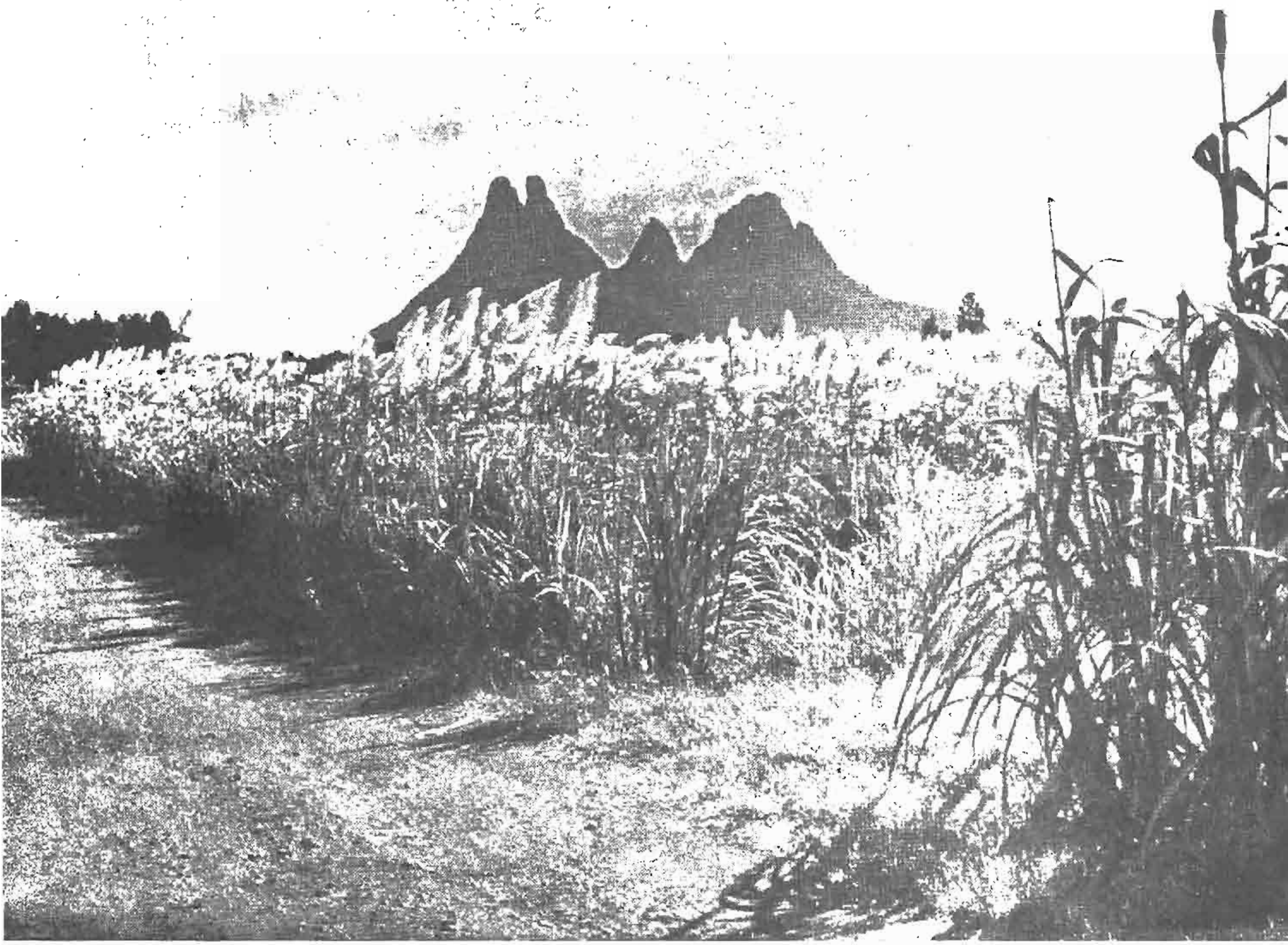

ANNUAL REPORT 1954

MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE

MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE

ANNUAL REPORT 1954

Printed by :
CLAUDE MARRIER d'UNIENVILLE
THE MAURITIUS PRINTING COY. LTD.
37 SIR WILLIAM NEWTON STREET
PORT LOUIS—MAURITIUS

CONTENTS

Unless otherwise stated the photographs are by Mr. P. Halbwachs. On the cover, cane field near the " Trois Mamelles " Mountain.

MEMBERS EXECUTIVE BOARD

The Honourable A. L. Nairac, C. B. E., Chairman ;

representing the Chamber of Agriculture

Mr. W. Allan, C. B. E., Director of Agriculture (1. 1. 54 to 11. 4. 54)

representing Government

Mr. A. North Coombes, Ag. Director of Agriculture (12. 4. 54 to 31. 12. 54)

representing Government

Mr. P. G. A. Anthony	;	*representing*	*factory owners*
Mr. P. P. Dalais	;	,,	*factory owners*
Mr. C. Noel	;	,,	*factory owners*
Mr. L. A. Rouillard	;	,,	*large planters*
Mr. D. Luckeenarain	;	,,	*small planters*
Mr. M. Ramdin	;	,,	*small planters*

MEMBERS
RESEARCH ADVISORY COMMITTEE

Mr. P. O. Wiehe, Chairman.

Mr. A. North Coombes	;	*representing*	*the Department of Agriculture*
Mr. J. Marot	;	,,	*the Extention Service of the Department of Agriculture*
Mr. G. P. Langlois	;	,,	*the Chamber of Agriculture*
Mr. R. Leclezio	;	,,	*the Société de Technologie Agricole et Sucrière*
Mr. F. North Coombes	;	,,	*the Société de Technologie Agricole et Sucrière*

and the senior staff of the Research Institute.

Co-opted members :

Mr. G. Orian, Plant Pathologist, Department of Agriculture

Mr. J. R. Williams, Entomologist, Department of Agriculture

STAFF LIST

Director	P. O. Wiehe, M.Sc., A.R.C.S., F.L.S.
Agronomist	Pierre Halais, Dip.Agr. (Maur.)
Botanist	E. Rochecouste, B.Sc., Dip.Agr. (Maur.)
Chemist	D. H. Parish, B.Sc., M.Agr. (Belfast)
Assistant Chemist ...	S. M. Feillafé, Dip.Agr. (Maur.)
Plant Breeder ...	A. de Sornay, B.Sc., D.I.A.C., Dip.Agr. (Maur.)
Geneticist	Vacant
Plant Pathologist ...	R. Antoine, B.Sc., A.R.C.S., Dip.Ag.Sc. (Cantab), Dip.Agr. (Maur.)
Entomologist	Vacant
Sugar Technologist ..	Vacant
Chief Agriculturist ...	G. Rouillard, Dip.Agr. (Maur.)
Field Officers :	
Headquarters ...	G. Mazery, Dip.Agr. (Maur.)
"	P. R. Hermelin, Dip.Agr. (Maur.)
"	S. N. Coombes, Dip. Agr. (Maur.)
North	M. Hardy, Dip.Agr. (Maur.)
South	F. Mayer, Dip.Agr. (Maur.)
Centre	L. P. Noël, Dip.Agr. (Maur.)
Laboratory Assistants :	
Botany ...	P. Rouillard
Chemistry ...	L. C. Figon
Secretary-Accountant ...	P. G. du Mée
Clerks	Miss. E. Blackburn
	Mrs. G. Caine
	Mrs. A. Baissac

REVENUE AND EXPENDITURE ACCOUNT

from 29th August 1953 to 30th June 1954

Expenditure	Rs.	Revenue	Rs.
REHABILITATION, RUNNING AND MAINTENANCE OF STATIONS & LABORATORIES	223,120.17	CESS ON SUGAR EXPORTED ...	832,629.46
PERSONAL EMOLUMENTS & PENSION FUND CONTRIBUTIONS ...	133,583.95	CONTRIBUTION FROM MILLERS & PLANTERS	79,014.08
FEES — BOARD MEMBERS, AUDITORS & LEGAL ADVISER	4,260.00	CONTRIBUTION FROM SUGAR INDUSTRY RESERVE FUND ...	12,000.00
GENERAL OFFICE AND LIBRARY EXPENSES	32,497.44	MISCELLANEOUS RECEIPTS ...	30,119.00
INTEREST ON LOAN	416.67		
LEAVE & MISSIONS FUND	50,000.00		
PHYTALUS CESS	41,631.46		
	485,509.69		
Excess of revenue over expenditure for the period carried to accumulated funds ...	468,252.85		
Rs.	953,762.54	Rs.	953,762.54

BALANCE SHEET

as at 30th June 1954

Liabilities	Rs.	Assets	Rs.
ACCUMULATED FUNDS	468,252.85	FIXED ASSETS: (at cost less depreciation & amounts written off)	
RESERVE FUND	50,830.45	Land & Buildings	144,220.00
LOAN FROM A. M. A. S. Ltd. ...	100,000.00	Laboratory & Office Equipment & Furniture	300.00
SUNDRY CREDITORS & ACCRUED EXPENSES	1,062.69	Agricultural Machinery & Vehicles ...	20,650.00
		CURRENT ASSETS:	
		Sundry Debtors	20,260.73
		Cash on Deposit	25,062.50
		Cash at Banks & on hand	409,652.76
Rs.	620,145.99	Rs.	620,145.99

AUDITORS' REPORT

We have examined the Books and Accounts of the Institute for the period from 29th August 1953 to 30th June 1954 and have obtained all the information and explanations we have required.

In our opinion the foregoing Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Institute's affairs as at 30th June, 1954, according to the best of our information and the explanations given to us and as shown by the Books and Accounts of the Institute.

Port Louis, Mauritius, 18th August, 1954.

(sd) P. R. C. du MÉE
A.S.A.A. B. Com., C.A. (S.A.)
P. P. DUBRUEL, de CHAZAL, du MÉE & Co.
Auditors.

(sd) A. L. NAIRAC
(sd) P. G. A. ANTHONY } *Board Members*

(sd) P. O. WIEHE *Director*

MAURITIUS SUGAR INDUSTRY RESEARCH INSTITUTE

REPORT OF THE CHAIRMAN EXECUTIVE BOARD, 1954

THE Executive Board, composed of the same members as in 1953, held twenty-five meetings during the year under review and was again largely concerned with the organisation of the Institute, although an increasing number of administrative matters had to be dealt with as this organisation developed.

Sir Geoffrey Clay, K. C. M. G., O. B. E., M. C., Agricultural Adviser to the Secretary of State for the Colonies kindly attended one of our meetings and discussed questions of general policy with members of the Board. The Institute also welcomed a number of distinguished visitors including His Excellency the Governor, Sir Robert Scott, K. C. M. G., Lord Munster, then Parliamentary Under Secretary of State for the Colonies and Mr. J. B. Sidebotham, C. M. G., of the Colonial Office. The interest shown in our activities was a great source of encouragement to all.

The Research Advisory Committee was appointed early in the year and its members, together with members of the Board, visited the experimental stations of the Institute on various occasions.

The main results of the Board's activities are set out hereunder.

ESTABLISHMENT

Full agreement was reached with Government concerning the transfer on secondment of officers attached to the former Sugarcane Research Station.

The following new appointments were made during the year :

Chemist : D. H. Parish, B. Sc., M. Agr., formerly Assistant Lecturer in Agricultural Chemistry, Queen's University, Belfast and Scientific Officer, Chemistry Research Division of the Ministry of Agriculture for Northern Ireland.

Plant Pathologist :	R. Antoine, B. Sc., A. R. C. S., Dip. Agr. Sc. (Cantab.), formerly Assistant Plant Pathologist, Department of Agriculture and later Senior Agricultural Officer, Mauritius.
Field Officers :	P. R. Hermelin, Dip. Agr. (Maur)., formerly Assistant Plant Breeder, Sugarcane Research Station.
	S. North Coombes, Dip. Agr. (Maur.), formerly Chemist, The Mount S. E. and lately Agronomist, Blyth Brothers & Co., Ltd.

Appreciable progress has therefore been achieved in building up the Institute along the lines indicated in the first report, and it now remains to inaugurate the sections of Sugar Technology and Entomology in order to complete the first stage of development which the Board had set as its objective.

The advantages of experience gained overseas is of capital importance to any research organisation: it becomes even more so in Mauritius because of the isolation and remoteness of the island. The policy of the Board therefore is that all officers of the Institute shall benefit in turn from scientific contacts abroad.

Mr. Pierre Halais, Agronomist, represented the Institute at the Vth International Soil Congress held at Leopoldville in August.

Mr. A. de Sornay, Plant Breeder and Mr. E. Rochecouste, Botanist, made short visits to Réunion Island.

On his return journey from overseas leave, Mr. G. Mazery, Field Officer, was requested to spend six weeks in Natal to study recent developments in mechanization and overhead irrigation as applied to sugarcane cultivation.

The Director, Mr. P. O. Wiehe, spent three weeks in Madagascar in October on the invitation of the French Government. He later visited Réunion to attend the IVth meeting of the "Comité de Collaboration Agricole Maurice-Réunion".

The Board also decided that the Director and Plant Pathologist should visit Australia and Fiji early in 1955.

DEVELOPMENT OF THE INSTITUTE

Considerable work was done during the year in connection with the development of experimental stations and the building programme of the Institute.

By arrangement with the General Manager of the Anglo-Ceylon and General Estates Co. Ltd., the experimental station at Hermitage was transferred to a better site at Belle Rive. In addition it was deemed necessary to open another, but smaller, experimental station in the super-humid zone of the island. Land for that purpose was leased from the Mauritius Agricultural and Industrial Co. Ltd., at Union Park and work at both stations started in April.

The experimental station at Pamplemousses was extended by leasing an additional portion of land from Messrs. Harel Frères at Mon Rocher. Furthermore, to give effect to the Board's decision that three of the six Field Officers should be resident at or near the experimental stations of which they are in charge, a house was purchased by the Institute in the vicinity of the Pamplemousses experimental station and two others built at Belle Rive and Union Park. In addition the following were constructed during the year : a house for the Director at Réduit ; labourers' quarters for nine families at each of the two stations, Réduit and Belle Rive; offices, stores and meeting rooms at Union Park and Belle Rive; foreman's quarters and new nurseries at Pamplemousses; irrigation reservoirs and a network of canals at Réduit and Pamplemousses.

The Board was allowed to proceed with its building programme on the grounds of the future headquarters of the Institute. A new wing covering a floor space of 4,500 sq. ft. is accordingly under construction, to be used for Chemistry, Foliar Diagnosis and Sugar Technology, and a pre-fabricated 'Arcon' structure will serve as an experimental cane mill and for routine analyses of cane samples.

Concerning the actual delivery, however, of the Bacteriological Laboratories at Réduit, the Board was informed by Government that no date could as yet be fixed in view of the "heavy back log of building work and strained resources of the Architectural Department" which are delaying the construction of medical laboratories.

FINANCE

The first financial year of the Institute ending on 30th June 1954 has shown an excess of revenue over expenditure of Rs. 468,252.85 after constituting special reserves amounting to Rs. 50,830.45.

This apparently large excess is due to the fact that the Institute had, on the 30th of June, 1954, only just started its fairly extensive programme of capital expenditure. The figures after the 1954-1955 financial year will bring us nearer to reality. It is expected however that on 30th June 1955 a general reserve of approximately Rs. 250,000 will have been constituted.

The Board in order to finance the capital expenditure which must be incurred to place the Institute on a really efficient basis has contracted a loan of Rs. 700,000 from the Anglo Mauritius Assurance Society Ltd. repayable over ten years The first Rs. 100,000 of this amount was paid to the Institute on 1st June, 1954. The remainder has been or will be paid as follows : Rs. 200,000 on 1st September 1954; Rs. 200,000 on 1st December 1954; Rs. 200,000 on1st December 1955. This loan will enable the Institute to pursue its building programme without impairing its financial stability even if the annual revenue is diminished in any year by adverse climatic conditions.

The revenue and expenditure account and the balance sheet are published on page 4.

This brief review of the administrative and financial situation of the Institute will, I hope, justify the Board's opinion that good progress has been made without undue risks being taken, that useful work can already be and is being performed by the Institute and that it will soon be in a position to reach maximum efficiency. My colleagues of the Board and myself fully realise that these results have only been rendered possible by the vision, planning and untiring energy of our Director and the devotion and keenness of his staff, to all of whom we would renew our thanks.

We would also record our deep appreciation of the whole-hearted assistance we have received from the Director of Agriculture and the Acting Director of Agriculture with whose Department the Institute has maintained the necessary close cooperation while also working in complete harmony with the Chamber of Agriculture and other public bodies.

Chairman.

31st January, 1955.

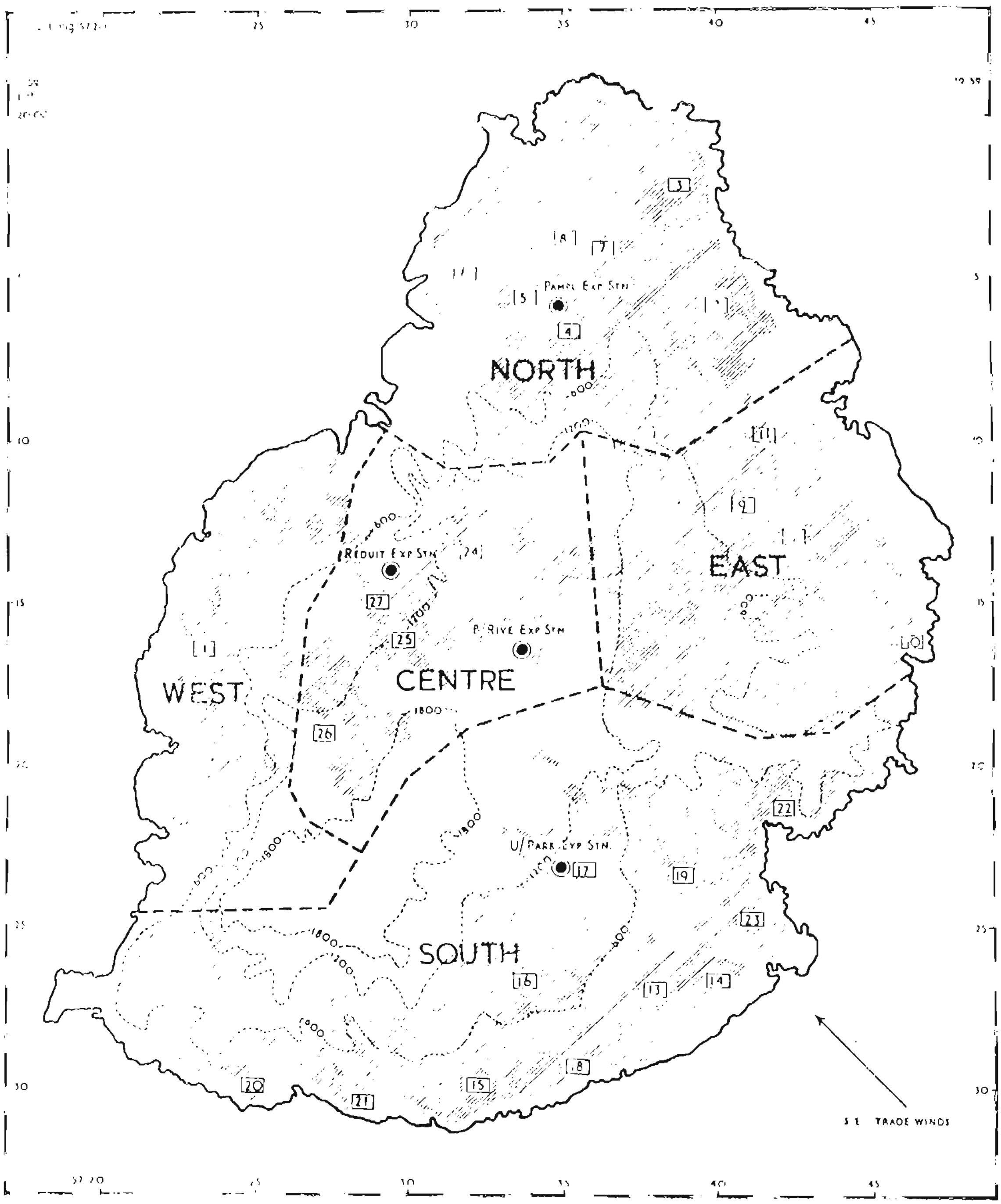

Fig. 1. Map of Mauritius showing area under sugarcane (shaded), the five natural sectors of sugar production (broken line), altitude in feet (dotted line), experimental stations of the Research Institute and sugar factories (1, Médine; 2, Mon Loisir; 3, St. Antoine; 4, The Mount; 5, Beau Plan; 6, Solitude; 7, Labourdonnais; 8, Belle Vue; 9, Union Flacq; 10, Beau Champ; 11, Constance; 12, Queen Victoria; 13, Savinia; 14, Mon Trésor; 15, Union St. Aubin; 16, Britannia; 17, Rose Belle; 18, Bénarès; 19, Riche en Eau; 20, Bel Ombre; 21, St. Félix; 22, Ferney; 23, Beau Vallon; 24, Mon Désert; 25, Highlands; 26, Rèunion; 27, Trianon.

INTRODUCTION

THE last publication of the former Sugarcane Research Station was the Annual Report for 1952, in which the Officer in charge Mr. N. Craig, O.B.E., briefly reviewed the work accomplished during the last 23 years and referred to changes about to take place in the administration of sugar research in the Colony. It is my pleasant duty in presenting the first technical report of this new sugar research organisation to pay tribute to the achievements of the Sugarcane Research Station, which will remain a source of inspiration to its successor.

The structure and organisation of the Sugar Research Institute was described in the first Annual Report of the Chairman of the Executive Board and is again referred to in his report for 1954. The Institute does not yet occupy its permanent headquarters nor is the establishment completed. Of the two senior appointments made during the year, Mr. D. H. Parish the Chemist only arrived at the end of September, while Mr. R. Antoine, the Plant Pathologist, will not be able to assume duty until March 1955. There still remains to appoint an Entomologist in order to complete the team working on the field aspect of sugar production. Meanwhile, the Plant Pathologist and Entomologist of the Department of Agriculture have kindly co-operated in a number of research projects and their assistance is gratefully acknowledged.

The research policy of the Institute is to increase the yield of sugar in the field and to improve manufacturing processes in order to attain a maximum sugar output per unit area. With this main objective in view a detailed research programme was prepared and submitted to the Research Advisory Committee. The programme is divided into 32 main research projects, each of which covers a large number of special investigations. While such a programme is useful as a guide to research activities, it is bound to have limitations and must offer sufficient flexibility so that certain problems should receive greater attention at the appropriate moment. Similarly, it must also provide a certain amount of freedom to individual workers in their own line of research.

Some of the problems of cane production facing the Mauritius sugar industry together with the work of the various branches of the Institute are summarised below. Special aspects of some of the investigations carried out by the Institute are reported in greater detail by individual members of the staff. Essential information concerning the sugar industry of Mauritius is given in statistical tables published as an Appendix to this report.

SELECTION OF CANE VARIETIES

A common feature in the policy of cane breeding stations the world over is an attempt to produce varieties which combine vigour with high sucrose content and high juice purity. In many countries including Mauritius, sugar producers also demand that some of these varieties should mature early in the season Reference to the maturity curves published in fig. 2 (data in tables VI and VII of the Appendix) demonstrate clearly the economic significance which early maturing varieties would have in Mauritius. A small increase in the sucrose content of the cane in July and August would result in an increase of many thousand tons of sugar in the Island's production. Consequently, the efforts of the Plant Breeding division of the Institute are orientated towards the selection of early maturing varieties. With this object in view the following modifications to the normal selection programme have been initiated:

(a) first selection will henceforth be made early in the season (August); the refractometric Brix of new seedling will be compared to a standard variety, replicated a large number of times in the same field;

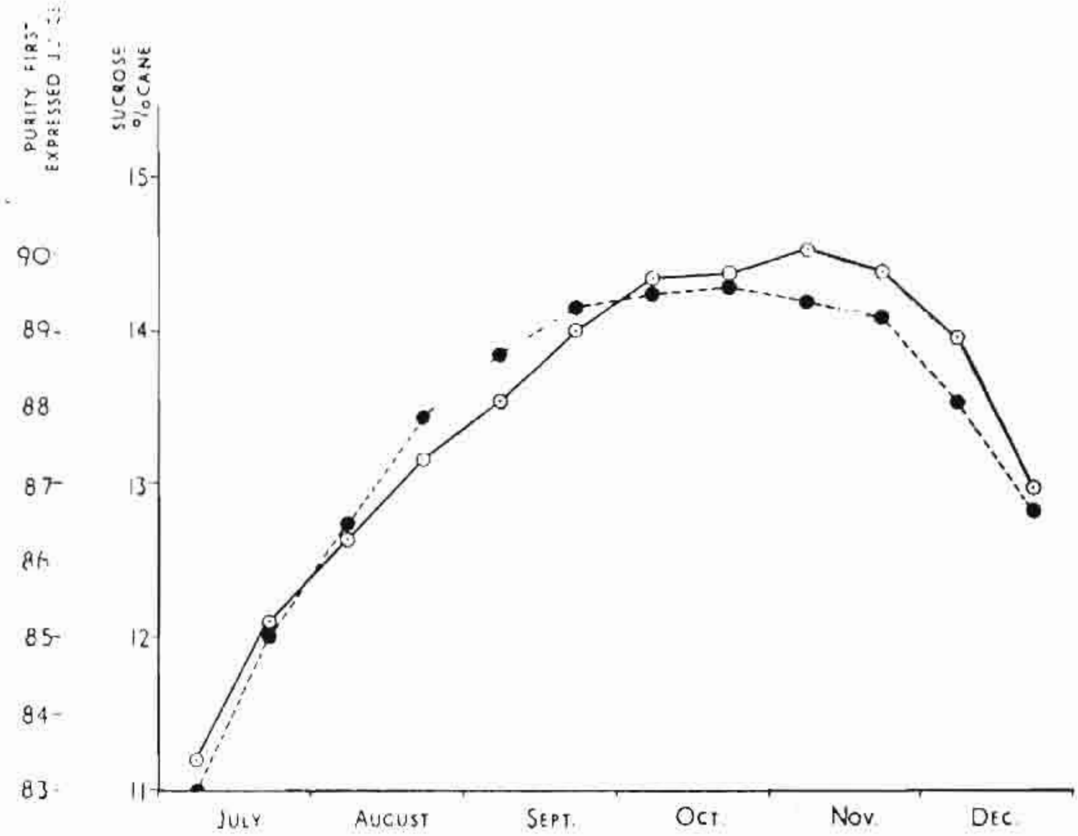

Fig. 2. Average fortnightly variations in sucrose % cane (plain line) and purity first expressed juice (broken line) for all factories of Mauritius from 1949 to 1954.

