1918.

QUEENSLAND.

EIGHTEENTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

(AS REQUIRED BY "*THE SUGAR EXPERIMENT STATIONS ACT OF* 1900").

Presented to both Houses of Parliament by Command.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

SIR,—I have the honour to submit the Annual Report of the General Superintendent of Sugar Experiment Stations up to the end of October, 1918.

Brisbane, 22nd October, 1918.

E. G. E. SCRIVEN,
Director.

The Annual Report of the Bureau for this year includes :—

1.—INTRODUCTION.

It is proposed this year to make the Annual Report as brief as possible in view of the paper shortage and the necessity for economy.

The anticipations in last year's Report that Queensland would manufacture some 346,000 tons of sugar were not realised. This was due to three causes :—

(*a*) Mills being delayed for want of lime and bags due to industrial strife in the Southern States ;

(*b*) To an early and abnormal wet season in many districts preventing an extension of the crushing into February ; and

(*c*) The cyclone at Mackay.

The tremendous crop of last year was due to several causes, the chief being the large amount of standover cane from 1916 and the extremely favourable growing weather of 1917. Although the full tonnage was not secured, the 1917 crop was easily the best that Queensland has yet seen, the total amount of raw sugar manufactured being 307,714 tons or 64,877 tons in excess of the last record year—viz., 1913. In reality some 313,000 tons of raw sugar were made, but approximately 6,000 tons were destroyed in the January cyclone at Mackay and the floods which accompanied that disaster. But for shipping delays last year, the whole of the sugar would have been removed and this great loss would not have occurred. It should remain an object lesson on the advantages of the rapid getting away of sugar stocks before the wet season sets in. Fortunately, this year no stocks have so far accumulated. It is seldom that a good season is experienced in all the sugar districts at the same time, but this happened both in 1913 and 1917. Practically every mill was supplied to its utmost capacity or over-supplied.

The yield of Queensland sugar in 1917 taken with that produced in New South Wales exceeded the consumption by about 60,000 tons. This amount is held in stock by the Federal Government, the purchasers of the sugar; and every pound of it will probably be needed to make up the deficiency that will occur in this year's crops.

2.—APPROXIMATE ESTIMATES OF THE 1918 CANE CROP.

At the commencement of the present year the outlook for another large yield of sugar was highly promising, and it was generally anticipated that, if not a record, the year would approach its predecessor very closely. The severity of the cyclones at Mackay, Babinda, and Innisfail, floods in these and other districts, severe frosts from Mackay southward, and an entire absence of favourable growing weather have operated to so large an extent that the estimated surplus will now result in a shortage. At Mackay the cane suffered quite as much from the terrific rainfall in January and February as from the cyclone itself, the fall for six weeks amounting to 91 inches, the greater part of which fell during the cyclone week. Portions of this district have also been more or less severely affected by frost. At Babinda and Innisfail the cane was much farther forward at the time of the cyclone in March than it was in the January cyclone at Mackay, and suffered a great deal more damage from the actual wind. The cane on the Herbert River and Proserpine did not suffer nearly so much from the cyclonic blows, but rain and floods interfered a great deal with its growth. At Cairns and Mossman the want of suitable canegrowing weather has largely reduced the crops, the climatic conditions having been too cool. On the Lower Burdekin there was an immense crop in the early part of the year, a large proportion of which was standover, but owing to long-continued dry weather a great part of this died. It was at one time doubtful if all the cane in the district could be crushed this year, but it is generally anticipated now that the whole of it can be treated. At Bundaberg and Childers the crops are better than elsewhere, but the severe frosts experienced at the former place have also led to a reduction in the sugar yield at that place.

The following are the estimates of the amount of cane to be crushed as supplied by the various mills during the present month; they are, of course, only approximate at this stage. A rough approximate estimate made in March is also furnished to show the falling off :—

