19	64	113	0	114	100	103	103
	Ratoons	95	42	98	106	52	110	77	38	85	86	38	89	108	44	109
Central	Plants	108	56	145	114	59	154	128	63	170	119	47	157	103	53	140
	Ratoons	110	32	114	117	24	154	112	20	148	103	20	135	103	21	138

- Data not available
+ No Entry in this category

Table XXII: Fertilizer used for each cane class for farms sampled - crop 2002

	Nitrogen				Phosphate				Potash			
	Hectares Fertilized	Tonnes Used	Mean kg/ha	% Total ha Fertilized	Hectares Fertilized	Tonnes Used	Mean kg/ha	% Total ha Fertilized	Hectares Fertilized	Tonnes Used	Mean kg/ha	% Total ha Fertilized
Fall Plants	238	21.67	90.75	70	132	11.76	88.56	39	53	3.94	72.97	32
Spring Plants	763	96.99	127.07	80	495	37.64	75.94	52	1,784	194.53	109.03	91
Stand Over Plants	52	4.54	86.26	35	24	2.12	86.22	16	61	5.44	88.83	35
First Ratoons	2,127	267.54	125.74	87	470	32.81	69.71	19	1,693	192.30	113.56	69
Second Ratoons	2,386	288.57			676	39.07	57.77		1,980	223.47	112.84	
Third Ratoons	2,809	327.17	116.45	93	803	52.48	65.32	26	2,473	279.04	112.80	81
Old Ratoons	8,512	982.02	115.37	94	1,838	100.92	54.90	20	7,554	854.57	113.13	84
Total/Average	17,063	2,005.35	117.52	91	4,487	279.61	62.31	24	14,880	1,668.45	112.12	79