(b) a higher level of sucrose content will be established for selection in second trials (plant canes, first and second ratoons);

(c) the testing of promising varieties in random block trials with four replicates, and which are now styled "pre-release variety trials", will be modified so that the experiments will be harvested at the beginning, middle and end of the crop; in order to reduce errors, sampling of individual plots will be made for determination of sucrose content and juice purity.

Reference should be made at this stage to "post-release variety trials" which combine 6 varieties with 3 levels of Nitrogen and 3 dates of reaping. Six of these trials were planted for the first time in 1954, two in each of the three climatic zones of the island, the varieties used being B. 3337, B. 34104, B. 37161, B. 37172 with Ebène 1/37 and M. 134/32 as control varieties.

The object of these trials is to supplement the information already available on the agronomic features of varieties recently released or which offer serious commercial prospects, and to obtain data on the manufacturing properties of juices and the optimal period for harvesting.

THE CANE VARIETY POSITION

Varietal changes in Mauritius during the last 25 years are shown diagramatically in Fig. 3 (data in table XI of Appendix). The area under M. 134/32 is decreasing although this variety still occupies approximately 85% of cane lands. An indication of the present variety trend is best obtained by studying figures relating to the area planted in 1954 (Fig 4 and Table XII of Appendix). Thus, on estates of the island as a whole, M. 134/32 occupies half of the 1954

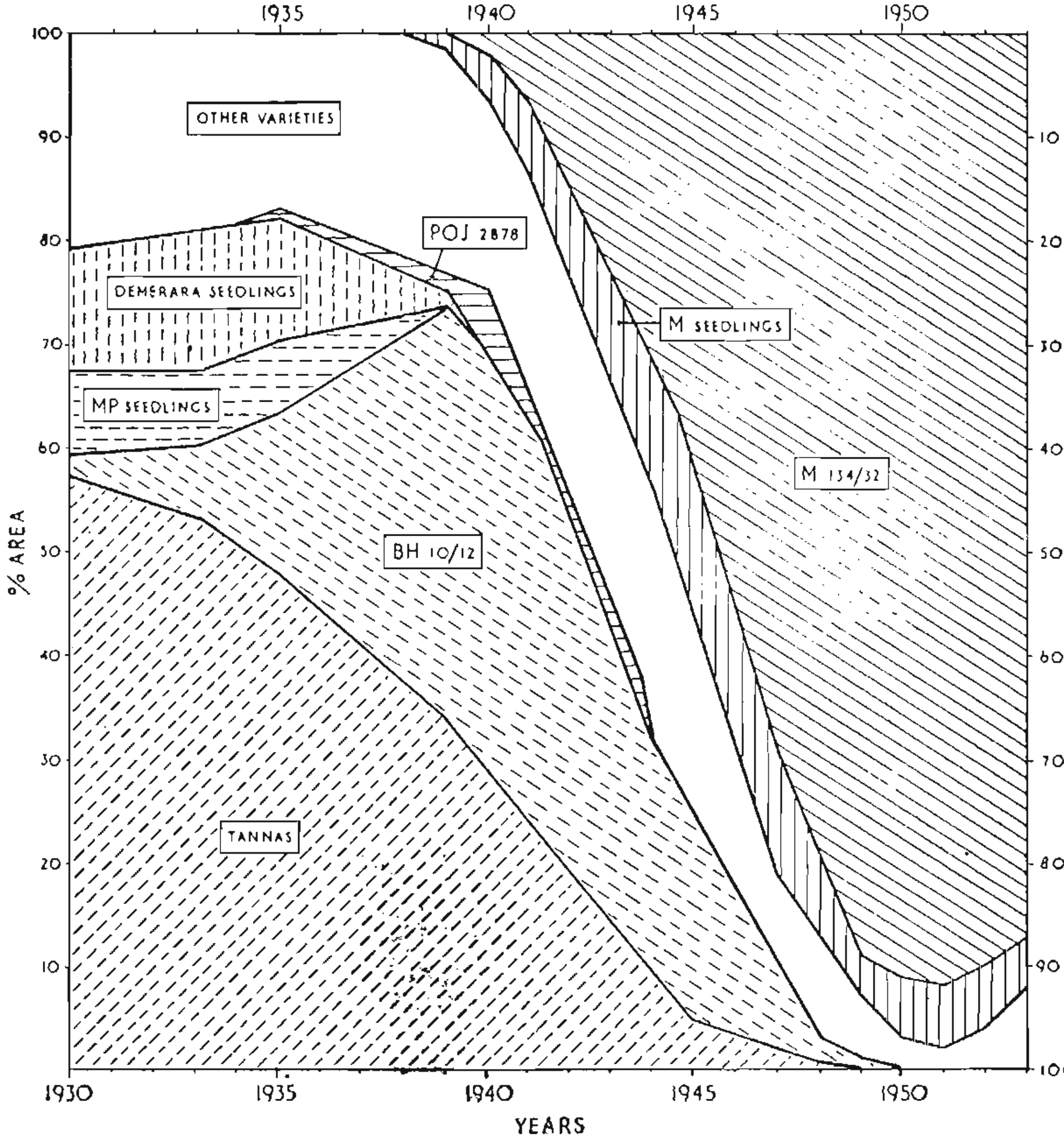

Fig. 3. Varietal changes in Mauritius from 1930 to 1953.

plantings; Ebène 1/37 about one quarter, being most popular in the Central Plateau and in the South, while the three Barbados varieties B. 3337, 37161 and B. 37172 are steadily gaining popularity accounting for 20% of the plantations made in 1954. M. 112/34 does best in the lowlands where it has the desirable feature of maturing early but is susceptible to red rot if harvesting is delayed.

Varieties which appear to have commercial prospects include M. 311/41, M. 129/43, M. 147/44 and M. 31/45. B. 34104 will probably be considered for release, provided it proves to be leaf scald resistant under Mauritius conditions.

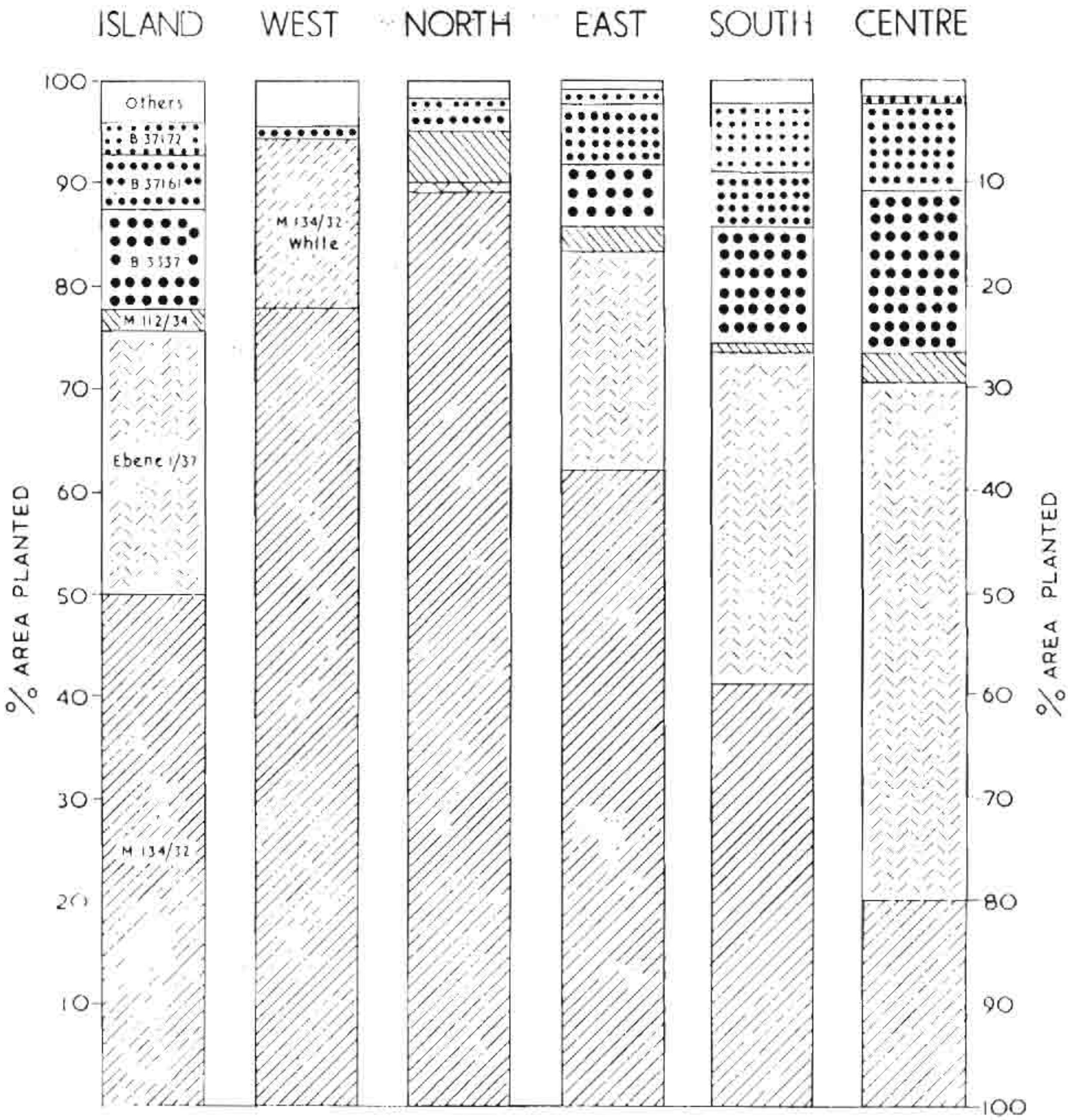

Fig. 4. Percentage area planted in different cane varieties in 1954.

NUTRITION AND SOILS

The large amount of experimental data available on Nitrogen and the sugar cane in Mauritius is being critically reviewed in a monograph which will be published shortly. Meanwhile, some important facts concerning the effect of nitrogenous fertilizers are summarised in this report. Reference should also be made to the determinaof Nitrogen requirements of the cane plant proposed by Halais. This improved differential method should help planters to establish a more rational programme of Nitrogen fertilisation.

Foliar diagnosis data obtained by the laboratory of the Sugar Industry Reserve Fund from 1947 to 1953, and which include about 40,000 determinations each of P_2O_5 and K_2O, have been card-indexed and summarised to serve as basis for future comparisons. About 8,000 diagnoses were done during the year as a free service to cane growers. The new foliar diagnosis laboratory will be equipped with a Perkin Elmer flame photometer which was presented to the Institute by the Sugar Industry Reserve Fund, to whose authorities I have pleasure in reiterating our thanks.

The results of experiments on organic fertilizers obtained from 1917 to 1953 are discussed by G Rouillard. In this connection reference should be made to four permanent trials laid down at each of the experimental stations, in which factory residues are compared to mineral fertilizers as to their effects on yield, soil structure, soil microflora, including the relative abundance of pathogens. Two varieties are planted in each plot of the latin square and will be rearranged after each cycle so that there is an alternation of varieties in two of the sub-plots, while the same variety will be grown continuously in the other two sub-plots. In addition, half the total number of plots of the latin square will be burnt before harvest, thereby providing a combination of different levels of organic matter.

Study of available data on the effect of liming has revealed a differential response on two soil types of the superhumid zone. Significant increases in yields have been recorded on the "Rose Belle" gravelly light clay, but not on the "Sans Souci" bouldery light clay. It is hoped that data obtained during the course of a soil survey of the island may help to elucidate the causes of this difference.

Preliminary work was started during the year on the chemical composition of the cane plant by chromatography with a view to relate some of the agronomic features of new varieties, the manufacturing properties of their juices and their resistance to important diseases, to specific constituents of the plant. The new laboratories are being provided with a constant temperature room for these studies.

CANE DISEASES

The sugar industry of Mauritius is confronted at present with two main pathological problems: ratoon stunting disease and chlorotic streak. Investigations concerning these two diseases are discussed in some detail in a separate section of this report. The recent outbreak of Fiji disease on the East coast of Madagascar represents a potential menace, which is aggravated by the fact that the dominant variety M. 134/32 is very susceptible to the virus. Both the local Government and the French authorities in Madagascar have taken every possible step to safeguard Mauritius from the introduction of this disease by sea or air, while a vigorous eradication campaign is being pursued by the Department of Agriculture in Madagascar in the infected regions of Tamatave, Brickaville and Fénérive. Meanwhile, arrangements are being made with the French authorities for testing resistance and susceptibility to Fiji disease of cane varieties of importance to Mauritius.

Several other diseases require special attention.

A disease closely resembling Red Stripe (*Xanthomonas rubrilineans* (Lee *et al*) Starr and Burkh.), was recorded for the first time in Mauritius by the Plant Pathologist of the Department of Agriculture in December. The varieties B. 3337 and B. 37161 appear to be susceptible but the damage caused is not alarming so far. An interesting feature of this disease is that it occurs on several wild grasses, particularly those belonging to the genus *Paspalum*.

Sclerospora disease reported for the first time in Mauritius on M. 134/32 in 1953 was found on Ebène 1/37. Although diseased stools suffer considerable stunting (fig. 5) the natural spread of the pathogen appears restricted.

No cases of leaf scald were noted on the variety B. 34104 which is very susceptible to this disease in British Guiana It is possible that either, different strains of the organism exist in the two countries, or that the variety reacts differently to the pathogen under different environmental conditions. It is noteworthy that another variety shows a similar reaction : thus no cases of leaf scald were recorded on M. 112/34 which has been grown commercially in Mauritius since 1941 while the same variety is extremely susceptible to the disease in British Guiana. *

Fig. 5. Stool of M. 134/32 infected with *Sclerospora sp.*

(Phot. G. ORIAN)

HOT WATER TREATMENT

The large scale hot water treatment of cane setts to control chlorotic streak (52° C for 20 minutes) was first started on a commercial scale in Mauritius by private initiative in January 1953. The beneficial effects of this treatment both as regards control of the virus and enhanced growth were so spectacular that fourteen estates were using hot water plants in 1954. The treatment is generally applied in the humid and super-humid zones and has proved to be a sound investment for the following reasons : negligible recruiting, reduced number of cuttings per acre, better growth, and extension of the planting period. Several investigations were undertaken during the year to study the deterioration of mercurial fungicides in the hot water tanks. It was found that deterioration was accelerated by heat and that eight days after the initial treatment, the solution had lost its fungicidal properties. Data in fig. 6 demonstrate the incidence of pineapple disease in relation to the mercury content of the solution in the hot water tank. Further experiments are in progress in order that recommendations may be made to planters as to the best sequence of operations concerning hot water and fungicidal treatments.

The practical aspects of the long hot

* Private communication from Dr. H. Evans.

water treatment of cuttings (50° C for two hours) and the establishment of disease free nurseries, as recommended by the Queensland Bureau of Sugar Experiment Stations, to control ratoon stunting disease, are being actively studied at the time of writing.

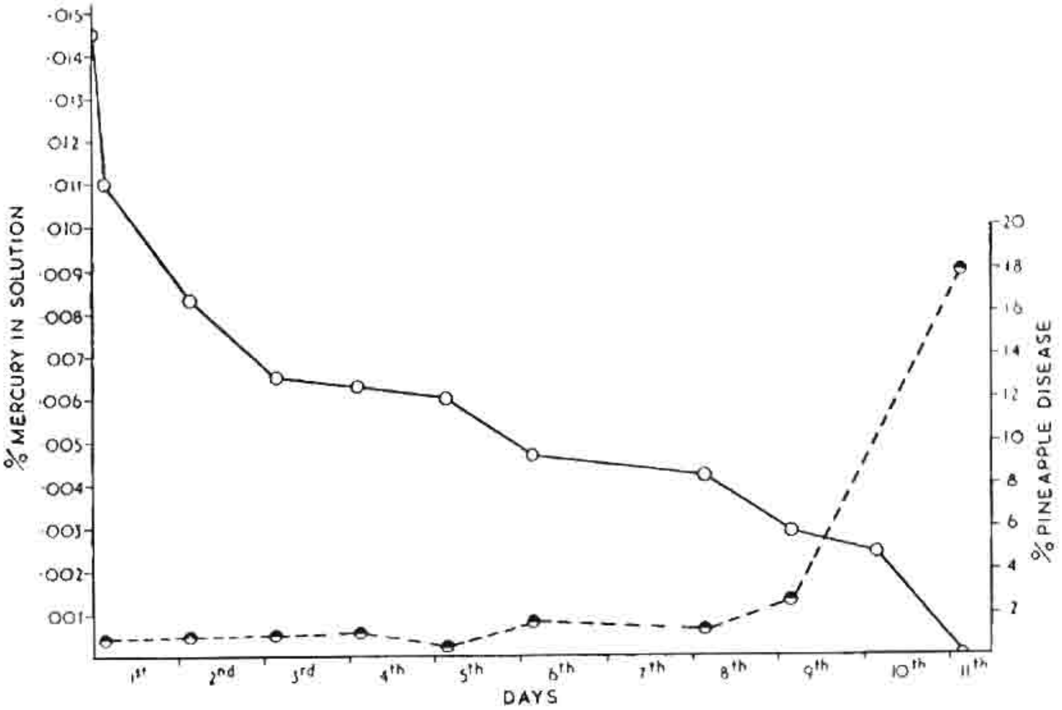

Fig. 6 Incidence of pineapple disease (broken line) in relation to deterioration of organic-mercurial fungicide in hot water tanks (plain line).

WEED CONTROL

The control of weeds by chemicals is now integrated in the normal sequence of cultivation operations in Mauritius. It is interesting to note that the value of herbicides imported in 1954 amounted approximately to Rs. 2,000,000.

The Botanical division devoted particular attention to the control of weeds in ratoon canes by means of a formulation which could act in pre and post-emergence and at the same time be lethal to perennial grasses. The required proportion of 2, 4-D or M C P A, Pentachlorophenol and T C A has been experimentally determined. The application of this formulation has proved to be of great assistance during the crop by releasing more workers for cane cutting. The practical aspects of chemical weed control were discussed at three regional meetings held in June, at which there was a large attendance of planters.

A weed flora of cane fields is in preparation and will be issued at intervals in the form of leaflets with an appropriate binder.

RAINFALL AND SUGAR PRODUCTION

The contrast between wet and dry seasons together with the absence of cyclones during the years 1947 to 1954, (tables VIII & IX of Appendix) have enabled Halais to evolve an equation relating rainfall to sugar production. Details of this investigation are described elsewhere in this report. It will suffice to say that the high correlation obtained between actual and calculated production is remarkable and may have considerable bearing in forecasting the current sugar crop. It should be noted also that by means of this equation, fluctuations due to climatic factors may be eliminated when assessing relative productions at different periods.

FIELD EXPERIMENTATION AND EXTENSION

In addition to investigations carried out in the laboratory and to the normal routine work connected with the breeding and selection of new cane varieties, 71 field trials were planted during the year bringing the total number of field experiments to 176. Of these, 33 are on experimental stations of the Institute and the remainder on estates. It may be of interest to refer to a special feature of the new research organisation which is the inclusion of a separate section of field experimentation within its cadre. This branch is responsible for the execution of trials under the guidance and with the collaboration of specialist officers, who can thus devote more time to their own special investigations.

It should be pointed out that the branch of field experimentation is also directly concerned with extension work on estates and large planters' lands. The island has been divided into three zones, each of which is served by a field officer whose duties include *inter alia* the establishment of a proper liaison between the producers and the Institute.

MEETINGS AND PUBLICATIONS

In order to make more readily available the information acquired by workers of the Institute, several meetings were held with planters and producers, the subjects discussed being: the influence of rainfall on sugar production; practical aspects of chemical weed control; ratoon stunting disease. Some of the activities of the Institute were displayed at the annual "Exposition des Maisons Claires" held at Curepipe in October. Technical circulars and papers prepared for publication included the following:

P. Halais. Nouvelles techniques de Diagnostic Foliaire. 8th Int. Bot. Congr., Paris, 1954.

A. de Sornay. Les variétés de cannes B. 3337, B. 34104, B. 37161 et B. 37172. Rev. Agr. Maur. 33, 111 — 114, 1954.

E. Rochecouste. Le désherbage chimique des plantations de canne à sucre. *ibid*, 160 — 174, 1954.

P. O. Wiehe. La maladie du rabougrissement de la canne à sucre. M.S.I.R.I., Circ. Techn. No. 1, mimeogr. pp. 15, Dec. 1954.

VISITORS

The laboratories and experimental stations were visited by a large number of planters and other personalities connected with the sugar industry. Amongst scientists from abroad, the Institute welcomed Sir Geoffrey Clay K. C. M. G., O. B. E., M. C. Adviser to the Secretary of State for the Colonies; Professor Millot of the Museum d'Histoire Naturelle, Paris and Director of the Institut de la Recherche Scientifique de Madagascar; Monsieur H. Barat, Director of the Plant Pathology Laboratory of Tananarive; Dr. G. C. Stephens, principal Soil Surveyor and Pedologist of the Commonwealth Scientific and Industrial Research Organisation of Australia; Mr. L. R. Brain of the Queensland Bureau of Sugar Experiment Stations and Mr. M. Samimy, Inspector General of Agriculture in Iran.

Although the movements of staff members have already been referred to in the Chairman's report, I should like to take this opportunity to reiterate my thanks to the French authorities in Madagascar for a most interesting visit in the course of which the sugar cane zones of the east and west coasts were visited, and first-hand information obtained on the Fiji disease situation. Valuable experience was also gained at the various agricultural experimental stations and at the *Institut de la Recherche*

Scientifique in Tananarive. I should also like to express my gratitude to Monsieur le Directeur des Services Agricoles of Réunion, his colleagues and the many personalities who contributed to make our visit to Réunion, in connection with the 4th meeting of the Comité de Collaboration Agricole Maurice-Réunion, both pleasant and instructive.

In concluding this Introduction I wish to place on record the unfailing assistance I have received from all members of the staff. The excellent team spirit which they have shown at all times is a great source of encouragement.

DIRECTOR.

15th February 1955.

Fig 7. Selected seedlings before planting out in second trials at Réduit Experiment Station.

CANE BREEDING IN 1953 AND 1954

A. de SORNAY

BREEDING POLICY

IN conformity with the research policy of the Institute, the breeding programme is directed towards the production of a range of varieties possessing desirable agronomic features combined with high sucrose content and high juice purity. Some of these varieties should mature early in the season, others should be adapted to sub-normal environments.

Fig. 8. Three months old seedlings from [illegible] crosses at Pamplemousses Experiment Station.

CROSSING

Many interesting crosses were made including different combinations with valuable parents and a number of syntheses involving *S. robustum* blood. Greater bias was given to crosses between complex hybrids of di- and tri- specific origin, in an attempt to condense several desirable features in one or two clones.

It would appear that, in the light of results obtained at cane breeding stations the world over, the blending of vigour and sweetness should be achieved by a process of back crossing whereby genetic characters such as high sucrose are transferred from one clone to another. It need not be emphasized that a programme of repeated back crossing is beset with difficulties. There is, in the first place, the time-consuming factor of preserving one particular character in successive generations by selection. Coupled with this is the possibility that undesirable genes, closely linked with the gene to be transferred, cannot be eliminated. There are, in addition, the difficulties that interesting individuals of the progeny from one cross may not flower, or if they do flower, they may not be of the proper sex. Some of these difficulties have already been encountered in 1954: B. H. 10/12, a rich parent variety, did not arrow, and derivatives of the cross B. H. 10/12 x M. 63/39 could not be mated to it; R 34104, a direct descendant of B. H. 10/12, had to be used instead as pistillate parent.

With a view to obtain some information on the prototypes from which wild canes have been derived, a long term investigation was started whereby three *Saccharum spontaneum* clones from Java were selfed and about 100 seedlings from each clone planted out in the fields. The seedling population will be studied and individuals departing most from the parent clone will be selfed if they arrow. The selfing process will be repeated until the progeny will have attained homogeneity.