Mill.	Rough Approximate Estimate made in March.	Approximate Estimate in October, furnished by the Mills.	Remarks.
	Tons.	Tons.	
Mossman	62,000	54,000	
Babinda	95,000	112,000	
Hambledon	85,000	70,000	
Mulgrave	70,000	58,000	
South Johnstone	50,000	55,000	
Goondi	60,000	50,000	
Mourilyan	35,000	40,000	
Victoria	100,000	85,000	
Macknade	100,000	80,000	
Kalamia	150,000	96,000	
Pioneer	140,000	110,000	
Inkerman	160,000	130,000	
Proserpine	63,000	58,000	Part from the Lower Burdekin.
Plane Creek	38,000	35,000	
Homebush	40,000	34,000	
Cattle Creek	35,000	30,000	
North Eton	30,000	24,000	
Marian	65,000	35,000	
Farleigh	35,000	25,000	
Racecourse	35,000	24,000	
Palms	19,000	..	Cane sent to Pleystowe.
Pleystowe	53,000	45,000	Including Palms cane.
Baffle Creek	7,000	7,000	
Miara	2,000	..	Closed down.
Waterloo	5,000	2,680	
Qunaba	55,000	50,000	
Millaquin	80,000	65,000	
Bingera	75,000	55,000	
Fairymead	90,000	84,000	
Gin Gin	26,000	24,000	
Invicta	20,000	13,100	Loss by frost estimated at 7,000 tons.
Doolbi	35,000	25,000	
Isis Central	45,000	48,000	
Childers	90,000	107,000	
Maryborough	20,000	13,000	
Mount Bauple	32,000	26,500	
Moreton	25,000	16,000	
Logan and Nerang	20,000	15,000	
Totals	2,147,000	1,801,280	

The above figures are approximate only. Taking the tons of cane at 1,801,280, and assuming that the average tons of cane required to make 1 ton of sugar will be $8\frac{3}{4}$, then a yield in

the region of 206,000 tons of sugar should be realised, providing matters run smoothly till the end of the crushing season. This will be about 101,000 tons less than last year. The price of raw sugar remains at £21 per ton, so the value to Queensland should be £4,326,000. Taking the output of New South Wales and Victoria (beet) at 20,000 tons, this would give the yield of Australian sugar at 226,000 tons. This is in terms of raw sugar. The approximate shortage would be somewhere about 57,000 tons, taking the consumption as given recently by the Commonwealth as 283,000 tons. This figure is largely in excess of the last two years and evidently accounted for by the large export of sugar in jam.*

3.—GENERAL WORK AND BRIEF SUMMARY OF SUGAR DISTRICTS.

The work of the General Superintendent and Field Assistant has continued upon the same lines as heretofore.

Mr. A. P. Gibson resigned in May last, and his services will be very much missed. He was a conscientious, loyal officer, and performed his duties with considerable ability.

Following Mr. Gibson's resignation a returned soldier, Lieut. J. C. Murray, has been appointed on probation. Mr. Murray is now visiting North Queensland, and is carrying out his duties in a satisfactory manner.

In addition to the advising of growers on methods of cultivation and rotation of crops, observations have also been made by the Field Assistant upon sugar-farms generally, comprising notes on soils and their testing for alkalinity and acidity, details of crops, use of lime, green manures, and fertilisers, drainage, irrigation, notes on weather, ploughing, planting, cultivation, harvesting, ratooning, labour, pests, varieties of cane, arrowing of cane, disposal of trash, &c. This will facilitate the giving of advice to growers by the General Superintendent in a marked degree.

So far reports upon 967 farms have been sent in. Upon these 82 farmers have used lime, 230 have practised green manuring, and 256 have used fertilisers. The percentage of growers using lime, green manures, and fertilisers is much higher on Northern sugar farms than it is in the South. In the cane soils submitted to the Agricultural Chemist for analysis, it is found that acidity is predominant.

The proportion of farmers using lime, green manures, and fertilisers is thus shown to be relatively small as far as the observations have gone.

During the year the General Superintendent has paid numerous visits to the sugar districts and delivered addresses at a number of centres on cane cultivation. A paper upon "The Australian Sugar Industry" was prepared and read before the Conference of Agriculturists called by the Advisory Council of Science and Industry to the Commonwealth, at Melbourne, to consider Agricultural Research in Australia. Papers on fertilisation and cultivation of sugar-cane were also read before the Conferences of the United Cane Growers of Australia and the Australian Sugar Producers' Association.

The initiation and supervision of the experimental work carried out at Bundaberg and Mackay take up a great deal of time, and this work will be added to in the future by the new Northern Experiment Station at South Johnstone, Innisfail, the buildings for which are now in course of erection. Correspondence, advising canegrowers, and the collection of data in connection with the industry have also to be attended to.

Brief Survey of Sugar Districts.

Mossman.—One mill. Crops cutting out lighter than anticipated. Mill expects to finish this month. Plantings for next year good, young cane looking well. D 1135, which was the favourite cane, is now taking second place, the Clark's Seedling or H.Q. 426 being favoured. Rats are very troublesome, and some means of fighting this pest are badly needed.