The seed-bearing fuzz was, on the whole, highly prolific in 1953, but considerably lacked fertility in 1954. This is reflected in the seedlings raised in 1953 which numbered nearly 70,000 from 232 crosses as against 44,812 obtained in 1954 when 269 crosses were made. Both years were wet with rainfall above normal during the crossing season.

Table 1. Summary of breeding work in 1953 and 1954.

Experimental Stations	Number of crosses made	Number of seedlings obtained	Number of seedlings transplanted
1953			
Réduit	150	44,369	10,505
Pamplemousses	82	25,510	10,017
Hermitage	—	—	10,231
Total	232	69,879	30,753
1954			
Réduit	164	8,645	12,360
Pamplemousses	105	36,167	13,004
Belle Rive	—	—	5,031
Union Park	—	—	4,576
Total	269	44,812	34,971

A curious phenomenon was observed, probably for the first time in Mauritius, in a certain number of seed boxes at Réduit and Pamplemousses. Fuzz from several crosses germinated at two periods: three to four days and three to four weeks after sowing. This resulted in the production of two well defined strata of seedlings. The time lag may be indicative of a certain state of dormancy.

Damping-off was not prevalent for two successive years. The disease is readily controlled by applications of "solusanigran" (methoxy ethyl mercuric chloride) before sowing and after the seedlings have emerged. The product did not impair seed germination, but flats containing unsterilized soil-manure mixture treated with solusanigran were weedy and contained a reduced number of seedlings growing less vigorously than those in the control flats. Disinfectants cannot, therefore, be a substitute for steam sterilization of the soil.

A summary of the breeding work during 1953 and 1954 is shown in table 1, while the list of crosses made is given in table XIV of the Appendix.

SELECTION

In 1953, selection from the hybrid seedling population was, as usual, made in plant cane at Hermitage and in ratoon at Réduit and Pamplemousses. In 1954, selection was also made from the plant cane populations at Réduit and Pamplemousses. The seedlings in these populations were short on the whole, and some of the crosses were very backward. It would appear that, in general, seedlings planted in December cannot be selected in November the following year, the shortness of the growing season preventing proper genotypic expression. Selection should therefore be made from ratoons and in August, so that early maturers may be sorted out. 734 seedlings were selected in 1953 and 211 in 1954 for planting in second trials.

Selections from second trials have, for the first time, been analysed for sucrose in the laboratory; only refractometer tests had been made up to 1952. The complete analysis of samples of selected varieties is no doubt and important step forward. The correlation coefficient found between the refractometric Brix in second ratoon and the C. C. S. % cane of samples is only of the order of + 0.624, although significant at the 5% level. Even if a higher correlation had been obtained, the possibility of coming across one or two varieties with a high Brix and relatively low C. C. S. would not have been ruled out because of high fibre content.

PLANTING MEDIA FOR FUZZ AND SEEDLINGS

Basalt. Basalt dust added to the ordinary soil-farmyard manure mixture at the rate of 1 part by volume of basalt to 2 parts of mixture had no harmful effect on fuzz germination. A depressing effect on seedlings growth, however, was noticed in 50% of the seedling flats; in no case was there a positive response to the addition of basalt. Crushed basalt cannot, therefore, be recommended as a soil conditioner for sugarcane seedlings.

Seed and potting composts * Seed and potting composts were prepared according to modified John Innes formulae, some of the original ingredients being replaced by others available locally. For example top soil and decaying wood were substituted for turfy loam and peat, while coral sand was used instead of chalk; no hoof and horn was added to the compost.

Weighed fuzz samples were planted in :

1. Common seedling flats containing soil-manure mixture;

2. Common seedling flats containing modified J. I. seed compost;

* Experiments carried out by Mr. H. Julien of the Department of Agriculture in cooperation with the Plant Breeder.

3. Common seedling flats containing modified J. I. P_2 compost.

4. Standard British seed boxes containing modified J. I. seed compost;

5. Standard British seed boxes containing modified J. I. P_2 compost.

There were apparently no difference in the times taken for fuzz germination, in the number of seedlings obtained and in the rate of growth of seedlings between the experimental and control flats. A few cases of damping-off were noticed in the boxes containing soil-manure mixture and none in those with the modified John Innes composts.

Experiments made to test the best stage for pricking seedlings showed that this operation should be performed as soon as the seedlings can be handled, that is, about five days after germination. There is then apparently no set back.

The seedlings from experiments 2 and 4 were pricked in standard British cases containing modified J. I. P_2 compost at the rate of 60 seedlings per case.

One hundred seedlings from pricking boxes were transplanted to ordinary straw pots containing modified J. I. P_2 compost, and 100 seedlings from the same boxes were transplanted to control straw pots containing soil-manure mixture. The seedlings transplanted in the compost had a better appearance than those in the control pots up to about two weeks after transplanting but there were, thereafter, distinct nitrogen deficiency symptoms, due to hoof and horn being absent from the compost. A little sulphate of ammonia added to the seedlings corrected the deficiency, the seedlings resuming normal growth after five to six days.

The use of modified John Innes seed and potting composts, and the pricking of seedlings will involve considerable changes in seedling technique, which are justified, however, by the good results obtained.

PRE-RELEASE VARIETY TRIALS

Twenty-two new trials were planted on the standard lay out of randomized blocks with four replications. There are at present 37 pre-release trials under study which are distributed in a comprehensive regional network (Table 2) and include 82 varieties.

Table 2. Distribution of pre-release variety trials.

Laid down in	Climatic zones				Total
	Subhumid	Humid	Superhumid	Irrigated	
1949	—	—	—	1	1
1950	—	—	2	—	2
1951	2	—	—	—	2
1952	1	7	3	1	12
1953	—	3	4	2	9
1954	—	8	2	1	11
Totals	3	18	11	5	37

Twenty-six trials were harvested in 1954. The rapid method of recording plot yields with a calculator was further simplified. Each of the workers who are transporting cane bundles wears a conspicuous label registering his weight. The officer may thus rapidly deduct this tare from the total weight.

The method of sampling canes for sucrose analysis was slightly modified: instead of taking composite samples of 12 canes, ten stalk samples are collected from each plot of a variety trial for analysis; in this way, the sugar yield from each plot can be calculated.

Trials including the varieties M. 311/41, M. 129/43, M. 147/44 and M. 31/45, which appear to have commercial prospects, were harvested in July, September and November, in order to obtain an indication of their maturity behaviour. Due to paucity of data, it is well-nigh impossible to determine in one year whether any variety is early, medium or late maturing, maturity gradients, if any, tending to be masked by sampling errors, which are frequently high. There is also the effect of climate on maturation which has to be studied over the years.

The average results obtained with the varieties M. 311/41, M. 129/43, M. 147/144 and M. 31/45 in plant cane and ratoons, in comparison with M. 134/32 and Ebène 1/37, are appended in Table 3. The variety M. 311/41 appears to yield particularly well under irrigated conditions at Black River, and should be specially recommended for commercial growing under such conditions if released. In the other districts, its performance approaches that of M. 134/32 on the whole.

The data for M. 129/43 and M. 147/44 are too fragmentary to allow of definite conclusions being drawn regarding their value for large scale cultivation. M. 129/43 seems to yield better in ratoon than in plant cane. It is fast growing and is liable to lodge. M. 147/44 has beaten M. 134/32 by a considerable margin in all tests in plant cane and ratoons, and the odds are, therefore, that it is a potentially high yielder with good sugar content. There are, as far as can be seen, indications that it matures early in the crop season.

M. 31/45 has surpassed M. 134/32 in yield of sugar in all, out of 12 trials in ratoons and is, in all probability, superior to the latter. It appears to be able to yield well in the three climatic zones of the island. It yields more cane under super-humid conditions, but appears to have inferior juice quality than the standard variety Ebène 1/37. The complete absence of arrows in M. 31/45 is a valuable asset.

The varieties imported in 1950, namely M. 336, P. R. 905, M. L. 3—18, Co. 419 and Co. 421, are still undergoing trial at the Experimental Stations but none appear promising. Co. 419 cropped well in plant cane, but gave disappointingly low yields in first ratoon. Co. 421 arrows profusely and is not likely to show promise for commercial cultivation. Both varieties are susceptible to ratoon stunting disease. The other varieties do not call for special comments.

RELEASE OF BARBADOS VARIETIES

The varieties B. 3337, B. 37161 and B. 37172 were added to the list of approved varieties in 1953. They are high grade varieties likely to challenge successfully the supremacy of M. 134/32. Limited quantities of seed material were distributed to planters in 1953 and 1954. The multiplication of all three canes is being steadily pursued, so that they should contribute to an appreciable percentage of the cane area in the near future.

The variety B. 34104 will not be released until more information is obtained on its resistance to leaf scald under local conditions. Experiments are being conducted to assess its performance with respect to this disease.

Table 3. Summary of Results of Promising Varieties in Pre-Release Variety Trials Reaped in 1953/54.

Category	No. of harvest	Tons cane per arpent		Sig. diff.	Juice Purity		C. C. S. % Cane		C. C. S. p. a.		Sig. diff.	Remarks
		311/41	134/32		311/41	134/32	311/41	134/32	311/41	134/32		
Plant cane	8	37.91	32.78	4.73	84.5	85.0	11.9	12.0	4.34	3.97	0.54	Whole Island
Ratoons	17	32.86	30.37	4.76	84.0	84.4	11.7	12.2	3.83	3.70	0.56	
Average	25	34.48	31.14	2.24	84.2	84.6	11.6	12.1	3.99	3.78	0.26	
Plant cane & Ratoons	5	39·77	30.39	2.86	85.4	85.5	12.5	12.4	4.96	3.77	0.32	Irrigated
		129/43	134/32		129/43	134/32	129/43	134/32	129/43	134/32		
Plant cane	4	42.37	42.79	5.62	82.0	78.2	11.7	10.3	4.81	4.15	0.58	Humid and irrigated conditions
Ratoons	5	33.73	33.13	2.72	88.0	88.2	12.9	13.4	4.36	4.44	0.36	
Average	9	39.57	39.42	2.64	85.3	83.9	12.3	12.0	4.55	4.32	0.30	
		147/44	134/32		147/44	134/32	147/44	134/32	147/44	134/32		
Plant cane	4	52.48	43.48	5.40	88.0	83.9	13.8	12.1	6.99	5.01	0.67	Irrigated and super-humid cond.
Ratoons	3	41.30	35.70	5.23	85.6	85.1	12.2	11.9	5.04	4.25	0.63	
Average	7	48.55	40.14	7.60	86.8	84.4	12.7	11.9	6.16	4.68	0.93	
		31/45	134/32		31/45	134/32	31/45	134/32	31/45	134/32		
Plant cane	11	45·43	35.37	6.50	83.8	83.3	12.2	11.6	5.35	3.97	0.73	Whole Island
Ratoons	12	34.34	28.72	2.55	85.9	85.4	11.9	11.9	4.08	3.42	0.31	
Average	23	39.64	31.89	2.94	84.9	84.4	11.9	11.6	4.68	3.71	0.34	
		31/45	E. 1/37		31/45	E. 1/37	31/45	E. 1/37	31/45	E. 1/37		
Plant cane	5	35.58	29.24	7.02	84.5	85.7	11.6	12.3	4.11	3.57	0.82	Superhumid conditions
Ratoons	8	37.30	33.73	1.37	86.6	87.7	11.8	12.7	4.39	4.25	0.16	
Average	13	36.71	32.00	2.13	85.7	86.9	11.7	12.5	4.27	4.00	0.26	

IMPORT AND EXPORT OF CANE VARIETIES

The following varieties were imported during the period under review and planted in the quarantine glasshouse:

FROM	DATE	VARIETIES
Brazil	November 1953	C.B. 38—22
Australia	August 1954	Q.44, Q.57, 27 M.Q.1124, 28 M.Q.1370, U.S.48—34 and E.P.C.39—393.
India	September 1954	Co.779 and Co.991
U. S. A.	October 1954	Pepe Cuca, P.R.1000, B.4362, H.37-1933, N:Co.310.
Australia	October 1954	Q.47

These introductions are designed primarily to provide a broader basis of germ-plasm for hybridization.

The varieties imported from U.S.A. in October 1952: Eros, H. 32—8560, and H. 37—1933, had to be destroyed, as the third variety was probably affected with ratoon stunting disease and had been grown in the same chamber in the glasshouse. Those introduced from Réunion Island in October 1952, viz., R. 366, R. 397, B. 41227, P. O. J. 3016, Pindar and Trojan have been released from quarantine and planted at Réduit Experimental Station. Cuttings from stools derived from cuttings not previously treated against ratoon stunting disease were hot air treated in a laboratory oven at 54° C for 8 hours with very good results.

Cuttings of several varieties have been exported by air-freight to the following countries: Trinidad, Réunion, French Equatorial Africa, British Honduras, Peru, Belgian Congo, Australia, Pakistan, South Africa, Madagascar and U. S. A. Cuttings of the varieties from which M. 134/32 was bred have, in addition, been sent to London in connection with the British Industries Fair.

EXPORT OF FUZZ

Fuzz from several crosses was despatched by air to Réunion, British Guiana and South Africa. A small quantity of a mixture of fuzz from several crosses was sent to Tate and Lyle, England, for experimental purposes.

INDUCTION OF ARROWING

Several experiments, involving new techniques, were made in an attempt to induce arrowing in the varieties R.P. 8 and B. H. 10/12. These experiments are briefly described below, experiments 1 and 2 being carried out jointly with the Botanist.

1. Tops of R. P. 8 and B. H. 10/12 were cut with 12 to 18 inches of stalk, planted vertically at fortnightly intervals from the 15th of February to the end of March 1953 at Réduit and Pamplemousses. " Seradix ", a root-forming hormone was applied to the cut ends or to the ends and downmost root zones. One third of the tops was left untreated as control. The leaves were trimmed and the tops shaded for a week. Root formation was more rapid in the seradix-treated tops, but in the end, all the canes became firmly established. At Réduit, 30% of the B. H. 10/12 canes died or lost their growing point. Mortality in R. P. 8 was higher and amounted to 58%. The canes that survived were grown until August 1954, but none flowered.

2. The leaves of actively growing B. H. 10/12 canes were sprayed with "Planofix", a flower-promoting product of May and Baker Ltd., and tri-iodo benzoic acid solutions containing one part per 100,000 of water, at fortnightly intervals from the 15th of February to the 15th of March 1954. The tri-iodo benzoic acid solution was also injected into canes during the same period. The canes were kept until the end of the arrowing season. There was no response to the treatments.

3. B. H. 10/12 stalks were injected with juice extracted from smut-affected B. H. 10/12 canes. The extract was prepared by crushing diseased canes from which all parts harbouring smut spores had been removed by cutting right down into healthy tissue. The treated canes did not show any signs of arrowing up to the end of the 1954 season and were destroyed.

The principle involved in the above experiment is based on the fact that the presence of the smut fungus in a cane plant induces the development of the growing point of infected shoots into a structure which is probably homologous to an inflorescence.

4. Small-scale plantings of two desirable parent varieties, R. P. 8 and B. H. 10/12, were established in two localities where B. H. 10/12 produced arrows fairly regularly.

In order to study the time of floral primordia formation in cane varieties, which has a bearing on arrow induction in non-arrowers, growing points of M. 134/32 have been collected at weekly intervals from the end of February 1954 onwards and fixed for further study.

RAPID ASSESSMENT OF RATOONING CAPACITY OF NEW VARIETIES.

Preliminary experiments carried out for rapidly gauging the ratooning capacity of cane varieties have been completed. The complete rotation, covering two years, consisted of plant cane and five ratoons grown under humid, super-humid and irrigated conditions. The average age of each crop was four months. Visual observation were made throughout the duration of the experiment. Growth appeared normal, except that tillering seemed higher in M. 63/39. The ratooning capacity of the varieties could be classified as strong and medium to weak ratooners, in good agreement with expectations.

In view of the importance of ratoons in cane cultivation in Mauritius, ratooning capacity trials will henceforth be established with promising new varieties. Four such trials were laid down during the year including the varieties M. 129/43, 147/44 and 31/45, with a stronger ratooner (M. 134/32) and a medium ratooner (M. 171/30) as controls. The varieties have been planted in latin squares, each plot of which consists of 4 rows of 10 feet. Cuttings were hot-air treated at 54° C for 8 hours in a laboratory oven, in order that the possible presence of the ratoon stunting virus may not invalidate results. Similarly sterilized knives will be used at harvest.

EFFECT OF ENVIRONMENT ON ANTHER FERTILITY IN M. 63/39.

It had been noticed for some time that the percentage of open anthers and amount of pollen produced in the variety M. 63/39 decreased from Pamplemousses (200 ft.) to Réduit (1,040 ft.), and Hermitage (1,300 ft.). To ascertain whether there is any relationship between percentage of open anthers and climatic factors, arrows were collected, after pollen shedding, from 36 different localities over the whole island from sea level to 1,500 ft. altitude. Collections were made along transects radiating from the central plateau to various points near the coast. The percentage of open anthers was estimated in the laboratory from a random sample of 500 to 600 anthers.

As usual, it was found that the plump purple anthers dehisced, while the smaller shrivelled yellow or pink yellow anthers remained closed.

The preliminary data obtained, appear to provide such a clear-cut issue as to warrant a brief discussion. It seems at present impossible to disentangle the effects of altitude, rainfall, humidity and temperature, the last three factors being functions of the first. Disregarding details and taking a wider view of the problem, it may be tentatively concluded that :

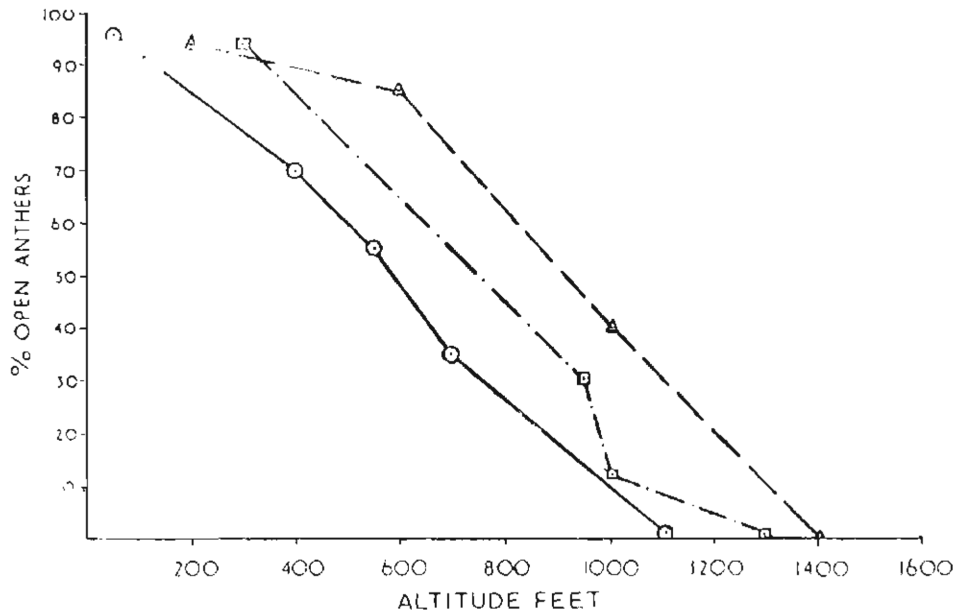

Fig. 9. Relationship between percentage of open anthers in M. 63/39 and altitude along three transects from the coast to the central plateau.

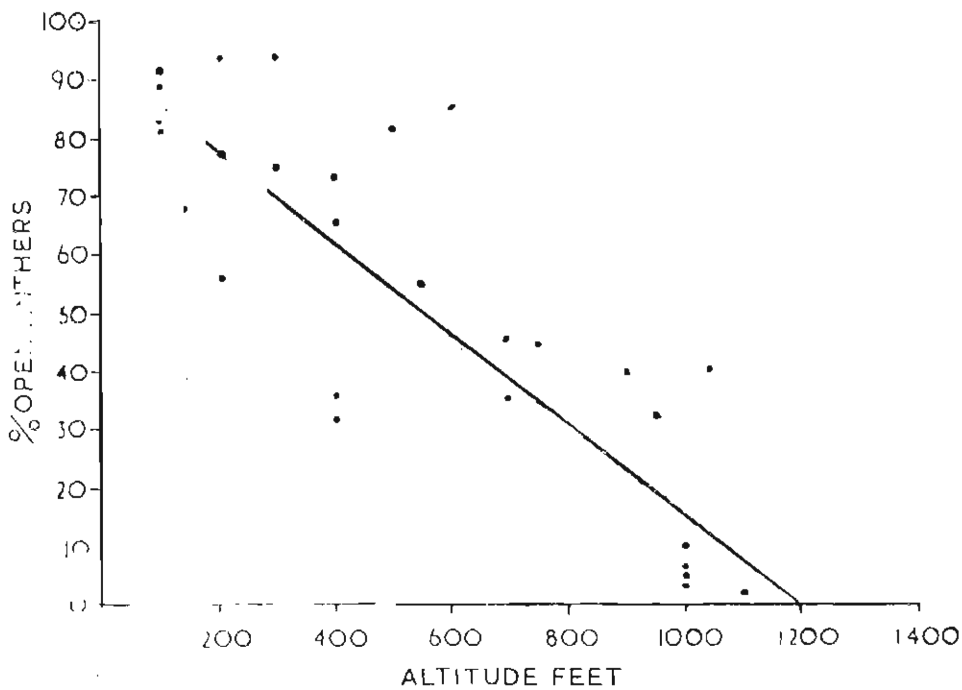

Fig. 10. Relationship between percentage of open anthers in M. 63/39 and altitude for the whole island.

(a) there appears to exist a close relationship between percentage of open anthers and altitude: the correlation cœfficient found between these two variables is — 0. 875 and highly significant; the cœfficient between open anthers and rainfall, as estimated from a dot diagram, does not appear as high;

(b) the regression cœfficient shows that the percentage of open anthers decreases at the rate of nearly 8% per 100 ft., attaining zero value at about 1,100 ft.;

(c) irrigation has no effect on anther fertility.

Regression lines in Fig. 8, indicate the linearity of the relationship between the variables for certain particular directions in space, while that in Fig. 9 covers the whole island.

Fig. 11. Weighing canes in experimental plots at Réduit.

NUTRITION AND SOILS

1. NITROGEN

S. M. FEILLAFÉ

THE Research Institute proposes to review in a separate publication our present knowledge of the effect of Nitrogen on sugarcane. Meanwhile it is useful to summarise the conclusions revealed by a critical study of available data.

Fertilizer experiments carried out by the Department of Agriculture prior to 1930 and by the former Sugarcane Research Station up to 1952 have shown that the main effect of Nitrogen fertilization is a large increase in yield.

From a more detailed study of experimental results, other important facts can be enunciated concerning the effect of Nitrogen on sugarcane in Mauritius.

a. There is a greater response to Nitrogen in sub-humid zones of the island as indicated by the following data (Table 4) derived from 90 trials :

Table 4 - Response to Nitrogen in different climatic zones.

Climatic zones	0 N	1 N	2 N
Sub humid	100	129	135
Humid and super-humid	100	123	130

b. When normal Nitrogen fertilization with artificials is carried out, no benefit is derived from application of pen manure, as may be seen from figures published in Table 5, which represent an average of 90 field experiments carried out during seven years. The use of pen manure is further discussed in a separate chapter of this report.

Table 5. Effect of Nitrogenous fertilizers in the presence and absence of pen manure.

Nitrogenous fertilizer	Pen manure 10 tons/arpent		No pen manure	
	Tons Cane per Arpent	Comparative yield	Tons Cane per Arpent	Comparative yield
No Nitrogen	23.8	100	23.3	100
30 kg. N/arpent	29.6	124	30.6	131
60 kg. N/arpent	30.9	130	32.7	140

c. Nitrogen lowers slightly sugar content of the cane plant but this effect is more apparent in plant canes than in ratoons and becomes almost negligible in old ratoons. Available data based on the results of 90 experiments are shown graphically in fig. 12. It should be noted that the adverse effects of depression in sugar content is more than offset by the increased cane yield.

d. The yield of sugar in ratoon canes may be maintained at a higher level by increasing progressively the amount of Nitrogenous fertilizer used.

Data shown in fig. 13 show response in terms of sugar produced for two levels of Nitrogen : namely 30 kgs and 60 kgs Nitrogen per

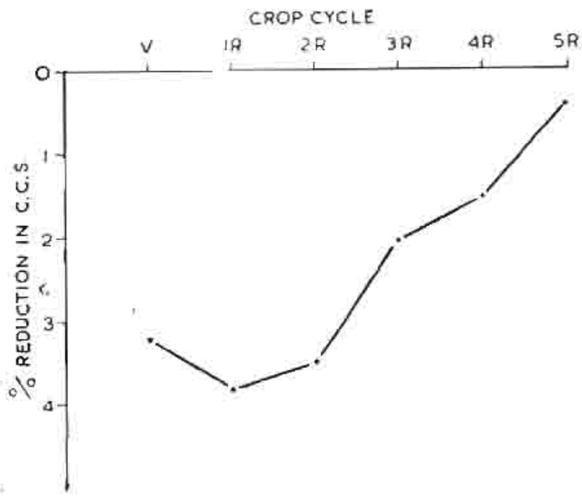

Fig. 12. Depression in sugar content, caused by the application of 30 kgs. Nitrogen per arpent per annum throughout the crop cycle. The reduction in C.C.S. is expressed as a percentage of the control.

arpent. It may be seen that until the second ratoon crop, no benefit is derived from applications exceeding 30 kgs Nitrogen per arpent, but in older ratoons additional amounts of Nitrogen produce significant increases in yield.