The cane borer parasite (the Tachinid fly) is present in large numbers on the Mossman, and the larvæ are being brought down by the Entomologist to the Sugar Bureau (Dr. Illingworth) and bred and distributed to districts below Mossman which are suffering abnormally this year from attacks of the weevil, or, as it sometimes called, New Guinea borer.

Cairns.—Three mills. On the 10th and 11th March of this year a most disastrous cyclone struck the Babinda district between Cairns and Innisfail. Apart from the damage to buildings, which was great, the cane crop suffered severely, as it was partly destroyed and lay about all over the ground shooting from every eye. The giant scrubs were badly knocked about, tangled, and blown over, so that instead of the inpenetrable jungle that usually meets the eye it was possible to see for very great distances. At Mulgrave and Hambledon the effects of this cyclone were not greatly felt. The mills are now all working, but the crops at the two latter places are cutting out on the light side, while at Babinda it is estimated that 70,000 tons of cane were lost as a result of the cyclone. New Guinea borer or weevil borer is doing a great amount of damage, principally to the Badila cane, a variety which, on account of its soft nature, particularly lends itself to attacks. Damage is also resulting at Mulgrave, and the Entomologist to the Bureau (Dr. Illingworth) has the matter in hand.

* Since the above estimate was in type some of the Mackay mills have closed for the season with a still smaller tonnage than they anticipated, so it is probable that the yield of sugar will be even less than 206,000 tons.

Johnstone River.—Three mills. The cyclone mentioned above apparently struck the Innisfail district with its full fury, and a large number of deaths occurred, principally through falling houses.

Very little damage was caused to the South Johnstone Mill, but the officers' houses and quarters at the latter place were totally wrecked. The cane, while perhaps not quite so severely damaged as at Babinda, has nevertheless suffered considerably, and it is estimated that the loss will be about 50 per cent. Here also the sticks have shot badly at the eyes, and rooting is taking place, while weeds (particularly blue top) are coming up vigorously all through the fallen cane.

Contrary to the usual custom, very little arrowing took place on the Johnstone River this year.

The Daraji cane was not so much affected by grubs this season. The plantings for next year have been fair to good, and the germination satisfactory on the whole. Owing to labour troubles, however, some of the fields present a dirty appearance, a good deal of couch grass and other weeds being much in evidence.

Herbert River.—On the Herbert River the crops were also disappointing, though much better than at Innisfail or Babinda. The plantings for next season have been fair, but the germination in places was not too good, and many of the fields were weedy. A large amount of H.Q. 426 or Clark's Seedling is in evidence on this river, but unfortunately it is developing gum in many parts. Owing to its high density, this is a favourite cane under the new conditions brought about by the regulation of cane prices, and it will be a regrettable fact if this cane does not possess sufficient stamina to throw off disease. A good deal of subsequent cultivation is done with the plough in this district, and, while a cheap and easy method of getting rid of weeds, is not to be recommended in comparison with frequent shallow cultivations, provided the original seed bed has been properly prepared.

At Macknade the interesting experiments of the Colonial Sugar Refining Company carried out by the Manager (Mr. Wilkinson) were inspected. These consist of planting various portions of the stick of cane, and the results appeared to be working out uniformly. A large number of new Papuan varieties and Fiji seedlings were also seen. It is expected that next year's crushing at Macknade will not equal this season's. The strike around Halifax has not been too good in places. The foreign element is largely in evidence on this river principally Italian, but there a large number of Greeks, Russians, and Maltese also present. The Ripple Creek Plantation is now almost wholly in the hands of Italians, who are a much better class than many of the other nationalities represented.

Lower Burdekin.—Three mills. A large amount of standover cane was left over from last year's crushing. Heavy rains fell in January, causing floods, but no rain of value has since fallen, and the consequence is that the whole district is experiencing arid conditions. This has had a most prejudicial effect on the crops, portions of which have commenced to die out, particularly the standover crops left from last season. One mill in this locality, which had estimated 150,000 tons as its crop for this year, has already reduced that amount by 25,000 tons, and other mills have been obliged to considerably curtail their expected tonnages. Some time ago it was considered impossible for the three Lower Burdekin mills, even with the assistance of the Proserpine mill, to crush the tremendous crop in sight, but it is now believed that there will be no difficulty in getting through the whole of the cane in a reasonable time, so great has the damage been through excessive dryness. The Inkerman irrigation work is progressing as quickly as possible. On the Haughton River there were some good crops, and the cane in this locality is standing better than at Ayr. There will be some 45,000 tons of cane to be harvested in this area, principally Badila, B 208, H.Q. 426, and N.G. 24B. The sugar content of the cane on the Lower Burdekin is good as a whole; one farmer at Kalamia was sending in B 208 with a commercial cane sugar content of 19·15 and a value of £2 15s. per ton. At the experimental plot upon Mr. Jas. Mackersie's farm it was found that Q. 813, 970, 855, Badila Seedling, and Hybrid No. 1 had given the best results. Arrangements were made for planting out some of the new Papuan varieties. Part of the Lower Burdekin cane was being railed to Prosperpine.

Proserpine.—One mill. The heavy wet season in this district precluded early planting for next year, and as late as August many farmers were engaged in getting their land ready, so that it is anticipated that planting will be on the short side for next year.

The mill is now crushing, and, in addition to the cane grown in the district, is receiving some 150 to 200 tons per day from the Inkerman and Gumlu areas of the Lower Burdekin district. The varieties of cane chiefly grown at Proserpine are H.Q. 426, N.G. 24B, M. 87, 89, 1474, Badila, and Malagache, the latter cane predominating. This variety is highly suitable to moist lands with retentive subsoils. Tractors for ploughing are in use in Proserpine to some extent, and much satisfaction is expressed by the owners, as they state it enables them to get large areas ready for planting quickly, and so to take advantage of favourable weather. Floods did great damage at Proserpine in the early part of the year, and several fine crops of cane were ruined. Frosts have also damaged the cane in low-lying places.

Mackay.—Nine mills. This district suffered greatly this year from the severe cyclone and floods experienced in January last. Not only was the town itself badly injured, but many of the farmers' residences and all the mill buildings in the outlying districts suffered damage to a greater or less extent. Many deaths occurred in the sea-wave which came up the river.

Due to the heavy wet season at the time of the cyclone, followed by cool weather, the cane made very little recovery, and losses have been great. Most of the mills will finish crushing this month, which will mean a long slack season. Frosts also did a considerable amount of injury to cane in many parts of the district. Plantings for next year have been fair to good, but, due to the cool weather experienced, the soil has not yet recovered sufficient heat to ensure a thorough germination. Consequently, the cane is backward in coming through. The tonnage of sugar produced this year at Mackay will be a good deal below the average.

Bundaberg and Childers.—Ten mills. A large amount of standover cane was left in these districts at the end of last crushing, a good deal of it being three years old at the commencement of the present season. In July very heavy frosts were experienced at Bundaberg. The most severe damage was caused on that portion of the Woongarra Scrub lying between the town and the Hummock, the river banks, and South Kalkie; while cane on the Kolan was also badly injured. The other side of the Hummock sloping towards the sea presented a totally different appearance. Where the cane has been badly frosted the commercial cane sugar has rapidly declined, and the average "density" will be low. The crops at Childers are turning out well on the whole this year, but plantings for next season in the two districts are not too promising. Rain is badly needed at the present time. Grubs were doing a large amount of damage at Childers early in the year.

Maryborough, Pialba, and Mount Bauple.—Two mills. The cane this year is behind the average, and the two mills have not been fully supplied.

Moreton.—One mill. Crops poor this season. Frost has done damage.

Logan and Nerang.—Seven mills. A poor season this year. Nerang Mill has been closed down, and will not crush again.

4.—NEW VARIETIES OF CANE.

During the year the following varieties have been introduced:—

To the Southern Sugar Experiment Station, Bundaberg.

From Macknade, by courtesy of The Colonial Sugar Refining Co., 7 R 96—this variety was unfortunately destroyed by flood waters; Oba Badila, a reintroduced Badila; H.Q. 409.

From Mossman, by courtesy of the Mossman Central Mill, two Mowbray seedlings. These varieties are very similar to Badila and N.G. 24B.

5.—WORK OF THE CENTRAL SUGAR EXPERIMENT STATION AT MACKAY.

The work of the Sugar Experiment Station this year has been considerably interfered with by the terrible cyclone of last January, It is estimated that fully 50 per cent. of the cane on the station was then destroyed. This has been a severe set-back to the experimental work, and has considerably interfered with the commercial testing of the new Papuan varieties. This station is in charge of Mr. J. L. Foran, who has carried out his chemical and field duties in a satisfactory manner. He is ably assisted on the field side by Mr. W. Millard, foreman, and a competent staff.