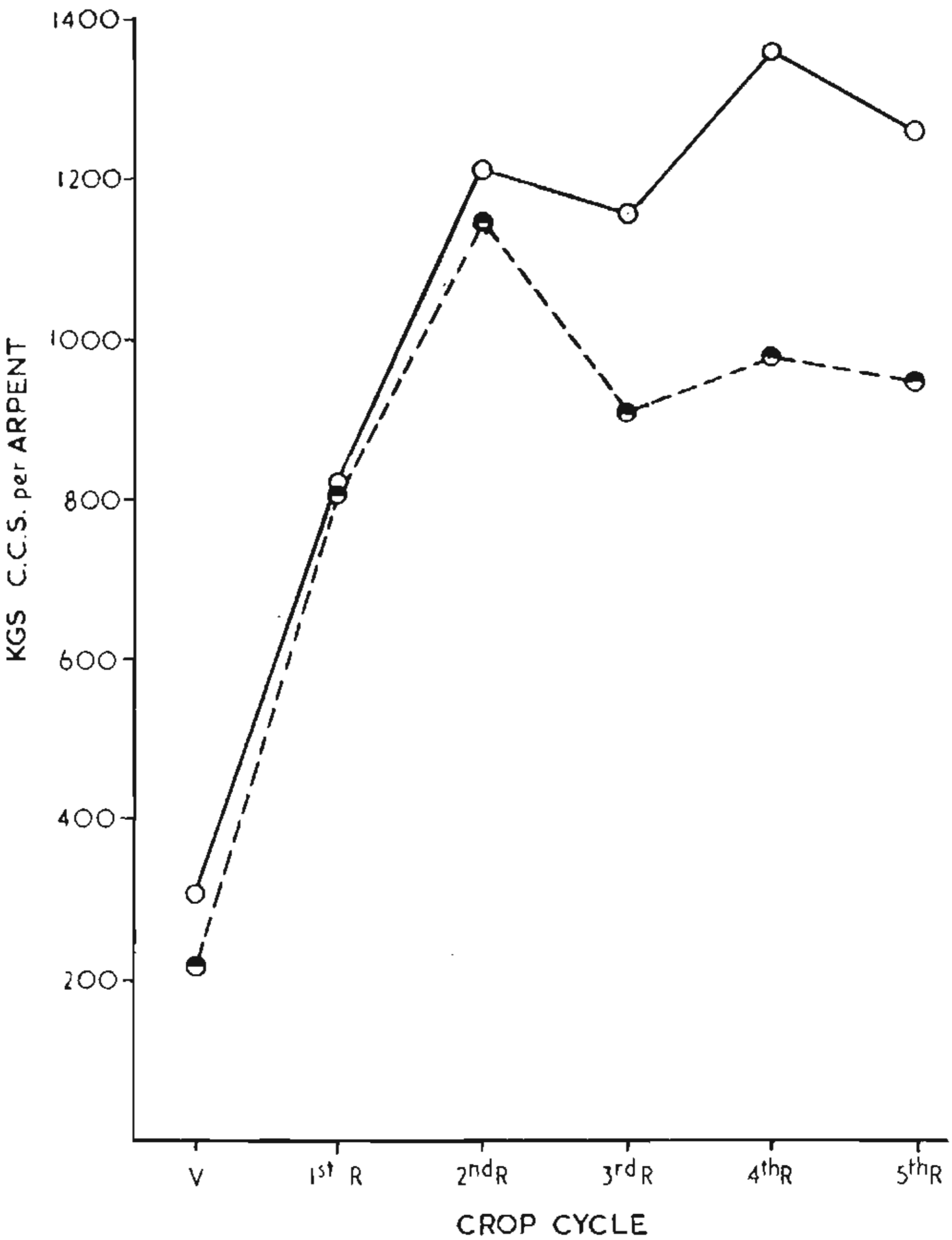

Fig. 13. Increase in C. C. S. per arpent due to two levels of Nitrogen. Plain line : 60 kgs. N per arpent per annum ; broken line : 30 kgs. N.

2. PHOSPHATE AND POTASH DEFICIENCIES

S. M. FEILLAFÉ

As a result of the numerous soil and foliar diagnosis studies carried out in the past a clear picture of the phosphate and potash status of the soils of the island has been obtained.

On large estates, especially those with factories, the mass application of factory residues, such as phosphate rich scums and potash rich molasses, together with regular liberal applications of mineral phosphatic and potassic fertilizers has built up a reserve of these two nutrients even in soils which were at one time markedly deficient.

On the other hand, phosphate and potash deficiencies are frequent on planters' lands which have not benefitted to the same extent from the large scale return of factory residues. Such conditions prevail more particularly on small planters' fields where natural soil deficiencies are often aggravated by unbalanced fertilization.

Apart from the different levels of fertility brought about by management, there exists for the highly mobile potassium, a gradient depending on rainfall, with lower levels in the super-humid zones.

Striking demonstrations of phosphate and potash deficiencies may be seen at Réduit Experimental Station in a trial which was first planted in 1936. Eighteen crops have already been harvested from

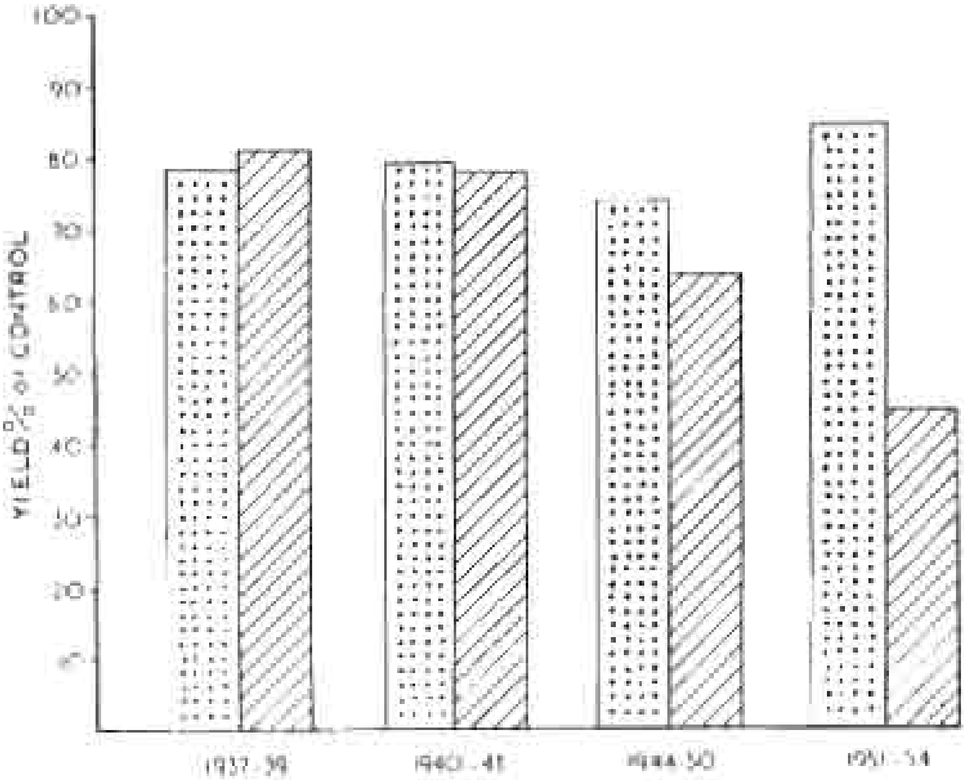

Fig 11 Yield of cane in the absence of Phosphorus (dotted) and Potassium (shaded) expressed as percentage of yields obtained with complete fertilizer, (for further explanation see text).

these plots: three with BH. 10/12, four with M. 134/32, seven with M. 112/34 and four with M. 423/11.

A summary of the data obtained is expressed graphically in fig. 14 which shows the average results of the — P and — K plots of the four rotations expressed as percentages of the results obtained with complete fertilization. Withholding phosphate or potash from the fertilizer mixture has caused large reductions in yield, particularly in the case of the — K plots in which a progressive decrease in yield may also be noted. The increase in yield occurring in the — P plots during the last rotation is due to eroded soil from an adjacent field being deposited on the experimental plots during heavy rains in 1952.

The general appearance of one of the — K plots compared to the control is shown in fig. 15. Canes in the — K plots show the following Potassium deficiency symptoms: slender stalks with

Fig. 15. Permanent fertilizer trial at Réduit Experimental Station; —K plot in the centre.

typical fan-like appearance of the tops, marginal scorch and spotting of the leaf blades, superficial reddish discoloration on the upper surfaces of midribs of older leaves and "firing" of the tips.

In view of the fact that uniform dressings of Nitrogen were applied over the whole experimental area, the marked decline in yield illustrates clearly the danger of unbalanced fertilizer treatment on soils deficient in phosphate and potash.

3. PRELIMINARY RESULTS
OF
LIMING SOILS OF THE SUPER-HUMID ZONE

S. M. FEILLAFÉ

On the highly leached soils of the super-humid zone of Mauritius, continuous cropping has greatly accelerated the loss of bases from the soil, conditions which have been further aggravated by the use of soil acidifying fertilizers. Thus a degree of acidity may develop in the soil at which optimum growth of the plant is prevented. Correction of the harmful effects of acidity requires the use of a large amount of basic calcium compounds such as coral sand or hydrated lime. This raises the pH and the level of available calcium and lowers the levels of aluminium and manganese which are usually in excess in acid soils. The adverse effect of shortage of available calcium on plant growth may also be mitigated by small applications of calcium ions which have no effect on soil acidity.

Formerly, the tendency in Mauritius was to apply to the soil that quantity of lime which was theoretically required to bring the soil to neutrality, an amount which frequently exceeded 10 tons of lime per arpent. The beneficial effects of this practice were never clearly demonstrated and consequently heavy liming did not gain popularity.

Smaller applications of lime were found in many countries to be sufficient to maintain the productive capacity of the soil at a satisfactery level. Thus in Queensland, liming at a rate of up to two tons per acre is all that is recommended by the Bureau of Sugar Experiment Stations, for soils having a pH of less than 4.2

Closely associated chemically with Calcium is Magnesium. Whilst there is no local evidence of Magnesium deficiency in the cane crop, it is well known that heavy applications of potassic fertilizers cause, by antagonism, a depression in Magnesium content of the plant.

It was therefore considered of interest to examine the effects, on cane yield and chemical composition of the plant, of the applications of Calcium and Magnesium to soils of the super-humid zone of the island.

EXPERIMENTAL

A series of five experiments was laid down in 1948 in the super-humid zone on a 3 x 3 x 3 factorial design with every combination of Lime, Potassium and Magnesium at the following levels per arpent.

TREATMENTS	0	1	2
Lime (as slaked lime)	Nil	1.5 tons	3.0 tons
Magnesium (as Magnesium sulphate)	Nil	25 kgs	50 kgs
Potassium (as Muriate of Potash)	Nil	50 kgs	100 kgs

Two years later, a second series of eleven experiments was established in the same climatic zone. In this later series, the potassium treatment was omitted and the layout consisted of 4 x 4 latin square with lime and magnesium applied separately and in conbination.

In both series, Nitrogen, Phosphorus and Potassium (except for Potassium in the factorial experiments) were supplied at optimal levels.

Lime was applied by hand and spread evenly in the furrows and in the interlines at planting.

The amounts of slaked lime and magnesium sulphate applied in the latin squares correspond to the highest levels of Calcium and Magnesium applied in the factorial experiments.

RESULTS AND DISCUSSION

(a) Cane Yield. The factorial experiments were harvested in 5th ratoons in 1954. The results given in Table 6 show the response to the double dose of lime and magnesium.

Table 6. Response to Lime and Magnesium

Tons cane/arpent		Tons cane/arpent	
0 Ca	28.7	0 Mg	29.3
2 Ca	29.1	2 Mg	28.9
Response to Ca + 0.4		Response to Mg — 0.4	
Sig. Diff. (P = 0.05) ± 0.5			

Figures in Table 6 show that there is a small positive response to lime and a negative response of the same order to magnesium, but both responses failed to reach significance.

The latin square trials yielded, on the average, results of the same trend as those of the factorial series but in a few individual trials there were rather large responses to lime. A more detailed examination of the results revealed that the response to lime was only shown in trials located on the gravelly soils of the " Rose Belle " type, as indicated in Table 7.

Table 7. Yield of Cane in Tons per arpent on two soil types of the super-humid zone

Treatment / Soil Types	" Rose Belle " gravelly light clay	" Sans Souci " bouldery light clay
Control	21.6	24.9
Lime	24.2	24.9
Magnesium	22.9	24.4
Lime + Magnesium	25.0	24.7
Sig. Diff. P · 0.05	±1.5	±0.9
P = 0.01	±2.0	±1.2

Reference to the above figures show that there is a highly significant response to lime application on the "Rose Belle" soil type, but that there was no response on the "Sans Souci" type. Magnesium did not give any response on either type of soil.

The factorial experiments were all planted on "Sans Souci" soil type and the results are quite in accord with those of the latin squares located on the same soil type.

(b) Foliar Diagnosis. On both the gravelly and free soils, the application of lime and magnesium resulted in an increased concentration of CaO and MgO respectively, in the third leaf as sampled for foliar diagonsis. There was no marked effect on the level of other elements as may be seen from figures in Table 8.

Table 8 - Mineral contents % dry matter of third leaf punch.

	"Rose Belle" gravelly light clay				"Sans Souci" bouldery light clay			
	Control	Lime	Mg	Lime & Mg	Control	Lime	Mg	Lime & Mg
N	1.63	1.59	1.61	1.55	1.72	1.73	1.73	1.74
P_2O_5	0.48	0.50	0.48	0.47	0.47	0.47	0.49	0.48
K_2O	1.90	1.94	1.90	1.70	1.84	1.81	1.86	1.84
CaO	0.57	0.62	0.57	0.59	0.59	0.71	0.60	0.72
MgO	0.35	0.33	0.36	0.31	0.34	0.31	0.37	0.33

(c) Sugar Content. Each year, sugar analyses were made on composite samples of cane from the different treatments of each experiment.

On both soil types, the sugar content was affected to almost the same extent by lime application.

Data presented in Table 9 show the effect of lime and magnesium on sugar content of the cane from both series of experiments.

Table 9 - CCS % Cane in presence and absence of Lime and Magnesium.

No lime	12.51	No Magnesium	12.33
With lime	12.29	With Magnesium	12.41
Sig. Diff. ($P = 0.05$)	±0.28	Sig. Diff. ($P = 0.05$)	±0.22

It may be inferred from these figures that lime application has a slight detrimental effect on sugar content and that this effect approaches significance, while no effect was observed with magnesium.

It must be emphasized that the depression in sugar content caused by the lime treatment has, however, been counter-acted by the increased yield of cane in the gravelly soils (Table 10).

Table 10. Effect of on lime on yield of cane and sugar.

	Tons cane/arp.	C.C.S. % cane	Tons sugar/arp.	Response in tons sugar/arp.
No lime	22.25	12.51	2.78	—
With lime	24.60	12.29	3.02	+ 0.24

The latin square trials were harvested in 2nd ratoons in 1954, thus giving a total of three harvests for each experiment. The average yearly response of 240 Kgs sugar per arpent accumulated over three crops therefore, gives a true response of 720 Kgs sugar per arpent on the gravelly soil type.

(c) Soil Characteristics. The differential response to lime by two types of soils of the super-humid zone could not be explained by the uptake of N, P, K, Ca and Mg as determined by foliar diagnosis. The main characteristics of these two soil types are shown in Table 11 from which it may be seen that the chief differences lie in the higher exchangeable H and the much higher organic matter content of the " Rose Belle " soil type.

Table 11. Chief characteristics of two soil types of the super-humid zone

	" Rose Belle "	" Sans Souci "
Soil type	gravelly light clay	bouldery light clay
Soil group	Lithosol	Humic latosol
Stones and Gravels % whole soil	25	4
Clay < 2μ per % dry fine soil	44	47
Organic matter % " "	10	6
Carbon/Nitrogen ratio	11.5	12
pH	4.7 — 5.5	4.7 — 5.5
Molecular S_1O_2/R_2O_3 of clay fraction	0.5	0.2
Total base exchange capacity m.e. % dry fine soil	32.1	21.7
Exchangeable H m.e. % dry fine soil	23.5	16.5
" Ca " " " "	6.3	4.5
" Mg " " " "	2.0	0.5
" K " " " "	0.3	0.2

The figures published in Table 11 are derived from analyses carried out some twenty years ago at the Sugarcane Research Station; it is felt, therefore, that a re-examination of the two types of soil is necessary to explain the differential response to lime treatment.

---

4. ORGANIC FERTILIZERS

GUY ROUILLARD

(a) FARMYARD MANURE AND FACTORY SCUMS

Farmyard manure made from cattle dung and cane trash has been used in Mauritius since the early days of sugar cane cultivation and was for many years almost the only form of fertilizer employed.

At the origin, farmyard manure was a mere by-product of stables, the main reason for the rearing of cattle being the transport of canes to the factory. Early in the century, a serious outbreak of surra (*Trypanosome evansii*) decimated the herds and caused a rapid evolution towards the mechanisation of transport. As a result, the production of farmyard manure decreased rapidly and factory residues were used as a substitute on an increasing scale.

Many planters however consider farmyard manure as an essential requirement in cane cultivation and herds of cattle kept as "farmyard manure machines" are still of common occurrence. This method is expensive and generally considered obsolete.

In an attempt to throw some light on this much debated question by planters, a number of experiments were laid down by the Centre Agronomique du Nord in 1948, comparing the effect of farmyard manure and factory scums to nitrogeneous fertilizers. A summary of the results obtained is presented below.

Series I. This series of experiments was carried out with the variety M. 134/32 on normally fertile soils of three different types: one trial in the sub-humid zone on "Mapou" soil type, three trials in the humid zone on "Plaisance" soil type, three trials in the sub-humid zone, but irrigated, on "Richelieu" soil type.

Treatments were as follows:

a. Without organic matter, 30 Kgs Nitrogen per arpent per annum.

b. Without organic matter, 60 Kgs Nitrogen per arpent per annum.

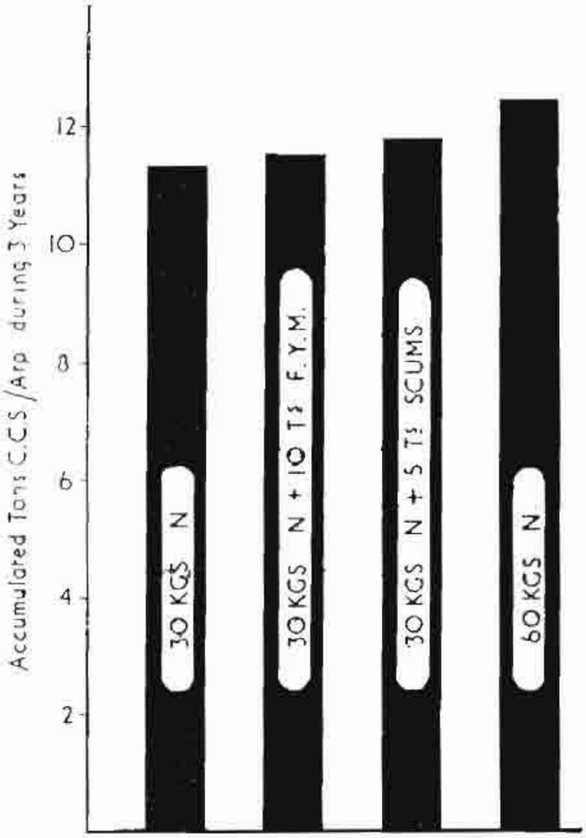

Fig. 16. Aggregate yield of sugar per arpent during three years in the presence and absence of factory residues.

c. Ten tons farmyard manure at planting plus 30 Kgs Nitrogen per arpent per annum.

d. Ten tons factory scums at planting plus 30 Kgs Nitrogen per arpent per annum.

Yield of cane and sucrose content was recorded for the virgin crop as well as first and second ratooms while leaves were sampled every year for foliar diagnosis.

The aggregate yield of cane and sugar obtained during three years in each of the treatment are shown in table 12 and fig. 16. The results obtained for each individual crop and on the three different soil types have not been included in this summary as they followed the same trend, namely no significant difference in favour of organic fertilizers but a high positive response to heavy Nitrogen fertilization.

Table 12. Cumulative yield of cane and sugar during three years in the presence and absence of farmyard manure and factory scums, The data obtained for each treatment represents an average of 126 observations (six replications in seven trials reaped during three consecutive years).

Treatments	Tons cane per arpent	C. C. S. % cane	C. C. S. per arpent
(a) 30 Kgs N per annum	90.07	12.78	11.51
(b) 60 Kgs N per annum	101.10	12.46	12.60
(c) as a + 10 Tons F.Y.M. at planting	91.80	12.48	11.46
(d) as a + 10 Tons Scums at planting	95.58	12.35	11.80
Significant difference ($p = 0.05$)			0.55

The average results obtained for P_2O_5 and K_2O content of leaves during the course of the experiment are summarised in table 13 from which it may be inferred that there has been no differential assimulation of these elements by plants occuring in the various treatments.

Table 13. Foliar diagnosis data in the presence and absence of farmyard manure and factory scums; average during three years.

Treatments	P_2O_5	K_2O
(a) 30 Kgs N	0.53	1.81
(b) 60 Kgs N	0.52	2.01
(c) as (a) + 10 Ts. F. Y. M.	0.53	1.98
(d) as (a) + 10 Ts. Scums	0.55	1.94

Series II. In order to study the effect produced by organic fertilizers on soils of low fertility a second series of experiments was carried out in an area where considerable erosion had taken place in the past. Two 4 x 4 latin square trials were laid down in fields known to be deficient in phosphate and of low organic matter content. The fields received a dressing of 500 Kgs guano phosphate per arpent before planting in 1948 and the variety used was M. 134/32. Data were recorded for the virgin crop and three ratoons.

The four treatments were identical to those described in the preceding series, although it should be mentioned that a certain amount of molasses had been inadvertently mixed with the factory scums applied in treatment (d).

The cumulative yields and average foliar diagnosis data obtained during four years are shown in tables 14 and 15.

Table 14. Cumulative yield during four years, in the presence and absence of organic matter. Each set of figures is an average of 32 observations (four replications in two trials reaped during four consecutive yields).

Treatments	Tons cane per arpent	C. C. S. % cane	C. C. S. per arpent
(a) 30 Kgs N. per annum	78.50	13.76	10.73
(b) 60 Kgs N. per annum	85.86	13.10	11.21
(c) as (a) + 10 Ts F.Y.M. at planting	97.31	14.00	13.62
(d) as (a) + 10 Ts Scums (1) at planting	114.85	13.81	15.86
Significant difference $p = 0.05$	—	—	0.46

Table 15. Foliar diagnosis, average during four years.

Treatments	P_2O_5	K_2O
(a) 30 Kgs N. per annum	0.38	1.36
(b) 60 Kgs N. per annum	0.36	1.36
(c) as (a) + 10 Ts F. Y. M.	0.42	1.52
(d) as (a) + 10 Ts Scums (1)	0.49	1.95

The results obtained in this second series of experiments indicate clearly that on soils of low fertility the addition of organic matter has a beneficial effect. It is interesting to note that in spite of the heavy dressing of phosphatic fertilizer at planting, plots receiving farmyard manure and scums showed a greater uptake of Phosphorus than those receiving Nitrogen alone. The response to organic matter treatment in this experiment may be ascribed to both Phosphorus and Potassium deficiencies in the soil as revealed by foliar diagnosis data. This effect is particularly marked in the plots receiving scums to which — as remarked previously — molasses had been inadvertently added.

Conclusion. These two series of experiments show that organic fertilizers applied in the form of farmyard manure and factory scums have not produced a significant response in normally fertile soils where deficiencies of major elements do not occur. Under such conditions the use of farmyard manure and factory scums appears definitely uneconomical if it is borne in mind that large amounts of organic matter are returned to the soil annually in the form of trash, top and surface roots. On the other hand, the same fertilizers applied to eroded soils deficient in phosphate and potash have produced large significant increases in yield. The beneficial effect are more noticeable with factory sums, which should be preferred when available, to farmyard manure.

(b) MOLASSES

The use of molasses as a fertilizer in Mauritius goes back to the last century. Boname followed by Tempany carried out many investigations to determine the magnitude and causes of the beneficial effects observed when molasses are applied to cane fields. In addition to the effect of Potassium — and to a smaller extent Nitrogen — it was postulated that molasses may have a partial sterilization effect on the soil, thereby causing increased Nitrogen fixation.