During the analysing season Mr. H. A. Larsen assisted in the laboratory, and performed his duties in a thoroughly competent way. The tables contained in this portion of the report have been compiled by Mr. Foran.

Meteorological.

Last November good rains fell, which made a great improvement in the young plant and ratoon cane, the foliage appearing luxuriant and green. In December slight showers fell on eight consecutive days at the beginning of the month, followed by a fall of 9 inches. The warm weather following helped the crops along considerably, and at the end of the year everything looked most promising. In the early part of January this year a further fall of 8¼ inches took place. This was followed by stormy conditions, the weather being very hot. On the night of the 20th and morning of the 21st a disastrous cyclone occurred, the barograph at the Post Office reading 27·9 inches, the lowest point it could attain. Floods took place, the water from the lagoons overflowed many of the cane plots, and the wind beat down and broke fully half the cane sticks.

During February sultry conditions prevailed, with heavy showers. Due to this, cultivation was much hampered. For the first six weeks of the year 91 inches of rain fell. In March further high winds were experienced at the time of the Innisfail cyclone. The atmosphere now began to cool off considerably, and no further growing weather was experienced. In July exceptionally severe cold set in, the damage to cane by frost in the low-lying places being great.

The weather conditions during the growing period will be found in the following interesting table :—

ABSTRACT OF METEOROLOGICAL OBSERVATIONS, MADE AT THE SUGAR EXPERIMENT STATION, MACKAY, FROM 1ST SEPTEMBER, 1917, TO 31ST AUGUST, 1918, COVERING GROWTH OF EXPERIMENTAL CROPS.

Month.	Rainfall in Inches.	Highest Shade Maximum.	Lowest Shade Maximum.	Mean Shade Maximum.	Highest Shade Minimum.	Lowest Shade Minimum.	Mean Shade Minimum.	Mean Diurnal Range.	Mean Temperature.	Mean Relative Humidity of the Air. Saturation equalling 100 at 9 a.m.	Mean Daily Evaporation in Cubic Inches.
September	·60	88·0	75·0	82·1	68·5	43·5	55·5	26·6	74·7	65·0	·072
October	·82	90·5	76·3	86·6	71·0	46·7	63·0	23·3	80·1	62·0	·202
November	5·97	96·0	79·0	86·3	77·5	62·2	69·2	17·1	81·0	70·3	·206
December	11·04	93·0	74·5	86·5	76·5	63·5	69·4	17·1	79·0	82·0	·204
January	85·17	94·0	78·0	86·5	79·5	65·0	71·7	14·8	80·2	91·0	* ..
February	11·77	93·0	82·0	88·2	79·5	62·5	69·1	19·1	79·2	82·3	* ..
March	7·14	95·0	78·2	86·6	75·5	67·5	70·3	16·3	78·1	82·3	* ..
April	8·42	88·0	72·5	80·8	70·5	62·0	65·3	15·5	73·6	86·2	·226
May	·35	84·0	70·5	75·7	67·5	55·0	62·4	13·3	69·2	85·0	·141
June	2·40	84·0	70·5	77·1	62·5	48·0	57·2	19·9	66·2	86·5	·164
July	·97	80·0	68·5	74·5	59·5	35·5	52·1	22·4	62·3	78·0	·165
August	·71	82·2	69·0	73·5	65·0	44·0	54·3	19·2	66·7	86·5	·120
Total	135·36										

* Instrument broken in cyclone and not replaced till April.

The work of the Mackay Sugar Experiment Station latterly has been principally confined to the testing of the large number of Papuan canes introduced in 1912-13. This has now been completed, and a selection of the best has been made for a final competitive test. Unfortunately, none of them have the promise of Badila, nor do any of them yet appear equal to the Gorus as croppers. Further reference will be made to these at a later stage. The results of the first selection of twenty of these canes appeared in last year's report covering plant, first, and second ratoons.

EXPERIMENTS DEALT WITH IN FOLLOWING SECTION.

1. Conclusion of experiments with Papuan Canes second ratoons.

2. Experiments with miscellaneous canes.

3. Tests to determine the action of fertilisers on plant crops and their effect on the succeeding ratoon crops.

4. Tests to determine the value of subsoiling ratoon crops.

5. Subsoiling *versus* ordinary cultivation.

1. PAPUAN CANES PLANTED OUT IN EXPERIMENT—SECOND RATOON CROPS.

In the former reports full details regarding these canes have appeared, which it is unnecessary to repeat. The first shipment of canes had a year's start of the following, and the results were completed last year.