The large scale use of molasses as a fertilizer was generally accepted by the majority of Mauritian planters as one of the first essentials in sound cane husbandry, and only a small proportion of the molasses produced was used in alcohol manufacture. During the war, however, the large demand for industrial alcohol curtailed markedly the amount of molasses available for use in the fields. More recently the exportation of molasses at a remunerative price has further reduced the amount available as fertilizer. *

With a view to determine the fertilizer value of molasses, a series of experiments was started by the Centre Agronomique du Nord in 1947 to compare the effect of increased dressings of molasses on the yield of ratoon canes in the presence and absence of inorganic nitrogenous fertilizers. Six random block trials with four replications were laid down in fields of M. 134/32 where there was as abundant supply of potash as previously revealed by foliar diagnosis. One of the trials was located in the sub-humid zone on the " Mapou " soil type, four in the humid zone on the "Plaisance" soil type and one on irrigated lands on " Richelieu " soil type.

Treatments included:

(a) Control (no molasses, no inorganic Nitrogen).

(b) 5 tons molasses per arpent applied in the interline of first ratoons.

(c) 10 tons molasses per arpent.

(d) 50 Kgs N. per arpent per annum as Sulphate of Ammonia.

(e) 5 tons molasses per arpent in first ratoon + 50 Kgs N. per arpent per annum.

(f) 10 tons molasses per arpent in first ratoon + 50 Kgs N. per arpent per annum.

* Statistics on the production and use of molasses in Mauritius are published in Table X of the Appendix.

Plots were weighed and sucrose determinations made in first, second and third ratoons. Sampling for foliar diagnosis was carried out yearly.

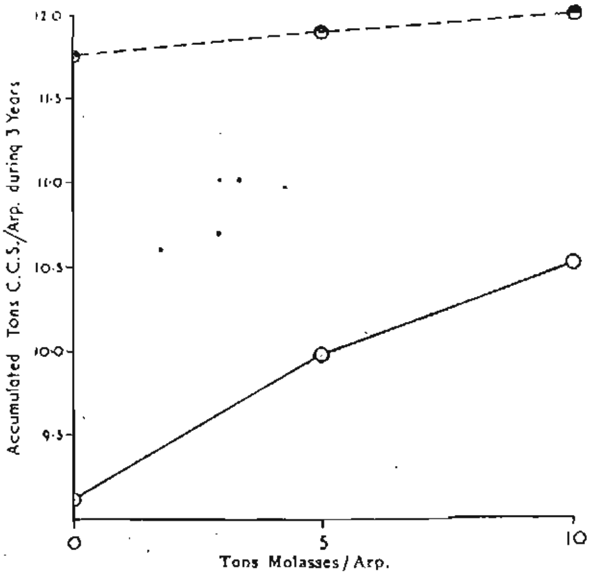

Fig. 17. Effect of molasses on sugar yield in the presence (broken line) and absence of Nitrogen (plain line).

The cumulative yields obtained are shown in table 16 and fig. 17.

These data show a marked response to increasing dressings of molasses in the absence of Nitrogen: from 1.02 tons C.C.S. per arpent at the lower level of molasses to 1.45 tons at the higher level. In the presence of Nitrogen however there is no significant difference in yield of cane or sugar at the two levels studied in the experiment.

Foliar diagnosis data in table 17 show a small increase in the assimilation of Potassium in the presence of Nitrogenous fertilizers but it is noteworthy that potash assimilation was not higher in plots receiving 5 and 10 tons of molasses in the abscence of Nitrogen. There was no increase in the phosphate content in any of the treatments.

It may be concluded from these experiments that under conditions where potassium is not a limiting factor to growth the effect of molasses as a fertilizer is negligible provided there is an adequate supply of Nitrogen. On the other hand the small increase in yield although not significant in the above experiment cannot be overlooked. Further studies on the effect of molasses are being pursued in permanent trials laid down recently at the four experimental stations of the Research Institute.

Table 16. Cumulative yield of cane and sugar during three consecutive years. The data obtained for each treatment represent an average of 72 observations (four replications in six trials during three consecutive years).

Treatments	Tons cane per arpent	C. C. S. % cane	C. C. S. per arpent
(a) Control	70.40	12.90	9.08
(b) 5 tons molasses in 1st ratoon	78.09	12.93	10.10
(c) 10 " " " " "	81.48	12.92	10.53
(d) 50 Kgs N arpent per annum	96.94	12.53	11.76
(e) 5 tons molasses + 50 Kgs N	96.60	12.33	11.91
(f) 10 tons molasses + 50 Kgs N	98.10	12.24	12.01
Significant difference $p = 0.05$	—	—	0.71

Table 17. Average foliar diagnosis results during three consecutive years.

Treatments	P_2O_5	K_2O
(a) Control	.56	1.50
(b) 5 tons molasses without N	.57	1.51
(c) 10 " " " "	.57	1.51
(d) No molasses + 50 kg. N annually	.55	1.77
(e) 5 tons " " "	.55	1.84
(f) 10 " " " "	.56	1.94

Meanwhile, it may be stated that applications of molasses in furrows at planting is a sound practice which should be continued, particularly on soils which are deficient in Potassium. Applications at the rate of 10 tons per arpent, represent the normal needs in potash of a rotation producing 200 tons of cane.

5. FOLIAR DIAGNOSIS

PIERRE HALAIS

INTRODUCTION

Advisory work on fertilization of sugarcane plantations in Mauritius is, nowadays, carried out after critical examination of the data obtained from both field trials and foliar diagnosis.

Extensive experimentation, comprising over a hundred replicated field trials, conducted during the last twelve years with M. 134/32 has proved most useful in stressing that proper use of nitrogenous fertilizers constitutes one of the major ways leading to increased sugar production.

The nitrogen supplying power of soils, normally under sugar cane, has been found in the above trials to be reasonably constant, but the average amount of additional Nitrogen as fertilizer to suit any particular condition is governed by the three variables:

(a) crop cycle: plant or ratoon canes,

(b) cane tonnage expected and

(c) relative price of fertilizer Nitrogen to that of millable cane.

Foliar diagnosis as usually practiced, does not contribute directly towards a closer understanding of the individual problems relating to nitrogenous fertilization of sugar cane plantations. On the other hand, the direct foliar diagnosis method as such, has found a permanent place as a convenient means of detecting whether the cultivated canes have enough Phosphorus and Potassium at their disposal to maintain a proper nutritional balance within the plant itself, so that the return from advocated nitrogenous fertilization — to be applied each year at high cost — should remain within the profitable limits expected.

Since 1947, some 40,000 cane leaf punch samples collected over the sugar plantations of the island, have been analysed for both total Phosphorus and Potassium contents. The results obtained have demonstrated that foliar diagnosis, when properly conducted, constitutes an accurate, practical and irreplaceable means of disclosing the integrated influences of past manuring responsible for the present Phosphorus and Potassium status of the cultivated sugar cane fields.

The triangular frequency diagram (fig. 18) illustrates important differences in Phosphorus and Potassium cane leaf contents according to the type of holding practised. At one extreme stand the millers who, for decades, have insisted on complete and balanced fertilization through the regular use of nitrogenous, phosphatic and potassic fertilizers and the return to their soils of molasses and factory scums which contain those plant nutrients. Whereas, at the other extreme, are found the small independent planters who have, more often, relied upon the unilateral use of nitrogenous fertilizers. It will be found pertinent, at this juncture, to compare the average cane yields obtained by millers and planters as published in table III of the Appendix.

Fig. 18. Frequency diagram illustrating the influence of type of holding on P & K foliar diagnosis. Circles indicate phosphate, triangles potash. Black, millers; shaded, large planters; white, small planters. The diagram is divided into four main zones: E= excess, O= optimal, D= deficient, DD very deficient.

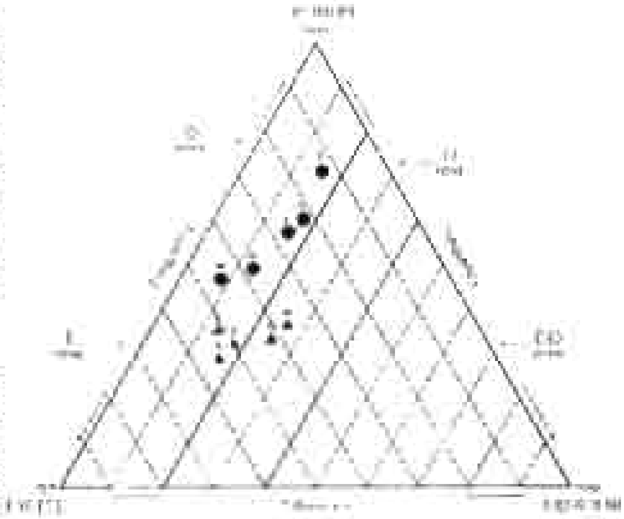

Fig. 19. Frequency diagram illustrating the influence of the cane sectors of the island on P & K foliar diagnosis. Circles indicate phosphate, triangles potash.

The other diagram (fig. 19) shows that, on the whole, there is no marked difference in phosphorus or potassium leaf contents — that is in the supplying power or reserve of soils in those two plant foods — between the broad sugar cane sectors of the island or between the soil types normally encountered. Consequently, there is no course left but that of testing the phosphorus and potassium status of the cultivated sugar cane by means of foliar diagnosis run as a permanent agronomic control measure.

As a first approximation, each sugar estate has been divided into a number of section-units ranging from some fifty to several hundred acres in area — often bearing local names — which have enjoyed, in the past, some uniformity in management, hence, in manurial treatment. Each year, leaf punch samples are collected from a large number of individual fields on section-unit of the estate, and are analysed separately. The percentage frequency of occurence of foliar diagnosis showing excess, optimal or deficient contents for Phosphorus or Potassium is calculated and plotted in a triangular diagram. The following limits have been assigned for the interpretation of leaf punch analysis conducted on representative third leaf-blades of M. 134/32 ratoon canes, five to seven months old and in full growth during the summer period, January to April, prior to flowering:

		Excess	Optimum	Deficit
Phosphorus,	P_2O_5 % d. m.	≮ 0.55	0.55 — 0.45	< 0.45
Potassium,	K_2O % d. m.	≮ 1.65	1.65 — 1.35	< 1.35
As % of Optimum		≮ 110	110 — 90	< 90

The triangular diagram used for each section-unit is divided beforehand into four different zones, one locating Excess (E), one Optimum (O), one Deficiency (D) and one acute Deficiency (DD). In order to visualize the trend of Phosphorus and Potassium nutrition within the cultivated canes of each section-unit, as time goes on, three years running-averages of the frequency percentages are normally calculated.

The amount of potassic fertilizer and of factory residues to be applied with most benefit for each section-unit, are proportioned to the location of the dots on the diagram : *statu quo* in the amounts, if the majority of cultivated canes are already within the desired optimal zone; increased applications if Phosphorus or Potassium deficiencies prevail over the area; or reduced applications whenever excesses predominate.

Under present conditions, it is impracticable to deal separately with small individual fields (two to ten arpents in size) as such a course would require a more intensive leaf sampling organization. A general programme to suit the section-unit as a whole, appears to offer a reasonable compromise.

IMPROVED DIFFERENTIAL METHOD FOR NITROGEN

The existing methods of foliar diagnosis are being steadily improved at the Research Institute. Thus, concerning the determination of the Nitrogen requirement of sugar cane, for which the usual direct method of foliar diagnosis appears to possess important limitations, a new differential method has been communicated by the author as part of the symposium of the 8th International Congress of Botany held in Paris in July 1954. The outstanding advantages of the new method arise from its differential or relative nature minimizing the disturbing influences of : (a) the cane variety cultivated, (b) the age of the cane, provided it is still young, (c) the cane category, plant or ratoons, (d) the meteorological circumstances preceding sampling, excluding drought for unirrigated canes, which are factors contributing to the imperfection of the usual direct method, when dealing with the Nitrogen problem.

Groups of three micro-plots consisting of one plus-Nitrogen plot additional 20 Kg. of Nitrogen per arpent flanked by two controls standard Nitrogen treatment are located in an appropriate number of replications within regular fields of young virgin or ratoon canes, if some doubts prevail as to the adequacy of the nitrogenous fertilization practised. Leaf-blades on each plot of the group are sampled comparatively on two or preferably three occasions during the second and third months following the application of Nitrogen to the plus-Nitrogen plots. The average percentage increase in the green weight of the third leaf blade, collected from the plus-Nitrogen plot over the adjoining controls, is calculated from weighings carried out in the fields (" Vegetative Index " of HALAIS). The average percentage increase in Nitrogen content of the leaf-punch collected on the above-mentioned blades, is determined subsequently by means of chemical analysis rapidly carried out in the laboratory (" Nitrogen Index " of INNES). By using the proper regression cœfficient assigned to each of the two variables concerned — relative percentage increase in green blade weight and in Nitrogen content of leaf punch — as a result of an island-wide experimentation arising from a series of replicated field trials, the corresponding relative increase in sugar production, following the addition of extra Nitrogen, is obtained while the canes are still young and thus response to fertilization. This production value is used for determining any additional dose of nitrogenous fertilizer which may be required for the field as a whole.

In case the additional Nitrogen plots show no increase in calculated sugar production, the control or standard fertilization regularly practised may have been already excessive. During following years, the standard Nitrogen fertilization is gradually reduced whilst the differential bipartite foliar diagnosis method is carried out along the lines described above. Thus, through successive approximations derived from the appropriate and practicable agronomic control proposed, it becomes possible to evaluate and follow more accurately the Nitrogen requirement of any particular section-unit of a large estate.

ANALYTICAL METHODS

The following is a brief account of the analytical procedures adopted for routine analysis of cane leaf punches in the Foliar Diagnosis Laboratory of the Institute. The dipicrilaminate colorimetric method for potassium will be described more fully as the author thinks it is the best method when a flame photometer is not available, or is unnecessary when a limited number of samples are to be analysed.

Sampling. Not less than sixty fully representative third leaf blades should be sampled from each field under study on at least two occasions during the summer months. A punch, 5 mm in diameter, is used to sample the blades midway in width and length. The leaf punches after collection are oven dried as soon as possible at 105°C. for three hours, to prevent any loss of Nitrogen during storage.

Wet Digestion. 100 mg. of recently dried leaf punch are rapidly weighed on a torsion balance and placed placed into a 50 cc conical flask. Add 2 cc of 50% vol. by vol. of conc. pure sulphuric acid. Digest for 10 minutes on a hot plate regulated at 125° — 150°C. Then transfer for 5 minutes on another hot plate maintained at 300° — 325°C and kept under a fuming cupboard. Cool or allow to cool well before adding another four drops of H_2O_2 etc. The last two heatings at 300° — 325°, should be made with the funnel removed. It is important that the hot plates used should produce uniform surface temperatures. Finally, place the hot conical flasks for 30 minutes inside an electric oven regulated at 125°C. to drive off all traces of hydrogen peroxide. Dilute the colourless residue inside the flask with 50 cc of water. Mix well the diluted leaf extrat.

Prepare a Blank and two Standards corresponding to (a) 2.00% Nitrogen, 0.50% P_2O_5 and 1.00% K_2O on dry matter basis, and (b) same N & P but 2.00% K_2O. Use for this purpose evaporated volumes of the Standard solutions in 50 cc conical flasks and add 100 mg of extra pure sucrose before starting the digestion.

Nitrogen. Pipette out exactly 1 cc of diluted leaf extract into a 22 mm calibrated Pyrex test tube for use with a Lumetron 401 photoelectric Colorimeter. Neutralize with 1 cc of dilute NaOH (25 gr per liter) add 10 cc of dilute solution of sodium metasilicate (2 gr per litre) and finally 8 drops Nessler Reagent (Vanselow, Anal. Ed. I. E. Ch. 12, p 516, 1940). Mix well the liquid in the tube with a long glass rod between the addition of each drop of Nessler. Allow the yellow-coloured liquid to stand for half an hour and determine the optical density using the blue-green filter 490. Run concurrently two "blanks" and two "standards."

Phosphorus. Pipette out 5 cc of diluted leaf extract into a 18mm calibrated tube. Add 2 cc of sodium molybdate in dilute sulphuric acid (31 g Na_2MO_4 2 H_2O and 50 cc conc H_2SO_4 per litre) and immediately 3 drops of 1, 2, 4 Sulphonic Reagent (Cotton, Anal. Ed. I. E. Ch. 17 p. 734, 1945). Mix rapidly with a glass rod and allow to stand for half an hour. Find the optical density using the red filter 650. Run concurrently two "blanks" and two "standards."

Potassium. Pipette out 5 cc of diluted leaf extract into a 30 cc Vycor Silica crucible. Carefully evaporate to near dryness over a hot plate or inside an oven at 125°C. Then place under a fume cupboard on another hot-plate regulated at 300°—325°C until cessation of white fumes. Place the crucible inside an electric muffle heated at not more than 500°C and raise the temperature to 650°C. Keep the crucibles at that temperature for half an hour in order to drive off all the sulphuric acid and the ammonia contained in the diluted leaf extract. Allow to cool completely and add to the ash residue at the bottom of the crucible exactly 1 cc Amdur Reagent (Amdur, Anal. Ed. I. E. Ch. 12 p. 731, 1940), containing 4g of dipicrilamine per litre. Cover each crucible and place inside a closed and humidified cupboard to prevent evaporation. Allow to stand for three hours at room temperature. Carefully pipette 0.4 cc of the reddish liquid using a special Pyrex blood pipette, fitted on the tip with a 42 mm diameter filter paper firmly held in place by means of a thin rubber ring. This pipette is manufactured to order by Arthur Thomas. Wash the contents of the pipette into 100cc of water; mix well. Place into 22mm. diam. calibrated tube and find the optical density of the coloured liquid using the blue-green filter 490.

For each daily series of 100 Potassium determinations on leaf extracts, concurrently run three "blank" tests, three "standards" corresponding to 1% K_2O on d.m. basis and three "standards" corresponding to 2% K_2O. Plot three points on a graph: the average optical density of the "blanks," that of the 1 K, and 2 K "standards." Read on the curve the potassium contents of the cane leaves analysed.

DISEASES

P. O. WIEHE

1. RATOON STUNTING DISEASE

ALTHOUGH the presence of ratoon stunting disease had been suspected in Mauritius since 1953, it is only recently that experimental proof of its occurrence was obtained by Mr. G. Orian, Plant Pathologist of the Department of Agriculture (vide Ann. Rep. Dept. Agric., 1954).

Symptoms of the disease have been observed on M. 134/32, particularly in the super-humid region of the island, where, it is believed that ratoon stunting is the major cause of declining yields recorded in recent years on this variety. On the other hand, it is noteworthy that M. 134/32 still produces high yields, up to the ninth or tenth ratoon crop, in the sub-humid and humid zones. The effect of environment on severity of the disease thus appears to be important when assessing susceptibility and resistance of varieties to the virus. Consequently four trials were laid down during the year to compare the behaviour of healthy canes (heat-treated setts) to others inoculated before planting, under rainfall conditions varying from 50 to 125 inches per annum.

Ratoon stunting has also been diagnosed on B. 3337 in commercial plantations and on many varieties grown in breeding and museum plots at experimental stations. The disease is particularly severe on Port Mackay, D. 109, Co 419 (fig. 20) and Co 421. D. 109 suffers considerable stunting and exhibits conspicuous orange red to brown discoloration of the vascular bundles in a pattern of "dots and commas" in the lower part of the nodes. The diffuse pinkish discoloration of the nodes in young shoots, as reported in Queensland may be also readily observed. In view of the clear symptoms shown by

Fig 20. Co. 419 infected with ratoon stunting disease showing discoloured vascular bundles in lower part of nodes.

D. 109, it is being used as a "test variety" in several experiments.

Field trials are in progress to determine the resistance and susceptibility of commercial and potentially commercial varieties, while the practical aspects of establishing disease free nurseries is under active consideration. In this connection the susceptibility of ten varieties to the long hot water treatment was determined and the results shown in fig. 21.

I view of the importance of ratoon stunting disease a technical circular was issued and a lecture delivered to planters, stressing the necessity of adopting island wide measures to control the disease.

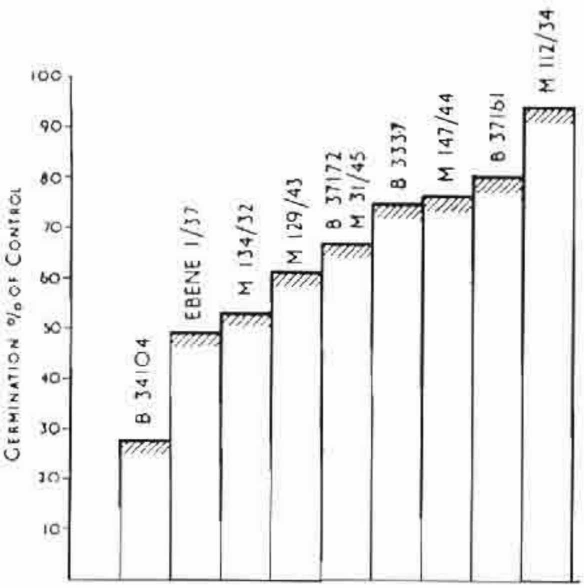

Fig. 21. Effect of long hot water treatment (50oC for two hours) on germination of 10 cane varieties

2. CHLOROTIC STREAK

Chlorotic streak is widespread in the super-humid zone of Mauritius and is also of frequent occurrence on ill-drained irrigated soils of the sub-humid areas. The two main varieties in cultivation, M. 134/32 and Ebène 1/37 are susceptible to the virus. Symptoms of the disease have also been observed on B. 3337, B. 37161 and B. 37172, the first named variety being the most susceptible.

There is abundant evidence that chlorotic streak is transmitted by vectors in Mauritius. For example, new seedling canes develop the disease about six to seven months after they have been planted in the field. Similarly, shoots from hot water treated setts may show typical leaf symptoms five to six months after treatment. Reference should be made to the Annual Report of the Department of Agriculture for 1954, in which Mr. J. R. Williams, the Entomologist, summarizes his investigations on insect transmission of chlorotic streak. The following five species were used by him with negative results : *Fulmekiola serrata* (Kob.), *Longiunguis sacchari* (Zehnt.), *Peregrinis maidis* (Ashm.), *Perkinsiella saccharricida* (Kirk) and *Dicranotropis muiri* (Kir.).

The effects of the disease are twofold:

(a) presence of the virus in the stem causes a marked reduction in germination and subsequent growth;

(b) given a susceptible variety and favourable environmental conditions to the development of the disease, there is a significant decrease in yield.

(a) Effect on germination and early growth. It has been recorded by other workers that the virus is not uniformly distributed throughout the stem. Thus, by planting single eyed cuttings of an infected shoot it is found that some buds do not germinate, others produce stunted shoots which soon die, while apparently normal shoots with leaf symptoms develop from other buds; finally, symptomless shoots of normal size develop from some buds of the infected cane. The relative proportion of buds behaving in the above described manner is under study.

In an experiment in which 360 cuttings from infected stools of Ebène 1/37 were compared to an equal number of cuttings treated in hot water at 52°C. for 20 minutes the following results were obtained (table 18).

Table 18. Effect of chlorotic streak on germination and early growth of Ebène 1/37.

	Cuttings from	
	diseased canes	H.W.T. canes (52°C/20 mins.)
(i) % germination	48	86
(ii) % germinated shoots which died from chlorotic streak during the firstfive months	41	8
(iii) % germinated shoots which showed leaf symptoms excluding those from (ii)	40	3
(iv) total length of shoots (cms) after five months.	1904	5623

It is clear from these data that chlorotic streak may be the cause of severe losses at planting and that in regions where the disease is prevalent cane setts should be subjected to the short hot water treatment as a matter of routine. It should be pointed out that in the experimetal results given above, the low incidence of disease which developed in stools from heat treated setts might have been due to imperfect temperature control during treatment, or the secondary infection. The remarkable increase in growth of canes derived from healthy cuttings is to be attributed partly to the absence of chlorotic streak and partly to the well known beneficial effects of heat treatment on growth.

(b) *Effect on yield.* In all countries where chlorotic streak occure it has been observed that cane shoots showing leaf symptoms are often stunted. In order to determine quantitatively the depressing effect of the virus in a susceptible variety, the following experiment was carried out.

Fifteen stools of M. 134/32 showing leaf symptoms were compared to an equal number of symptomless stools growing as near as possible to the diseased canes. Thirty -fields of first, second or third ratoon were thus sampled in the humid and super-humid zones of the island, thereby giving 450 paired setts of data for comparison. The number of canes and weight per stool as well as length and diameter of the stalk were recorded; average Brix readings for each stool were also made. The result obtained are summarized in table 19 and shown graphically in fig. 22.

Table 19. Influence of chlorotic streak on yield of M. 134/32.

	Diseased canes	Presumed healthy canes	Sig. Diff. p = 0.05
No. of canes per stool	3.3	3.6	0.25
Length of stalk cms.	155.8	174.4	15.1
Diameter of stalk cms.	2.8	3.2	0.1
Weight of stool kgs.	3.8	5.6	1.1
Brix	17.0	17.1	0.57

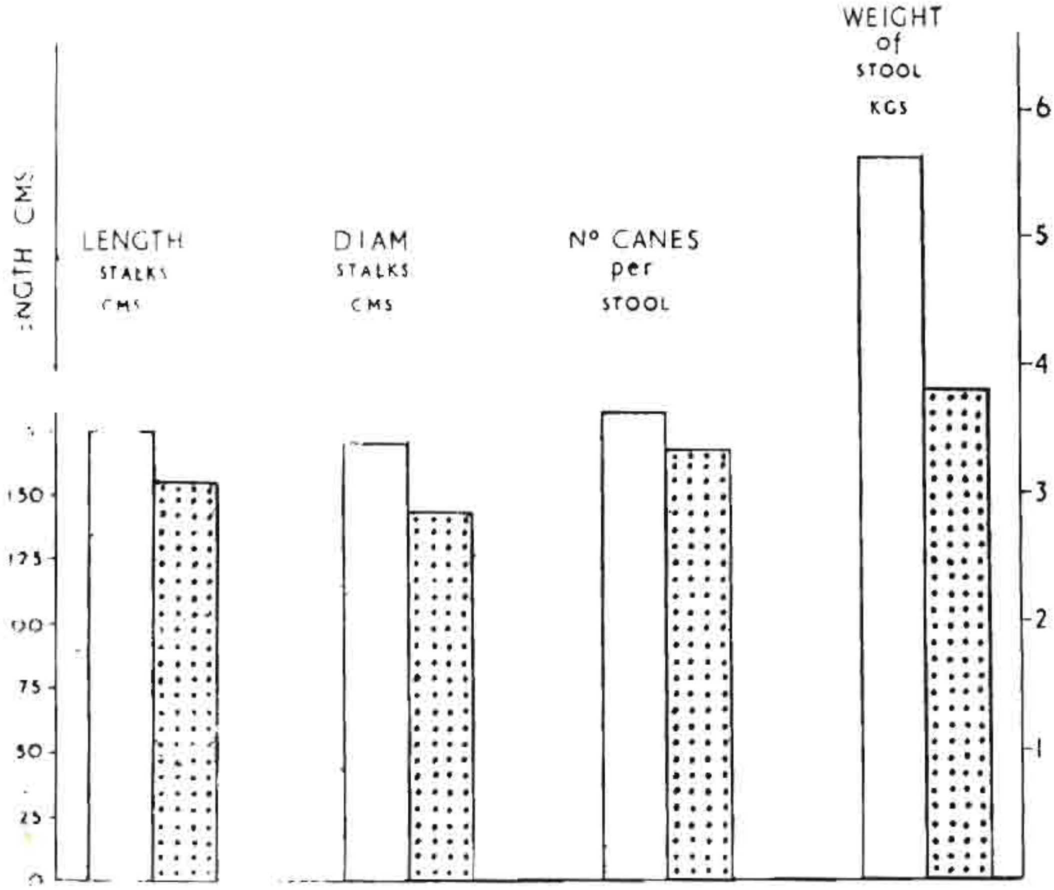

Fig. 22. Effect of chlorotic streak on **M. 134/32**; plain column : healthy stools, shaded column: diseased stools.

These data show that while chlorotic streak has no effect on sucrose content it causes a small but significant reduction in the number of canes per stool and markedly affects the length and diameter of individual stalks. As a consequence, the weight of infected stools is reduced by over 30%.

In view of the fact that chlorotic streak prevails over a wide area of the cane zone the reduction in yield recorded in the above experiment indicates that this disease is the probable cause of significant sugar losses which justify the large scale adoption of such control measures as the hot water treatment of cuttings before planting.

WEED CONTROL

E. ROCHECOUSTE

1. INTRODUCTION

CHEMICAL weed control has superseded weeding by hand to a large extent in recent years. This method has also proved a valuable adjunct to the control of weeds by cultivation.

A large number of experiments have been carried out during the last eight years to study the effect of selective herbicides on the weeds of sugarcane fields in Mauritius and the results have served to stress that herbicidal treatment can be both effective and economical when placed under careful management. M C P A and 2, 4-D are technical abreviations well known to Mauritian planters nowadays. The selective herbicides, under the form of their metallic and amine derivatives are used on a fairly wide scale by sugar estates for the control of annual weeds by pre-emergence and perennial broad leaved weeds by post-emergence. On the other hand, sodium T C A has been found to be a very potent grass killer and hundreds of acres of cane land have already been treated with this chemical to eradicate perennial grasses. To sum up, it may be said that the rate of re-invasion of sugarcane plantations once weeds have been destroyed is decreasing gradually and that with new developments in agricultural chemicals rapid and successful progress may be anticipated in the years to come.

2. NEW FORMULATION FOR THE TREATMENT OF RATOON CANES

During recent years the general practice for chemical weed control in ratoon canes in Mauritius had been chiefly a pre-emergence treatment as soon as possible after harvest and following the lining up of trash or following harrowing of the interlines. This method although successful in some cases is not entirely satisfactory as broad leaved weeds and perennial grasses are often present and develop rapidly once more light becomes available. It was felt therefore that the use of a combined spray which could destroy the weeds present (perennial grasses as well as broad leaved weeds) and also act in pre-emergence was highly desirable. Consequently, several experiments were laid down in different localities of the island with a view to determining the best and most economical mixture of herbicides which could destroy existing weeds and simultaneously control germinating seeds. In order to exercise its full herbicidal action such a formulation should contain: (1) a contact herbicide to kill the majority of weed seedlings and to cause sufficient damage to the aerial growth of perennial grasses; (2) a selective grass killer to check the re-growth of perennial grasses and (3) an hormone type of weed killer to remain long enough in the soil to come in contact with the germinating weed seedlings so as to affect adversely their subsequent development.

Experimental. Forty different combinations of the following weedkillers were used in the experiments :

(a) Pentachlorophenol ... ... Monsanto 15% pentachlorophenol miscible oil.

(b) M C P A ... ... Types: Potassium (" Agroxone 4 "); Sodium; Ammonium (" Phenoxylene Plus ".)

(c) 2, 4-D Amine Salt ... ... Types dimethyl, tri-ethanol.

(d) T C A ... ... Sodium trichloracetate.

The quantities used per arpent varied from 1 gallon to 1/6th of a gallon for pentachlorophenol, from 1 to 2 lbs acid for amine salt of 2, 4-D and M C P A and from 5 to 10 lbs for T C A.

All trials were laid down in randomised blocks with four replicates. Weed population was estimated by the "frequency-abundance" method, that is, the species were listed according to their relative abundance by two observers, the result pooled and the average taken. The effects of the various treatments on crop and weeds were recorded in awarding points according to the degree of damage sustained and here again the observations were made by two independent observers.

Throughout these investigations the recording was made according to the following plan :

a) a preliminary weed survey was made a day or two before spraying,

b) a week after the herbicidal spray, injury caused to cane shoots was noted,

c) three weeks later, the effects of treatments on the weed population were recorded,

d) finally, eight weeks after spraying a weed survey was carried out in order to estimate the new weed population that had become established through the disappearance of the herbicide from the soil.

Summary of results. Of all the combinations tried the mixture which gave consistently better results was :

a) Pentachlorophenol (1/6 to 1/4 gallon)	in 45 gallons of water per arpent
b) M C P A or Amine salt of 2, 4-D, (1½ to 2 lbs acid equivalent)	
c) T C A (5 lbs)	

The results obtained with this formulation are summarized in table 20 which necessitates the following comments :

(i) In column (a) the majority of the annual weed species listed were, at spraying time, at seedling stage, a condition found essential for satisfactory results.

(ii) The figures in column (b) are incomplete because at the time assessment of mortality was made a large number of weeds were moribund but could not be recorded as dead.

(iii) In column (c) the new weed population in the treated plots may appear high when compared to the controls but it must be emphasized that at the time observations were made, the majority of the weeds in the treated plots were at the seedling stage while those in the controls were adult plants at the flowering or fruiting stage.

Table 20. Effects of formulation: MCPA or 2, 4-D combined with PCP and TCA for the control of weeds in ratoon canes.

TREATMENTS	Sugar cane variety	Number of weed species	Initial infestation expressed in % of control. (a)			Effects on sugarcane one week after treatment.	Effects on weeds expressed in % mortality 3 weeks after treatment. (b)			Final infestation expressed in % of control 8 weeks after treatment. (c)		
			Annual	Perennial	Total		Annual	Perennial	Total	Annual	Perennial	Total
ROSE BELLE. (super humid)	B. 3337	26										
Control			100	100	100		0	0	0	100	100	100
MPCA (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			111	165	129)	Moderate scorching	86	81	84	36	65	16
Amine Salt 2, 4—D (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			114	141	123)	of young cane leaves	92	69	77	29	65	41
GROS BOIS. (humid)	M.134/32	29										
Control			100	100	100		0	0	0	100	100	100
MPCA (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			94	91	92	Slight scorching effect	81	46	68	38	54	42
Amine Salt 2, 4—D (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			100	104	102	Practically no effect	73	36	55	45	51	48
UNION VALE. (humid)	M.134/32	28										
Control			100	100	100		0	0	0	100	100	100
MPCA (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			70	124	105	Slight scorching effect	84	70	75	50	94	63
Amine Salt 2, 4—D (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			87	119	108	" "	82	73	76	59	91	59
BENARES. (humid)	B. 37/172	39										
Control			100	100	100		0	0	0	100	100	100
MPCA (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			73	88	78	Practically no effect	98	88	95	42	55	46
Amine Salt 2, 4—D (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			82	96	87	" "	99	86	95	36	69	46
TERRACINE. (humid)	E. 1/37	34										
Control			100	100	108		0	0	0	100	100	100
MPCA (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			88	100	97	Practically no effect	76	65	71	32	65	40
Amine Salt 2, 4—D (1 1/2 lbs) + PCP (1/3 gal) + TCA (5 lbs)			108	115	111	" "	70	68	70	33	65	41

In the above formulation pentachlorophenol is the only constituent of the mixture likely to cause injury to young cane shoots. These effects, however, are not serious on most varieties at the rate of $\frac{1}{3}$ gallon per arpent. It should be pointed out, that of the varieties studied, B. 3337 appears to be more susceptible to the scorching effect of pentachlorophenol. When spraying fields cultivated under this variety, the amount of pentachlorophenol should therefore be reduced to $\frac{1}{4}$ gallon per arpent.

The presence of T C A in the above formulation is to check the regrowth of perennial grasses. In their absence therefore, this chemical may be omitted from the mixture.

3. EXPERIMENTAL WORK WITH SODIUM TCA

(a) EFFECTS ON PERENNIAL GRASSES

The large scale use of hormone weed killers which started about 1948 in Mauritius has resulted in the gradual invasion of cane lands by perennial grasses which are difficult to eradicate by mechanical means and are also resistant to such chemicals as Sodium chlorate and pentachlorophenol. The two most noxious perennial gramineae in cane fields in Mauritius are: *Cynodon dactylon* ("chiendent") and *Phalaris arundinacea* ("herbe Mackaye"). Experimental work carried out in recent years has shown that these weeds may be efficiently controlled with T C A. A summary of the results obtained is presented below.

Effect of T.C.A. on swards of different species. Plots 20 ft x 20 ft were selected in pure swards of different grass species and treated with T C A at the rates of 50, 75, 100, 125 and 150 lbs in 200 gallons of water per arpent. The experiment was designed to compare the effect of this chemical at the above concentrations on cut and uncut grass and on cut grass when sodium pentachlorophenate was added as an adjuvant at the rate of 8 lbs per arpent.

The results obtained are summarized in table 21 from which it may be observed that:

(a) The effect of T C A on "cut grass" can give satisfactory results at comparatively lower rates of application. However, it must not be overlooked that extra labour is required to cut and remove the grass from the field and this may not prove practical from an economic view point.

(b) A rapid kill of the top growth is obtained when sodium pentachlorophenate is added to the T C A spray. No difference was noted, however, in the total "kill effect" when this chemical was added to the spray solution under the conditions the experiments were performed.

(b) CONTROL OF PERRENIAL GRASSES IN SUGARCANE FIELDS

From the experimental evidence available at present, it is possible to make the following recommendations on the use of T C A in sugarcane fields:

(i) Pre-planting treatment. Infested fields should be treated with T C A at least two months before planting. It is advisable to burn out the field so as to get rid of the trash prior to spraying. This operation will permit an easy detection of grass growth when it appears, thereby facilitating spot spraying of infested areas only. It should be emphasized that whenever perennial grasses in cane fields have to be eradicated priority should be given to this treatment.

(ii) Treatment in virgin crop. Perennial grasses in virgin canes should not be sprayed with T C A unless the canes are about 3 to 4 months old. Their control in very young sugarcane plantations should be avoided since the chemical may cause severe injury to shoots, which are at an early phase of development. All spraying should be done with a knapsack sprayer fitted with a protective device to avoid

Table 21. Effects of different rates of application of TCA (lbs per arpent) on four grass species.

GRASS SPECIES	50 lbs	75 lbs	100 lbs	125 lbs	150 lbs
UNCUT GRASS TREATMENT					
Cynodon dactylon ("chiendent")	100% top kill with abundant regrowth after 5 to 6 weeks.	Varied results; may give 60 to 80% kill in lands where the rhizomes are not deeply seated.	95 to 100% control; regrowth insignificant.	100% control.	100% control.
Phalaris arundinacea ("herbe mackaye")	— — —	Varied results as above.	90 to 100% control regrowth insignificant.	— — —	— — —
Ischaemum aristatum ("herbe d'argent")	80% kill.	Almost complete control.	100% control.	100% control.	100% control.
Imperata cylindrica ("lalang grass")	60 — 75% top kill with abundant regrowth after 5 to 6 weeks.	50 to 60% control; regrowth incidence high.	75 to 80% kill.	95 to 100% kill; regrowth insignificant.	100% control.
CUT GRASS TREATMENT					
Cynodon dactylon	Effective over a longer period in comparison to "uncut" treatment at same dose, but regrowth fairly high after 8 weeks.	80% control; consistently better than "uncut" treatment at same dose.	100% kill; practically no regrowth.	100% control.	100% control.
Phalaris arundinacea	— — —	As above.	As above.	— — —	— — —
Ischaemum aristatum	80 — 90% kill.	100% control; practically no regrowth.	100% control.	100% control.	100% control
Imperata cylindrica	Ineffective control.	70% kill with regrowth after 8 weeks.	80 to 90% control.	100% control; practically no regrowth.	100% control.
UNCUT GRASS TREATMENT (with Sodium pentachlorophenate in TCA spray)					
Cynodon dactylon	Rapid kill of top growth with abundant regrowth after 6 — 8 weeks.	Similar results as in 'cut grass treatment' at same dose.	100% control practically no regrowth.	— — —	— — —
Imperata cylindrica	80 — 90% top kill with abundant regrowth after 6 — 8 weeks.	Similar results as in 'cut grass treatment' at same dose.	Similar results as in 'cut grass treatment' at same dose.	— — —	— — —

spraying unduly young cane shoots with the herbicide.

(iii) Treatment in ratoon crop. The proper time of application of T C A in ratoons is after the lining up of trash when the grass has made its appearance and the young cane shoots are still at the "spike" stage. A protective device adapted to the sprayer is also recommended to reduce the hazard of injuring the canes.

(iv) Grasses controlled by T C A Grasses which have been successfully controlled with T C A are listed below, and the quantities of chemicals required for their eradication have been applied in 200 gallons of water per arpent.

Chiendent (*Cynodon dactylon*) 100 lbs per arpent.

Herbe Mackaye (*Phalaris arundinacea*) 100 lbs per arpent.

Herbe d'Argent (*Ischaemum aristatum*) 50 to 75 lbs per arpent.

Lalang grass (*Imperata cylindrica*) 100 to 125 lbs per arpent.

(c.) CONCLUSIONS.

Best results have been obtained when there is sufficient moisture in the soil at time of application of the herbicide. Winter applications, in general, have been found to give erratic results. This has been attributed to the slow growth of the grass during the cooler months, resulting in a reduced absorption of the toxic material by the plant. Summer applications, on the other hand, have given exceedingly good results in the control of these perennial grasses. Rain was not found to be a factor limiting its application, provided extremely heavy showers were not experienced on the day of the spraying or the days immediately following it. Owing to the excellent results obtained in the eradication of perennial grasses with T C A, this chemical should be used on a wide scale in sugarcane land.

4. OTHER INVESTIGATIONS.

(a) "MEINKI" (*Digitaria spp.*)

The common name 'meinki' is given to, at least, two species of the genus Digitaria, namely *D. timorensis* and *D. biformis*. These two grasses are widespread in cane fields, and waste land of the humid localities of the island. They have both a similar habit of growth, being loosely tufted annuals with vigorous growth and extensive development of culms from a creeping base and rooting at the nodes. They reproduce freely by seeds, flowering occurring during the summer months. Of the two species *D. timorensis* appears to be the more serious weed owing to its wider distribution in sugarcane fields. These two species are troublesome weeds from November to April when they may form pure swards in sugarcane plantations. Because of their particular life form, control of these two species by cultivation is unsatisfactory. Re-invasion occurs from fragments of stolon and germination of seeds appears to be enhanced after hoeing. Consequently, the possibility of using herbicides for the control of 'meinki' was investigated during the year and the results obtained are reported below.

(i) Post-emergence treatment Two experiments were carried out in the humid zone on pure stands of 'meinki' consisting mainly of *D. timorensis*. T C A was used alone and in combination with M C P A in order to determine whether an hormone weed killer added to the T C A spray would not control re-infestation from seeds. The results are shown in tables 22 and 23.

(ii) Contact pre-emergence treatment. Experiments were carried out in ratoon canes from October to December in cane fields known to be generally heavily infested with "meinki". M C P A and amine salt of 2, 4-D were used in pre-emergence and in combination with TCA and pentachlorophenol as a contact-pre-emergence spray. The results are summarized in table 24.

Table 22. Results of Experiments 1.

Treatments (rates per arpent in 150 gallons water)	Observations
1. TCA 100 lbs	Complete kill.
2. ,, 75 ,,	,,
3. ,, 50 ,,	,,
4. ,, 30 ,,	80 — 90% kill; regrowth incidence rather low.
5. ,, 20 ,,	about 60% kill; with regrowth after two months.

Table 23. Results of Experiment 2.

Treatments (rates per arpent in 150 gallons water)	Observations
1. TCA (20 lbs)	About 60% kill with regrowth after two months.
2. TCA (20 lbs) + MCPA (4 lbs acid eq.)	Killing effect as above, re-infestation from seeds apparently not affected.
3. TCA (30 lbs)	About 80 — 90% kill, regrowth insignificant
4. TCA (30 lbs) + MCPA (4 lbs acid eq.)	Killing effect as above, re-infestation from seeds apparently not affected.
5. TCA (40 lbs)	Almost complete kill, practically no regrowth.
6. TCA (40 lbs) + MCPA (4 lbs acid eq.)	Killing effect as above, re-infestation from seeds apparently not affected.

(iii) Summary and Conclusion. When T C A is used alone as a post-emergence spray an application of 30-40 lbs per arpent has been found to give satisfactory results. The addition of an hormone type of herbicide to the T C A spray was not found to be effective in controlling re-infestation from seeds, the density of the top growth may possibly have prevented the hormone to reach the soil at the time "meinki" seeds were germinating.

M C P A or 2, 4-D used alone gives a fairly good control of "meinki" in pre-emergence treatment, but when supplemented with pentachlorophenol and T C A, better results are obtained. This

Table 24. Effect of MPCA, 2, 4-D and TCA on Digitaria spp.

Treatments (rates per arpent in 45 gallons water)	Observations	
	Spraying made immediately after lining up of trash	Spraying made a fortnight after lining up of trash, "meinki" seedlings at two-leaf stage.
1. MCPA or 2, 4-D amine (4 lbs acid eq.)	About 50—60% control of seed germination,; re-infestationf from portions of living stolons occurs 3—4 weeks after and from seeds 6—8 weeks after spraying.	—
2. MCPA or 2, 4-D amine (4 lbs ac.) + TCA (5 lbs) + PCP (1/3 gallon)	About 50—60% control of seed germination. Small re-infestation from living stolons.	Almost complete kill of young seedlings and living stolons, re-infestation from seeds greatly reduced.
3. MCPA or 2, 4-D amine (4 lbs ac.) + TCA (10 lbs) + PCP (1/3 gallon)	About 50—60% control of seed germination, re-infestation from living stolons insignificant.	Complete kill of young seedlings and living stolons; re-infestation from seeds greatly reduced.

may be attributed to the killing action of the T C A—P C P combination on the living stolons present in the field.

Spraying a field infested with "meinki" with the above mixture a fortnight after the lining up of trash may give exceedingly good results owing to the destructive effect of the contact spray on the young "meinki" seedlings. Further, re-infestation from seeds is thereby reduced owing to the double effect of the contact and pre-emergence herbicides.

The principal indications obtained from these experiments suggest the following scheme for the control of "meinki" in sugarcane plantations:

(i) Application of a contact pre-emergence spray about a fortnight after the lining up of trash with the following mixture:

M C P A or 2, 4-D amine salt .... 2 lbs acid eq.

Pentachlorophenol (15 % emulsion) .... $\frac{1}{3}$gallon

T C A .... 10 lbs.

The volume of water used should be sufficient to give a good coverage and experience has shown that no less than about 100 gallons per arpent are necessary to obtain satisfactory results.

(ii) It is essential that after this first application the field should be kept under close supervision in order to repeat the treatment once it is observed that the effect of the hormone weed killer tends to disappear from the soil. This will become evident when "meinki" seedlings begin to re-appear. In summer, the interval between treatment and new emergence of seedlings varies from 3 to 6 weeks depending on initial infestation of the field and weather conditions. A third application of the mixture may be necessary in certain fields.

(iii) In view of the very large number of fertile seeds produced it must be borne in mind that complete eradication of "meinki" will not be achieved in one season. It is therefore important that treated fields should be kept under supervision in order that foci of infestation may be repeatedly treated.

(iv) It is important to stress that often the good effects of a first treatment are ruined because the second spraying has been delayed and the field has run into weeds again. This practice should be avoided at all cost because the mixture recommended is not sufficiently potent to kill established "meinki" plants. Meanwhile, seeds are shed during the intervening period thereby creating new foci of infestation.

(*b*) "HERBE SIFFLETTE" (*Paspalidium geminatum.*)

This grass has always been classed as a very noxious weed wherever it occurs. It is a perennial which spreads rapidly by rhizomes and many noded stolons. As it thrives best in damp and marshy places it has become a troublesome weed, in localities where such lands have been reclaimed for growing sugarcane. Results obtained from preliminary work carried out in an attempt to eradicate this weed by chemical methods are given below.

(*i*) *Experimental.* Plots 20 ft x 30 ft in size were taken in a badly drained field of an estate in the north of the Island, where a dense growth of the grass occurred. In order to allow a better penetration of the chemicals in the soil, the plots were shaved of all vegetation. A fortnight later, Sodium Chlorate and ICA were sprayed at the following rates per arpent:

a) 100 lbs TCA

b) 200 lbs TCA

c) 100 lbs TCA+50 lbs Sodim Chlorate

d) 200 lbs TCA+100 lbs Sodium Chlorate.

Table 25. Effect of TCA and Sodium Chlorate on Paspalidium Geminatum.

Treatments (rates per arpent in 200 gallons water)	Effects on grass:		
	after one month	after two months	after four months
100 lbs TCA	Partial scorching of top growth	40 — 50% regrowth	Control ineffective 100% regrowth
200 lbs TCA	—do—	20 — 25% regrowth	— do —
100 lbs TCA + 50 lbs Sodium Chlorate	Complete kill of top growth	About 10% regrowth	About 80% regrowth
200 lbs TCA + 100 lbs Sodium Chlorate	—do—	— do —	— do —

The herbicides were applied in 200 gallons of water per arpent. It must be emphasized here, that previous attempts to kill the grass with TCA and Sodium Chlorate at the rate of 50 lbs and 75 lbs per arpent failed to give satisfactory results.

(ii) Results and Conclusions. The data obtained from the experiment are summarized in table 25. They show that T C A and Sodium Chlorate are ineffective to control this grass under the conditions in which the experiment was performed. Other experiments have been laid down where chemical weed control has been combined with weed control by cultivation but results are not yet available for publication.

THE EFFECT OF RAINFALL ON SUGAR PRODUCTION

PIERRE HALAIS

RAINFALL distribution is generally accepted as being one of the most important climatic factors responsible for fluctuations in the annual sugar output of Mauritius.

A dense network of rain gauges has been maintained for the last hundred years on the sugarcane plantations, but no generalized rule had been devised for a quantitative interpretation of monthly rainfall data in terms of final sugar production as derived separately from cane tonnage and quality.

The last period of eight consecutive years running from 1947 onwards, which has been exceptionally free from the disturbing influence of cyclonic winds—above 30 miles during one hour — or important cultural and varietal changes, offered an excellent opportunity to the author, with the collaboration of E. G. Davy, Director of the Meteorological Services of the Colony, to initiate a mathematical study, involving simple and multiple linear regressions between certain critical rainfall distribution data on the one hand and yield of cane per unit area and sugar manufactured % cane on the other.

At the start the postulate was made that, as sugar production is quite successful in Mauritius, the average or normal monthly rainfall distribution, for the island as a whole, must necessarily fit the monthly water requirements of sugar cane.

During the vegetative period of eight months, which starts from November and ends in June, any monthly rainfall amount which falls short of the corresponding average or normal monthly figure can be considered deficient, that is detrimental to sugar cane growth, while, monthly excesses will do no harm to a hardy crop as sugar cane cultivated on free draining soils usually encountered on the island. The excesses during this period of high summer rainfall are not kept by the soil for future use by the cane plant, but are rapidly lost into the sea.

During the maturation period of four months, which extends from July to October any monthly rainfall amount which exceeds the corresponding average or normal monthly figure can be considered as excessive or detrimental to maturity, that is to sucrose accumulation in the stalk and to juice purity. The excesses during this period of low winter rainfall can be held by the soil and used by the cane plant for further growth delaying the maturity of the crop to be harvested.

Consequently, as far as final cane tonnage is concerned, drought is measured numerically by the sum of monthly rainfall deficits accumulated between November and June, the vegetative or growing period of sugar cane. For the island, as a whole, this sum of monthly deficits — D — worked out for the period 1875 — 1953 amounts on an average to 15 inches with the lowest figure of 2 inches measured during 1931 and the highest 29 inches during 1934.

On the other hand, as far as final sugar manufactured % cane is concerned, wetness is measured numerically by the sum of monthly rainfall excesses accumulated between July and October, the maturation period. For the island, as a whole, this sum of monthly excesses E, during the period 1875—1953 averages 2.5 inches, with the lowest figure of O inches fairly frequent, and the highest 9 inches, recorded in 1927.

From the rainfall data reproduced in table VIII of the Appendix, the November — June deficits and the July — October excesses can be easily calculated for each particular crop year.

Over the 78 years of uninterrupted rainfall records used in this study, no correlation has been found between the November — June deficits and the July — October excesses ($R = -0.03$).

Consideration of rainfall data pertaining to Mauritius as a whole greatly simplifies the interpretation of final crop results, but would of course be meaningless if the correlations were not of a high order between the monthly figures collected over the different sectors of the island.

The following simple linear regression has been worked out for calculating final cane tonnage for each crop year:

$$\text{Tons canes per arpent} = \text{“Normal T.C.A.”} + k_1 (15 - D)$$

Where the regression coefficient k_1 varies for the different sugar sectors as shown in table 26.

Another multiple linear regression has been worked out for calculating final cane quality for each harvest year:

$$\text{Sugar manufactured \% cane} = \text{“Normal S.M.C.”} - k_2 (15 - D) + k_3 (2.5 - E).$$

The regression cœfficients k_2 and k_3 also vary according to the different sugar sectors as shown in table 26.

The November — July deficit D has been introduced in this last equation to account for an indirect factor, the mass of cane harvested and milled, which affects the length and efficiency of the crushing season. An early start and a late ending resulting from a large crop to be handled by labour and factory, being detrimental to the final results obtained.

Table 26. Variation of regression coefficients in different sectors of the island.

	One inch monthly deficit D, November — June:		One inch monthly excess E, July — October:
	decreases cane tonnage per arpent by (k_1)	increases sugar manufactured % cane by (k_2)	decreases sugar manufactured % cane by (k_3)
ISLAND	0.307	0.0444	0.137
WEST & NORTH	0.685	0.0569	0.173
EAST & SOUTH	0.195	0.0534	0.118
CENTRE	0.190	0.0052	0.110

As could be expected on theoretical grounds, the highest values for the three regression cœfficients are found in the West and North sectors and the lowest in the Centre.

In fig. 23 a comparison is established between actual and calculated cane ton-

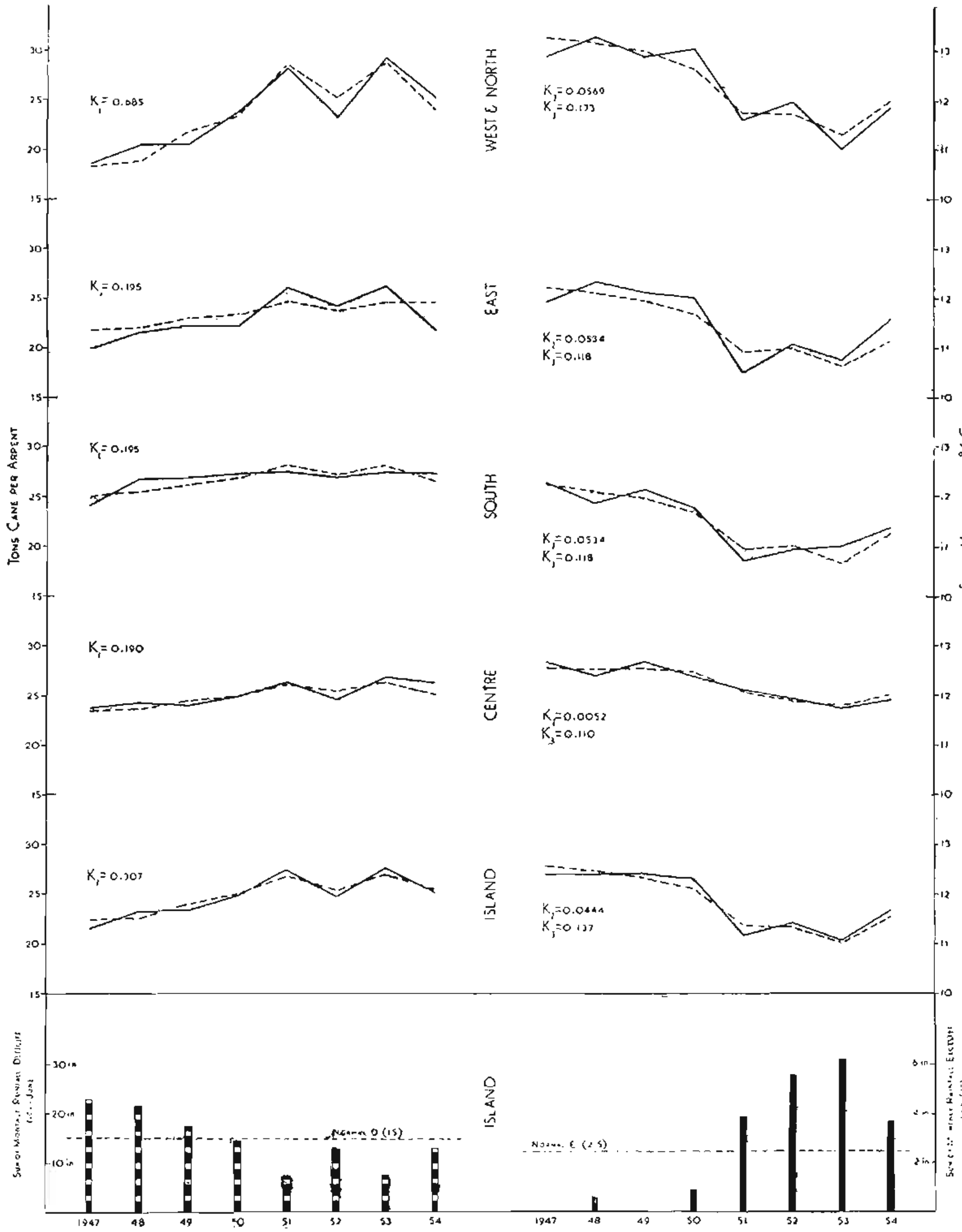

Fig. 23. Relation between monthly rainfall deficits (November — June) and excesses (July — October) and sugar production. Dotted lines indicate calculated and plain lines actual production.

nage and sugar manufactured % cane for the different sugar sectors during the last eight years. They show the closeness of the relationship involved and the practical value of the "deficit" and "excess" concepts regarding final sugar production. In fact, more than 80% of the annual fluctuations in sugar production, for years free from cyclonic disturbances, can be accounted for in this manner by a rational consideration of monthly rainfall data. However, the proposed equations should be used with some caution on individual sugar estates, as it is unlikely that the general conditions such as cane rotation, cultivated soils, and manurial treatment should remain constant from year to year, when dealing with comparatively small areas. On the other hand, a large measure of compensation is at work when the climatic studies bear on the whole island or on the sugar sectors.

From the point of view of general agronomy, a step forward has been accomplished, as it is now possible to calculate the normal production, by adjusting the results obtained in any particular year or group of years, to both the average November — June deficit of 15 inches and the average July — October excess of 2.5 inches.

The success of this study, involving comparatively simple factors, undoubtedly rests on the nature of the sugar cane plant itself: a perennial of which the final size and quality are a reflection of the accumulated weather conditions during the two lenghthy vegetative and maturation periods. With such a crop, there are no critical stages of short duration, influenced by transitory meteorological circumstances, with the exception of cyclonic winds, capable of producing a notable effect on the final yields obtained.

APPENDIX *

* *Grateful acknowledgement is made to the Secretary, Mauritius Chamber of Agriculture, for providing the necessary data to compile tables II to V.*

Table I. General description of sugarcane sectors of Mauritius.

SECTORS	WEST	NORTH	EAST	SOUTH	CENTRE
DISTRICT	Black River	Pamplemousses & Rivière du Rempart	Flacq	Grand Port & Savanne	Plaines Wilhems & Moka
ORIENTATION	Leeward	—	Windward	Windward	—
PHYSIOGRAPHY	Lowlands and Slopes	Lowlands	Slopes	Slopes	Plateau
GEOLOGY	Late Lava — Pleistocene.				
PETROLOGY	Compact or vesicular doleritic basalts and subordinate tuffs				
ALTITUDE	Sea level — 900 ft.	Sea level — 600 ft.	Sea level — 1,200 ft.	Sea level — 1,200 ft.	900 — 1,800 feet
HUMIDITY PROVINCE	Sub-humid	Sub-humid to humid	Humid to super-humid		
ANNUAL RAINFALL, Inches. Range and Mean	(30 — 60) 44	(40 — 75) 55	(60 — 125) 94	(60 — 150) 90	(60 — 150) 90
MONTHS RECEIVING LESS THAN TWO INCHES RAIN	June to October	September and October	None		
AVERAGE TEMPERATURE °C JAN.	27.0°	26.5°	25.5°	25.0°	23.5°
AVERAGE TEMPERATURE °C JUL.	21.0°	20.5°	19.5°	19.0°	17.5°
CYCLONIC WINDS, greater than 30 m.p.h. during 1 hour.	December to May				
PEDOLOGY Soil Groups: (*) A. Low Humic Latosol	"**Richelieu**" bouldery clay		—		
B. Humic Latosol	—	"**Réduit**" bouldery clay			
		—	"**Sans Souci**" bouldery Clay		
C. Lithosol	"**Mapou**" Stony and gravelly clay		—		
		"**Plaisance**" stony and gravelly clay			
(*) Other unclassified groups occur chiefly in the West & North	—		"**Rose Belle**" stony and gravelly clay		
IRRIGATION	Common	Some	Rare		
APPROXIMATE AREA (in 1000 arpents) SECTOR	56	91	72	160	63
APPROXIMATE AREA (in 1000 arpents) CANE	9	48	38	54	22
SUGAR FACTORIES (Approximate production in 1000 metric tons. in brackets)	Médine (28)	Mon Loisir (27) St. Antoine (24) The Mount (21) Beau Plan (19) Solitude (18) Labourdonnais (17) Belle Vue (13)	Union Flacq (37) Beau Champ (25) Constance (20) Q. Victoria (18)	Savinia (25) Mon Trésor (23) Union (17) Britannia (15) Rose Belle (13) Bénares (12) R. en Eau (12) Bel Ombre (10) St. Félix (9) Ferney (9) B. Vallon (8)	Mon Désert (27) Highlands (17) Réunion (11) Trianon (10)

Table II. ***Area under sugar cane in thousand arpents*(1), *1946—1954. The first column gives the total area under sugar cane, the others the area reaped for milling.***

Year	Island	Area reaped					
		Island	West	North	East	South	Centre
1947	143.03	130.74	6.61	36.07	27.22	42.59	18.25
1948	148.25	136.19	6.54	36.98	30.19	44.50	17.98
1949	156.52	144.04	6.94	40.24	30.98	46.56	19.30
1950	163.59	151.03	7.35	40.91	32.84	49.50	20.65
1951	169.11	159.64	7.75	44.61	34.99	51.02	21.28
1952	174.30	165.36	7.82	47.24	36.68	51.91	21.83
1953	176.88	168.30	8.41	48.12	37.25	52.82	21.68
1954 (2)	180.00	170.16	8.54	48.03	38.76	52.82	22.01

NOTE: (1) *To convert into acres multiply by 1.043*
" " " hectares " " 0.422

(2) *Final figures for 1954, not yet available.*

Table III. Yield of cane metric tons per arpent 1947—1954.

	1947	1948	1949	1950	1951	1952	1953	1954 (1)
ISLAND								
Millers	27.1	29.3	29.7	31.0	33.1	30.9	32.5	30.9
Planters	16.4	17.7	17.5	18.7	22.0	19.5	23.3	20.0
Average	21.4	23.2	23.3	24.6	27.3	24.8	27.6	25.1
WEST								
Millers	26.9	30.9	31.6	33.7	35.9	31.7	37.1	32.2
Planters	16.0	20.0	19.2	22.5	25.7	25.0	30.0	25.4
Average	18.2	22.2	22.5	25.5	28.4	27.3	32.4	27.7
NORTH								
Millers	24.2	25.6	28.0	31.3	36.2	30.1	35.0	30.9
Planters	15.9	17.1	16.1	19.2	23.9	18.9	26.1	21.4
Average	18.7	20.0	20.0	23.4	28.2	22.6	28.5	24.6
EAST								
Millers	26.2	30.3	31.3	32.7	36.5	33.6	34.1	29.9
Planters	15.6	16.1	17.2	16.4	20.9	19.5	22.1	17.4
Average	19.9	21.5	22.2	22.2	26.2	24.2	26.2	21.8
SOUTH								
Millers	28.5	31.0	30.2	31.0	31.4	30.7	30.8	31.1
Planters	17.4	19.5	19.7	19.4	20.1	19.6	20.4	20.0
Average	24.2	26.8	26.8	27.1	27.5	26.8	27.3	27.2
CENTRE								
Millers	27.8	27.9	28.4	28.6	30.5	29.3	30.9	31.5
Planters	18.2	18.7	17.5	19.3	20.0	18.4	21.2	19.5
Average	23.8	24.2	23.9	24.8	26.1	24.3	26.7	26.3

NOTE : (1) *Final figures for 1954 not yet available.*

(2) *to convert in metric tons/acre* x 0.959
,, *long tons/acre* x 0.945
,, *short tons/acre* x 1.058
,, *metric tons/hectare* x 2.370

Table IV. Average Sugar Manufactured % Cane 1947—1954.

Crop year	Island	West	North	East	South	Centre
1947	12.41	12.06	12.97	11.92	12.24	12.65
1948	12.40	11.85	13.56	12.31	11.82	12.35
1949	12.40	12.39	12.95	12.08	12.14	12.63
1950	12.28	12.97	13.03	12.01	11.78	12.32
1951	11.12	12.29	11.47	10.48	10.66	12.06
1952	11.42	12.12	11.94	11.08	10.94	11.92
1953	11.03	11.39	10.93	10.74	10.99	11.77
1954 (1)	11.65	11.87	11.88	11.62	11.35	11.89

NOTE: (1) *Figures for 1954 are provisional.*

(2) *To convert into: Tons cane per ton sugar manufactuted: divide 100 by above percentage.*

Table V. Sugar Production in thousand metric tons(1) 1947—1954.

Crop Year	No. of factories operating	Av. Pol	Island	West	North	East	South	Centre
1947	31	98.5	347.6	14.49	87.49	64.56	126.21	55.03
1948	29	98.4	391.7	17.17	100.20	79.78	140.84	53.69
1949	28	98.4	416.0	19.34	104.18	82.93	151.34	58.23
1950	27	98.3	456.7	24.24	124.50	87.45	157.62	62.98
1951	27	98.4	484.1	27.07	144.19	96.12	140.71	67.01
1952	27	98.5	467.8	25.92	127.75	98.43	152.14	63.06
1953	27	98.6	512.1	31.09	150.09	104.98	158.25	67.64
1954 (2)	27	98.6	498.6	28.12	140.29	98.05	163.31	68.83

NOTE; (1) *To convert into long tons multiply by 0.984.*
" " short " " 1.102.

(2) *Figures for 1954 are provisional.*

Table VI. Summary of mean fortnightly variation in sucrose % cane 1947—1953.

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
WEST												
Médine	—	12.77	13.18	13.86	14.27	14.65	14.85	14.95	14.88	14.69	14.10	—
NORTH												
Beau Plan	9.48	11.89	11.62	13.31	13.88	14.54	15.18	15.47	15.65	15.65	15.18	13.47
Belle Vue	11.00	12.49	13.12	13.81	14.25	14.96	15.51	15.96	16.05	16.05	15.62	14.26
Labourdonnais	10.68	11.95	12.99	13.52	14.04	14.71	15.21	15.62	15.95	16.14	15.59	14.56
Mon Loisir	11.33	12.49	12.99	13.51	13.84	14.34	14.83	15.21	15.14	15.15	14.80	13.85
Mount	—	12.20	12.50	13.09	13.39	13.92	14.43	14.63	14.70	14.89	14.16	13.45
Solitude	9.94	12.43	12.62	13.18	13.88	14.59	14.80	15.34	15.34	15.06	14.26	13.13
St. Antoine	11.32	12.03	12.64	13.48	14.19	14.75	15.29	15.54	15.66	15.73	15.00	14.28
EAST												
Beau Champ	11.28	11.87	12.35	12.92	13.28	13.62	13.86	13.89	13.86	13.54	13.07	12.16
Constance	—	12.44	12.96	13.49	13.87	14.25	14.55	14.48	14.34	13.67	13.75	11.88
Queen Victoria	11.76	12.43	12.76	13.15	13.42	13.79	14.06	14.14	14.20	13.98	13.28	12.02
Union Flacq	10.80	12.14	12.38	12.90	13.29	13.65	13.94	14.03	14.02	13.84	13.16	12.18
SOUTH												
Beau Vallon	—	12.43	12.77	13.30	13.37	13.56	14.10	14.10	14.18	13.69	12.94	—
Bel Ombre	—	12.31	12.83	13.09	13.27	13.63	13.88	14.16	14.28	14.20	13.69	12.21
Bénares	—	11.44	12.17	12.74	13.08	13.76	13.99	14.41	14.47	14.37	13.81	13.10
Britannia	11.62	11.98	12.39	12.41	13.15	13.53	13.70	13.73	13.78	13.46	13.03	12.45
Ferney	10.78	11.51	11.98	12.43	12.93	13.31	13.66	13.78	13.94	13.85	12.73	12.03
Mon Trésor	11.48	12.02	12.65	13.14	13.64	14.07	14.57	14.73	14.77	14.75	14.15	13.84
Riche en Eau	11.56	12.02	12.42	12.92	13.26	13.58	13.85	13.84	13.99	13.86	13.09	13.03
Rose Belle	11.62	12.51	12.96	13.34	13.72	13.96	14.14	14.12	14.05	13.94	13.59	12.83
Savinia	11.83	12.29	12.67	13.11	13.58	13.98	14.32	14.45	14.64	14.57	14.72	14.45
St. Félix	—	—	11.76	12.65	13.02	13.36	13.77	13.92	14.17	14.07	13.56	12.11
Union St. Aubin	—	10.59	12.05	12.45	12.75	13.10	13.26	13.74	13.76	13.82	13.56	12.67
CENTRE												
Highlands	—	12.89	13.58	14.64	14.00	14.22	14.37	14.43	14.47	14.36	13.88	—
Mon Désert	12.47	12.75	13.18	13.58	13.88	14.09	14.23	14.27	14.10	13.88	13.96	12.76
Réunion	—	11.67	12.75	13.03	13.22	13.98	14.26	14.22	14.13	14.03	13.74	—
Trianon	—	12.18	13.50	13.86	14.24	14.56	14.90	15.12	14.86	14.89	14.74	—
MEAN ISLAND	11.19	12.14	12.65	13.18	13.58	14.02	14.35	14.38	14.57	14.45	13.97	13.03

Table VII. Summary of mean fortnightly variations in juice purity, 1947—1953.

	JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
WEST												
Médine	—	87.7	87.1	87.9	88.7	89.1	89.0	89.2	88.9	88.7	87.7	—
NORTH												
Beau Plan	76.4	82.4	85.3	87.0	88.0	89.0	89.4	89.1	89.2	89.1	88.6	86.3
Belle Vue	78.6	84.9	86.4	87.8	88.2	88.7	88.9	88.5	88.3	88.5	87.8	86.7
Labourdonnais	81.5	84.3	88.0	89.3	89.7	90.1	90.3	90.4	90.5	90.4	89.7	89.1
Mon Loisir	82.5	86.1	87.7	88.7	89.2	89.1	89.8	89.4	88.9	88.7	88.1	87.3
Mount	—	82.8	83.9	85.9	86.3	87.8	88.6	88.7	88.5	88.4	87.9	86.0
Solitude	78.5	84.4	85.1	86.5	87.2	87.7	87.9	88.0	87.6	87.1	86.5	85.3
St. Antoine	81.0	84.3	86.6	88.1	89.0	89.1	89.2	89.1	88.6	88.4	87.8	86.2
EAST												
Beau Champ	84.3	85.8	87.2	88.0	89.3	89.7	89.8	89.8	89.2	88.6	87.9	85.8
Constance	—	82.2	85.2	86.5	87.7	88.4	88.5	88.8	87.8	87.8	85.6	82.8
Queen Victoria	84.3	87.5	87.1	88.4	89.1	89.6	90.2	89.9	89.6	88.8	87.7	86.8
Union Flacq	79.8	85.5	86.7	87.8	88.9	89.4	90.0	90.5	90.3	89.7	88.2	86.0
SOUTH												
Beau Vallon	—	86.4	87.2	89.5	89.7	90.0	90.7	90 6	90.2	89.7	88.3	—
Bel Ombre	—	86.1	87.2	88.4	89.0	89.6	89.7	90.0	89.9	89.7	88.1	86.4
Bénares	—	83.0	84.5	85.7	86.7	87.8	88.4	88.6	88.6	88.6	87.5	85.9
Britannia	83.5	85.2	86.2	87.4	88.2	88.7	89.2	89.0	89.2	88.6	87.5	86.6
Ferney	82.6	84.2	85.3	86.9	88.0	88.6	88.9	89.1	88.8	88.5	87.3	86.3
Mon Trésor	83.5	84.7	86.2	87.2	87.6	89.0	89.6	89.7	89.3	89.1	88.0	87.3
Riche en Eau	85.5	86.5	87.9	89.3	90.1	90.5	91.1	91.2	91.6	91.2	89.6	89.4
Rose Belle	86.7	87.8	88.5	90.2	90.6	90.7	90.8	90.8	90.8	90.3	89.6	88.5
Savinia	82.3	84.3	85.3	87.3	88.3	89.2	89.7	90.0	90.1	89.4	89.1	89.9
St. Félix	—	—	83.5	86.6	87.9	88.7	89.3	89.3	89.5	89.6	88.4	85.8
Union St. Aubin	—	83.6	85.7	86.7	87.6	88.2	88.5	89.4	88.8	89.1	88.1	86.4
CENTRE												
Highlands	—	87.3	88.3	89.5	90.1	90.5	91.0	91.0	90.7	90.9	88.7	—
Mon Désert	86.2	86.4	87.7	88.5	89.1	89.5	89.7	89.6	89.3	88.9	87.5	86.6
Réunion	—	85.4	87.6	88.6	89.3	90.3	90.7	90.6	90.3	89.9	89.0	—
Trianon	—	85.3	89.1	89.9	90.7	90.9	91.1	91.1	90.4	90.4	89.5	—
MEAN ISLAND	82.3	85.1	86.5	87.9	88.7	89.3	89.6	89.7	89.4	89.2	88.1	86.7

Table VIII. Monthly Rainfall in Inches. Average over whole sugarcane area of Mauritius.

	GROWTH PERIOD: deficient months in italics								NOV - JUNE (sum of monthly deficits)	MATURATION PERIOD: excess months in italics				JULY - OCT (sum of monthly excesses)
Crop Year	NOV.	DEC.	JAN.	FEB.	MAR.	APR:	MAY	JUNE		JULY	AUG.	SEPT:	OCT.	
Normals 1875-1949	3.77	7.09	11.04	11.06	12.09	9.50	6.91	4.96	15.00	4.59	4.15	2.90	2.81	2.50
Extremes:	0.52—13.18	1.74—39.92	2.69—32.46	3.07—36.04	3.35—38.98	1.45—27.60	1.62—21.41	0.97 16.49	2.20—29.20	1.62—10.23	0.60—12.52	0.69—6.41	0.76—9.83	0.00—9.40
1947	10.36	*3.42*	*8.06*	*6.83*	*4.26*	9.69	*3.50*	5.66	22.57	2.76	3.91	2.20	1.24	0.00
1948	*2.52*	*6.83*	*8.23*	*5.10*	*8.04*	12.13	*2.61*	*1.80*	21.79	4.12	2.84	3.34	*2.98*	0.61
1949	4.01	*5.48*	*4.81*	6.71	*8.86*	*7.01*	*3.30*	10.09	17.17	4.11	1.91	1.39	1.39	0.00
1950	*3.34*	*3.42*	10.20	*5.21*	23.18	11.39	*2.98*	7.02	14.72	4.47	*5.02*	2.80	2.35	0.87
1951	*3.15*	*5.86*	11.65	*8.20*	*10.89*	*7.98*	7.00	7.26	7.43	*4.91*	*5.41*	*4.16*	*3.84*	3.87
1952	4.08	*2.22*	*5.26*	*1.17*	16.88	10.11	*5.69*	*4.86*	12.31	*8.22*	*5.20*	*3.47*	*3.13*	5.61
1953	6.06	18.05	11.65	*6.59*	*10.57*	*8.35*	11.95	12.75	7.14	*10.10*	*4.72*	*3.07*	2.68	6.25
1954	*3.76*	11.47	*5.00*	*7.96*	14.89	*6.20*	*6.49*	6.06	12.88	*6.44*	*5.04*	*4.11*	1.53	3.76

NOTE: To convert into Millimiters, multiply by 25.4

Table IX. Highest wind speed during one hour in miles. Average over Mauritius.

Crop year	1949	1950	1951	1952	1953	1954
NOVEMBER	—	21	17	24	18	18
DECEMBER	18	16	24	21	15	16
JANUARY	27	26	21	22	18	28
FEBRUARY	20	24	20	25	15	15
MARCH	20	17	18	25	15	15
APRIL	18	21	17	22	20	16
MAY	20	19	20	24	22	22
JUNE	24	20	23	25	23	20
JULY	21	23	21	20	24	16
AUGUST	18	19	24	25	24	23
SEPTEMBER	20	21	21	21	20	19

NOTE: (1) *No winds of cyclonic origin (above 30 miles per hour during one hour) occurred during the period under review.*

(2) *to convert into : knots multiply by 0.87*
kilometres/hr. multiply by 1.61
metres/sec. muliiply by 0.45.

Table X. Production and Utilisation of Molasses.

Year	Production M. Tons	Exports M. Tons	Used for production of alcohol M. Tons	Available as Fertilizer M. Tons	NPK equivalent in molasses available as fertilizer Metric Tons		
					N	P_2O_5	K_2O
1948	85,308	—	42,640	42,768	222	107	2,198
1949	96,670	1,867	41,728	53,075	276	133	2,728
1950	98,496	79	25,754	72,643	378	182	3,734
1951	125,819	3,601	44,896	77,322	402	193	3,974
1952	113,756	40,537	29,878	43,339	225	108	2,228
1953	141,449	67,848	16,037	57,564	299	144	2,958

NOTE : *Approximate export of molasses in 1954 amounted to 90,000 metric tons.*

Table XI. Variety Trend in Mauritius 1930—1953

% Area Cultivated

	Tanna	M. P. seedlings 55,131	Demerara seedlings DK.74, D 109 D 130, RP6 RP8	POJ 2878	BH 10/12	M. 134/32	Other M. seedlings	Ebène 1/37
1930	57	10	16	—	2		—	—
1935	48	7	16	1	13	—	—	—
1940	29	1	1	5	40	2	5	—
1944	5	—		2	27	37	7	—
1950		—	—	—	—	91	6	—
1953	—	—		—	—	86	5	8

Table XII. Area planted under different cane varieties on sugar estates in 1954.

Varieties	Island		West		North		East		South		Centre	
	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
M. 134/32	5577	50.0	263	16.7	1764	89.5	1064	62.2	2057	41.1	430	20.0
M. 134/32 (white)	56	0.5	56	78.0	—	—	—	—	—	—	—	—
M. 112/34	236	2.1	—	—	111	5.6	37	2.2	22	0.4	66	3.1
Ebene 1/37	2949	26.5	—	—	13	0.7	329	19.2	1514	30.3	1092	50.7
B. 3337	1111	10.0	—	—	—	—	111	6.5	652	13.0	347	16.1
B. 37161	610	5.5	3	0.8	41	2.1	101	5.9	289	5.8	177	8.2
B. 37172	420	3.8	—	—	25	1.3	35	2.1	351	7.0	8	0.4
Other varieties	245	1.6	15	4.5	18	0.8	32	1.9	137	2.4	44	1.5
Total	11204	—	337	—	1972	—	1709	—	5022	—	2164	—

Table XIII. List of croses.

(a) REDUIT 1953.

CROSS			Number of crosses made	Number of seedlings obtained
B. 3337	x	Ebene 1/37	1	
,,	x	P. O. J. 2878	2	1
B. 3439	x	M. 63/39	1	[illegible]
B. 34104	x	Co. 419	2	5
,,	x	C. P. 36 — 105	2	0
,,	x	C. T. B.	1	2[illegible]
,,	x	Ebene 1/37	2	5
,,	x	M. 171/30	1	4
,,	x	M. 63/39	3	3700
,,	x	M. 423/41	2	1500
,,	x	P. O. J. 2878	1	1
B. 37161	x	B. 4098	1	0
,,	x	Co. 419	2	237
,,	x	Ebene 1/37	3	18
,,	x	M. 336	2	5
,,	x	M. 72/31	1	0
,,	x	M. 99/34	2	224
,,	x	M. 63/39	3	375
,,	x	M. 423/41	2	160
,,	x	P. O. J. 2878	3	20
Co. 281	x	Ebene 1/37	2	38
,,	x	M. 336	1	2
,,	x	M. 63/3 9	5	615
Co. 290	x	Ebene 1/37	2	0
,,	x	M. 63/39	2	720
Co. 421	x	M. 383/41	1	745
,,	x	P. O. J. 2940	1	30
C. P. 34 — 120	x	D. 109	1	2
C. P. 36 — 13	x	D. 109	1	22
Ebene 1/37	x	Co. 290	3	480
,,	x	Co. 419	3	350
,,	x	M. 63/39	3	2900
,,	x	M. 242/47	1	140
M. 336	x	M. 63/39	1	1700
,,	x	P. O. J. 2940	1	120
M. 73/31	x	Co. 419	1	5
M. 134/32	x	Co. 290	5	130
,,	x	Co. 419	3	2188
,,	x	C. P. 36 — 105	1	4
,,	x	Ebene 1/37	4	242
,,	x	M. 336	2	85
,,	x	M. 171/30	2	150
,,	x	P. R. 905	1	61
,,	x	S. C. 12/4	2	14
M. 112/34	x	B. 4098	1	33
,,	x	Co. 290	3	300
,,	x	Co. 419	3	757
,,	x	C. P. 36 — 105	1	13
,,	x	M. 171/30	1	200
,,	x	M. 63/39	5	8825
,,	x	M. 76/39	3	90
,,	x	213/40	1	0

CROSS			Number of crosses made	Number of seedlings obtained
M. 112/34	x	P. R. 905	1	500
M. 311/41	x	M. 336	1	0
M. 377/41	x	Co. 419	1	19
,,	x	C. P. 36 — 105	1	1
,,	x	M. 383/41	1	3
M. 126/42	x	S. C. 12/4	1	0
M. 11/43	x	Co. 419	2	55
,,	x	C. T. B.	1	17
,,	x	Ebène 1/37	2	554
,,	x	M. 27/16	1	1000
,,	x	M. 63/39	2	466
,,	x	M. 76/39	1	4
,,	x	M. 423/41	3	760
,,	x	M. 31/45	1	27
,,	x	M. 194/46	1	23
,,	x	M. 101/46	1	4
M. 24/47	x	Co. 419	2	140
,,	x	Ebène 1/37	1	50
,,	x	M. 336	1	1500
,,	x	M. 27/16	1	450
,,	x	M. 72/31	1	1300
,,	x	P. O. J. 2940	1	1800
,,	x	S. C. 12/4	1	25
M. 241/47	x	Ebène 1/37	1	190
,,	x	S. C. 12/4	1	240
M. L. 3 — 18	x	D. 109	1	85
,,	x	M. 27/16	1	1500
,,	x	M. 63/39	1	900
P. O. J. 2727	x	Co. 419	1	0
P. O. J. 2878	x	B. 34104	1	16
,,	x	Co. 290	2	4500
,,	x	D. 109	5	333
,,	x	M. 171/30	2	48
,,	x	S. C. 12/4	1	14
		Total	150	44,369

(b) PAMPLEMOUSSES 1953

B. 3439	x	M. 63/39	2	3000
,,	x	M. 76/39	1	1400
,,	x	M. 423/41	1	0
B. 34104	x	Ebène 1/37	2	415
,,	x	M. 63/39	2	925
,,	x	M. 423/41	2	30
,,	x	P. O. J. 2878	2	25
B. 37172	x	Co. 419	2	20
,,	x	Ebène 1/37	2	12
,,	x	M. 63/39	1	45
,,	x	M. 432/41	1	50
C. P. 34 — 120	x	B. 4098	2	210
,,	x	D. 109	1	0
,,	x	M. 72/31	1	0
C. P. 36—13	x	D. 109	1	0
,,	x	M. 72/31	1	420

CROSS			Number of crosses made	Number of seedlings obtained
C. P. 36/13	x	M. 99/34	1	1500
"	x	M. 63/34	1	319
"	x	P. O. J. 2940	1	80
Ebene 1/37	x	M. 63/39	3	1975
"	x	Selfed	1	64
M. 336	x	B. 4098	2	1450
"	x	Ba. 11569	1	0
"	x	D. 109	1	0
"	x	M. 171/30	2	0
M. 336	x	M. 72/31	2	2055
"	x	M. 76/39	2	470
M. 134/32	x	Co. 419	2	18
"	x	C. P. 36/105	1	39
"	x	Ebene 1/37	2	515
M. 112/34	x	M. 63/39	3	4220
"	x	M. 76/39	3	1351
M. 11/43	x	Ebene 1/37	1	338
"	x	M. 72/31	1	22
"	x	M. 63/39	2	500
"	x	423/41	2	150
M. 129/43	x	B. 4098	1	0
"	x	D. 109	1	20
"	x	Ebene 1/37	3	68
"	x	M. 171/30	3	125
"	x	M. 63/39	2	885
"	x	423/41	1	0
M. 60/44	x	M. 72/31	1	220
M. 61/44	x	M. 72/31	1	350
M. 24/47	x	Ebene 1/37	3	295
"	x	M. 73/39	1	130
"	x	P. O. J. 2940	1	1600
P. O. J. 2878	x	B. 34104	2	32
"	x	D. 109	2	25
"	x	M. 171/30	2	140
		Total	82	23,310

(c) REDUIT 1954

B. 3439	x	M. 63/39	1	80
"	x	M. 147/44	1	300
"	x	P. R. 905	1	0
B. 34104	x	Co. 419	2	0
"	x	D. 109	1	70
"	x	D. K. 74	1	0
"	x	Ebene 1/37	3	70
"	x	M. 63/39	4	410
"	x	M. 147/44	1	30
B. 34104	x	M. 99/48	1	0
"	x	M. 381/51	1	0
"	x	P. O. J. 2961	1	0
"	x	P. R. 905	1	10
B. 37161	x	Ebene 1/37	4	0
"	x	M. 63/39	1	16
"	x	M. 423/41	3	100

CROSS			Number of crosses made	Number of seedlings obtained
B. 37161	x	M. 147/44	2	2
,,	x	P. O. J. 2878	4	0
,,	x	P. R. 905	2	3
B. 37172	x	Ebene 1/37	3	16
,,	x	M. 63/39	3	31
,,	x	M. 423/41	3	568
,,	x	M. 147/44	2	4
Co. 213	x	P. O. J. 2878	1	0
Co. 281	x	D. 109	1	50
,,	x	M. 63/39	3	60
,,	x	P. R. 905	1	0
Co. 421	x	D. 109	1	0
Ebene 1/37	x	Co. 290	1	2
,,	x	Co. 419	1	5
,,	x	D. 109	2	850
,,	x	M. 63/39	4	2410
,,	x	M. 147/44	1	600
,,	x	P. R. 905	2	12
Glagah Kepandjen		selfed	1	56
Glagah Kloet		,,	2	200
Glagah Mauritius		,,	1	0
Glagah Passoeroean		,,	2	279
131 P.	x	Glagah Kepandjen	1	0
,,	x	,, Mauritius	1	115
55/1182	x	Ebene 1/37	1	0
,,	x	P. O. J. 2878	1	0
,,	x	P. R. 905	1	0
M. 134/32	x	B. 34104	3	0
,,	x	B. 37172	2	0
,,	x	B. 4098	2	0
,,	x	Co. 419	3	16
,,	x	Ebene 1/37	5	19
M. 134/32	x	M. 336	2	6
,,	x	M. 171/30	1	0
,,	x	M. 147/44	1	8
,,	,,	P. R. 905	2	5
M. 112/34	x	B. 34104	2	0
,,	x	B. 4098	1	3
,,	x	Co. 419	2	1
M. 112/34	x	M. 336	3	31
,,	x	M. 63/39	1	50
,,	x	M. 76/39	2	1
,,	x	M. 213/40	3	855
,,	x	M. 147/44	1	30
,,	x	M. 24/47	2	6
,,	x	M. 98/48	1	0
,,	x	M. 381/51	1	0
,,	x	P. R. 905	2	3
M. 186/37	x	D. 109	1	56
,,	x	M. 336	1	0
M. 165/38	x	P. O. 290	2	0
,,	x	Ebene 1/37	1	14
M. 241/40	x	D. 109	1	0
,,	x	Ebene 1/37	2	5
,,	x	P. R. 905	1	32
M. 11/43	x	B. 34107	2	0
,,	x	Ebene 1/37	2	11

CROSS			Number of crosses made	Number of seedlings obtained
M. 11/43	x	M. 63/39	2	2
,,	x	M. 147/44	1	0
,,	x	P. R. 905	1	0
M. 197/46	x	D. 109	1	15
,,	x	P. R. 905	2	16
M. 24/47	x	B. 34104	2	0
,,	x	Co. 290	2	0
,,	x	M. 336	1	0
,,	x	S. C. 12/4	1	700
M. 63/47	x	Co. 290	1	0
,,	x	D. 109	1	24
,,	x	Ebène 1/37	1	28
M. 279/51	x	Ebène 1/37	1	16
M. 381/51	x	M. 147/44	1	0
,,	x	S. C. 12/4	1	0
Mapou Perlée	x	Glagah Kletak	1	24
M. L. 3 — 18	x	M. 63/39	1	80
,,	x	M. 76/39	2	7
P. O. J. 2364	x	P. O. J. 2878	2	0
P. O. J. 2878	x	Co. 213	2	140
,,	x	Co. 290	3	90
,,	x	D. K. 74	2	2
		Total	164	8,645

(d) PAMPLEMOUSSES 1954.

B. 34104	x	D. 109	2	53
,,	x	Ebène 1/37	2	78
,,	x	M. 336	2	76
,,	x	M. 63/39	5	1169
,,	x	M. 423/41	1	640
,,	x	M. 147/44	2	295
,,	x	P. O. J. 2878	1	8
,,	x	P. R. 905	3	262
B. 37161	x	M. 63/39	2	71
B. 37172	x	Ebène 1/37	2	74
,,	x	M. 63/39	2	1417
Ebène 1/37	x	Co. 419	1	110
,,	x	M. 63/39	4	5450
,,	x	M. 147/44	3	440
,,	x	P. R. 905	3	220
M. 134/32	x	B. 34104	3	303
,,	x	B. 4098	2	28
,,	x	Co. 419	2	262
,,	x	Ebène 1/37	3	381
,,	x	M. 336	2	105
,,	x	M. 147/44	4	1219
,,	x	P. O. J. 2961	2	21
,,	x	P. R. 905	2	170
M. 112/34	x	M. 336	1	700
,,	x	M. 24/47	2	648
M. 11/43	x	B. 34104	2	12
M. 11/43	x	Ebène 1/37	2	231
,,	x	M. 63/39	4	728

CROSS			Number of crosses made	Number of seedlings obtained
M. 11/43	x	M. 147/44	2	39
,,	x	P. R. 905	2	460
M. 129/43	x	D. 109	1	100
,,	x	Ebene 1/37	3	17
,,	x	M. 63/39	4	402
,,	x	M. 147/44	3	45
M. 61/44	x	M. 336	1	36
,,	x	P. R. 905	1	3
M. 147/44	x	M. 336	2	246
,,	x	B. R. 905	1	327
M. 24/47	x	B. 34104	1	22
,,	x	M. 147/44	1	280
,,	x	P. O. J. 2940	1	630
,,	x	P. R. 905	2	295
M. L. 3 — 18	x	D. 109	2	490
,,	x	M. 63/39	5	14,300
,,	x	M. 147/44	2	1,242
P. O. J. 2878	x	B. 34104	2	210
,,	x	M. 147/44	2	1,800
,,	x	S. C. 12/4	1	52
		Total	105	36,167

Table XIV. Variety Collection at Réduit Experimental Station.

VARIETY	PARENTAGE
B. 3390	D. K. 74 open cross
B. 6308	T. 24 ,,
Ba. 2471	B. 3390 ,,
Ba. 6032	B. 7169 ,,
Ba. 7924	B. 6835 ,,
Ba. 8846	B. 6450 ,,
Ba. 11569	B. 16536 ,,
B. H. 10/12	B. 6835 X B. 4578
B. 3337	B. (30) L 7 selfed
B. 3439	Ba. 11569 X a nobilization of P.O.J.2364
B. 34104	Co. 281 X B. H.10/12
B. 37161	B. 603 X B. 3365
B. 37172	P.O.J.2878 selfed
B. 4098	B. 3439 X Co. 290
Badila	Natural variety
Bambou Blanche	Local Sport of Bambou Rayée
Bambou Rayée	Unknown
Beau Bois	Sport of B.H.10/12
Black Cheribon	Natural variety
Bois Rouge	Unknown
Branchue Rayée	Sport of Branchue
Chalain	Unknown
Co. 213	P.O.J.213 X Kansar
Co. 281	P.O.J.213 X Co. 206
Co. 290	Co. 221 X D. 74
Co. 301	Co. 213 X P. O. J. 1499
Co. 419	P.O.J.2878 X Co. 290
Co. 421	P.O.J.2878 X Co. 285
Côte d'Or Rayée	Unknown
C. P. 34—120	Co. 281 X P. O. J. 2878
C. P. 36—13	P.O.J.2725 X ?
C. P. 36—105	Co. 281 X C. P. 1165
Cent Tonnes Batard (C.T.B.)	P.O.J.2878 X Uba Marot (probably)
D. 109	White Transparent open cross
D. 109 Striped	Sport of D. 109
D. 109 White	,,
D. 130	Red Ribbon open cross
D. 625	?
D. 1135	D. 103 open cross
D. I. 52.	Black Cheribon X Batjan
D. K. 74	White Transparant open cross
Ebène 1/37	Ebène 1/34 X M. 27/16
Ebène 26/42	P.U.M.B.H.* X S.C. 12/4 X P.O.J.2878
Erianthus sara (= Saccharum munja)	Natural species
Fotiogo (Fichiogo)	Unknown
Gros Genoux	,,
H. 109	Lahaina open cross
Iscambine	Unknown
Iscambine Rayée	Sport of Iscambine
John Bull	Unknown
Knox	,,

**P.U.M. B.H.=P.O.J.2878 X Uba Marot X B.H.10/12.*

VARIETY	PARENTAGE
Lousier (Otaheite)	Sport of Mignonne
Lousier Rayée	Sport of Lousier
M. 336	M. 28 X P.O.J.2878
M. 23/16	John Bull open cross
M. 27/16	131 P. ,,
M. 27/16 Striped	Sport of M. 27/16
M. 29/16	131. P. open cross
M. 35/17	D. K. 74 open cross
M. 13/18	55 P. ,,
M. 33/19	D. K. 74 ,,
M. 26/20	790 ,,
M. 7/23	55 P. ,,
M. 14/26	,, ,,
M. 109/26	R.P.6 ,,
M. 108/30	P.O.J.2878 X Uba Marot
M. 171/30	R.P.6 X M. 27/16
M. 171/30 Striped	Sport of M. 171/30
M. 72/31	P.O.J.2878 X M. 35/17
M. 73/31	P.O.J.2878 X M. 109/26
M. 140/31	,, X Senneville
M. 196/31	,, X Uba Marot
M. 134/32	,, X D. 109
M. 134/32 Striped	Sport of M. 134/32
M. 134/32 White	,, ,,
M. 167/32	P.O.J.2878 X Uba Marot
M. 168/32	,, ,,
M. 2/33	55 P. X R.P.6
M. 168/33	M. 109/26 X M. 27/16
M. 188/33	P.O.J.2878 X B.H.10/12
M. 211/33	R.P.6 X M. 23/16
M. 213/33	,, ,,
M. 99/34	M. 109/26 X Uba Marot
M. 112/34	R.P.8 X P.O.J.2878
M. 36/35	P.O.J.2878 X M. 109/26
M. 84/35	M. 109/26 X M. 196/31
M. 95/35	M. 20/16 X P.O.J.2961
M. 177/35	M. 14/32 X ,,
M. 185/35	,, ,,
M. 7/36	R.P.6 X M. 72/31
M. 64/36	Ba. 11569 X M. 72/31
M. 144/36	R. P. 6 X M. 72/31
M. 5/38	M. 171/30 X S.C. 12/4
M. 29/38	M. 134/32 X M. 13/18
M. 47/38	,, X M. 196/31
M. 165/38	,, X ,,
M. 63/39	,, X M. 99/34
M. 76/39	,, ,,
M. 204/40	Ba. 11569 X M. 72/31
M. 213/40	M. 134/32 X M. 99/34
M. 233/40	,, ,,
M. 241/40	,, X Co. 290
M. 143/41	M. 73/31 X M X. 20/32
M. 311/41	M. 134/32 X M. 23/16
M. 377/41	M. 168/32 X B.H.10/12
M. 423/41	M. 134/32 X M. 99/34
M. 126/42	,, X C. T. B.

VARIETY	PARENTAGE
M. 11/43	Ba. 11569 X M. 72/31
M. 147/44	Co. 281 X M. 63/39
M. 31/45	M. 134/32 X 99/34
M. 24/47	M. 112/34 X M. 63/39
M. 63/47	M. 143/42 X ,,
M. 211/53	B. 37161 X Ebène 1/37
Mapou Perlée	Unknown
Mignonne	Sport of one of Caldwell's New Caledonian canes.
M.L.3—18	P.O.J.2878 X S. C. 12/4
N. G. 89	Unknown
N. G. 89 White	Sport of N.G.89
33 P. (M. 33 or M. P. 33)	Penang open cross
55 P. (M. 55 or M. P. 55)	,, ,,
87 P. (M. 87 or M. P. 87)	,, ,,
131 P. (M. 131 or M. P. 131 or Small 131 P.)	Guinghan ,,
55/1182	55. P. open cross
Penang (Salangor)	Unknown
P. O. J. 36	Str. Preanger X Chunnee
P. O. J. 161	Bl. Cheribon X Chunnee
P. O. J. 213	Bl. Cheribon X Chunnee
P. O. J. 2364	P.O.J.100 X Kassoer
P. O. J. 2727	P.O.J.2364 X Batjan
P. O. J. 2878	,, X E. K. 28
P. O. J. 2940	P.O.J.2722 X ,,
P. O. J. 2961	P.O.J.2878 X P.O.J.2940
Port Mackay (= Red Ribbon)	Unknown
Port Mackay Black	Sport of Port Mackay
P. R. 905	M. 28 X P.O.J.2878
R. F. No. 1 (= Uba Riche Fond)	Uba Open Cross
Rose Bambou (= White Transparent and Light Preanger)	Unknown
R. P. 6	D. 625 X a sport of B.208
R. P. 6 Striped	Sport of R. P. 6
R. P. 8	B. 208 X D. 145
R. P. 8 White	Sport of R. P. 8
R. P. 73	D. 145 X B. 208
Saccharum robustum	Natural species
Saccharum spontaneum (7 clones)	,,
S. C. 12/4	B. 6835 X B. 4578
Sealey's seedling	D. 74 Open Cross
Senneville	Unknown
Sin Nombre	,,
Sylva	,,
S. W. 499	Bl. Cheribon X Batjan
Tamarin	Sport of New Caledonia cane
Tanna Black	Sport of Striped Tanna
,, Mon Desert	Sport of White Tanna
,, St. Aubin	Sport of ?
,, St. Felix	Sport of White Tanna
,, Striped	Natural variety
,, White (=Yellow Caledonia)	Sport of Striped Tanna

VARIETY	PARENTAGE
Tombiapa	Unknown
Uba	Natural variety
Uba Iscambine	Uba X Iscambine
Uba Marot (= Gros Cailloux)	131P. X. S. *spontaneum* (natural cross)
Uba Rayée	Unknown
Uba Seedling No. 4	Uba X 55 P.
Uba Seedling Brown Sport	Sport of Uba seedling No. 4
" White Sport	" "

Varieties released from Quarantine in 1954

B. 41227	B. 35207 X P. O. J. [illegible]78
Pindar	Co. 270 X 33 M. Q. 157
P. O. J. 3016	P. O. J. 2878 X P. O. J. 2940
R. 366	P. O. J. 2878 X Uba Marot X Co. 281
R. 397	" " "
Trojan	Co. 270 X 27 M. Q. 1124

Varieties in the Quarantine Glasshouse, 1954

B. 4362	B. 37161 X P. O. J. 2878
Co. 779	Co. 421 X P. O. J. 2878 X Co. 299
Co. 9[illegible]1	Co. 603 X P. O. J. 2725 X Imperata
E.P.C. 39—393	M. C. 103/37 X E. P. C. 38 — 304
H. 37 — 1933	H. 32 — 8560 X H. 34 — 1874
N.Co.310	Co. 421 X Co. ~~312~~ 213
Pepe Cuca	P. O. J. 2878 X Co. 281
P. R. 1000	" "
Q. 44	Unknown
Q. 47	Co. 290 X P. O. J. 2878
Q. 57	Q. 27 X Q. 31
27 M. Q. 1124	Korpi selfed
28 M. Q. 1370	Badila X Q. 813
U. S. 48 — 34	G. 1051 selfed