Prior to planting out, a rigorous inspection of the canes was made, in consequence of which a number of the varieties were thrown out on account of the gumming disease being detected. The numbers of these canes were as follows :—Numbers 97, 99, 104, 109, 112, 120, 127, 136, 137, 150, 151, 154, 158, 162, 163, 166, 169, 170, 171, 172, 179, 180, 181, and 183. This manifestation of disease appears inherent in the canes themselves, as many of these numbers developed gum at the Bundaberg Station also. Since that time other varieties have developed gum.

The varieties finally planted out were as follows :—

Division A.—Numbers 92, 93, 94, 95, 96, 98, 100, 101, 102, 103, 104A, 105, 106, 107, 108, 110, 111, 113, 115.

Division B.—Numbers 116, 117, 118, 119, 122, 125, 126, 128, 129, 130, 131.

Division D.—Numbers 133, 134, 135, 138, 139, 140, 141, 142, 143, 144, 156, 147, 158, 149, 152, 153, 156, 164, 159, 160, 157, 165, 168, 173, 167, 175, 176, 174, 178, 184, 185, 186.

Details of the 1st ratoon crop of these canes appeared in last year's report.

As in all trials of large numbers of varieties, the greatest difference exists between them. One plot germinates rapidly, the next may be several weeks in appearing. One plot gives a high tonnage of cane, the next may be extraordinarily low. This will be amply borne out when the crop results are scanned.

The usual analytical data being secured, it was tabulated and is given below according to the respective divisions upon which the cane was planted, including a table of analytical results to date :—

FIRST PRELIMINARY EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION A—JUNE, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
N.G. 94	6-6-18	8 months ..	13·1	10·69	1·90	7·9	81·6
N.G. 98	6-6-18	do.	14·1	10·37	2·00	7·0	73·5
N.G. 100	6-6-18	do.	15·2	12·77	1·86	9·5	84·0
N.G. 102	6-6-18	do.	16·0	13·79	1·75	10·5	86·1
N.G. 103	6-6-18	do.	17·0	14·80	1·68	11·3	87·0
N.G. 104A	6-6-18	do.	14·8	11·56	2·13	8·2	78·5
N.G. 106	6-6-18	do.	13·5	10·00	2·56	6·8	74·0
N.G. 108	6-6-18	do.	17·4	15·39	1·97	11·8	88·4
N.G. 110	6-6-18	do.	15·8	14·86	1·78	11·9	94·0
N.G. 111	6-6-18	do.	16·6	14·33	2·01	10·9	86·2
N.G. 113	6-6-18	do.	11·8	9·71	2·47	7·2	82·3
N.G. 115	6-6-18	do.	14·6	14·20	1·86	11·6	90·4

SECOND PROGRESSIVE EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION A—JULY, 1918.

N.G. 94	8-7-18	9 months ..	16·5	12·20	2·22	8·3	73·9
N.G. 98	8-7-18	do.	14·9	12·96	1·88	10·0	86·9
N.G. 100	8-7-18	do.	15·8	13·39	1·58	10·1	84·7
N.G. 102	8-7-18	do.	16·2	13·98	1·80	10·6	86·3
N.G. 103	8-7-18	do.	16·8	15·07	1·78	11·7	89·7
N.G. 104A	8-7-18	do.	13·9	10·12	2·40	6·8	72·9
N.G. 106	8-7-18	do.	14·8	11·15	2·28	7·8	75·3
N.G. 108	8-7-81	do.	17·7	16·52	1·56	13·2	93·3
N.G. 110	8-7-18	do.	17·2	16·38	1·40	13·2	95·2
N.G. 111	8-7-18	do.	17·5	15·57	1·86	12·1	88·9
N.G. 113	8-7-18	do.	15·5	13·28	2·16	10·1	85·6
N.G. 115	8-7-18	do.	17·0	15·40	2·40	12·5	90·2

THIRD PROGRESSIVE EXAMINATION OF PAPUAN CANE (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION A—AUGUST, 1918.

N.G. 94	5-8-18	10 months	16·8	13·29	1·75	9·5	79·0
N.G. 98	5-8-18	do.	16·3	13·67	·98	10·2	83·9
N.G. 100	5-8-18	do.	18·0	16·21	·70	12·7	90·0
N.G. 102	5-8-18	do.	16·9	14·55	1·02	11·1	86·1
N.G. 103	5-8-18	do.	19·1	17·16	1·12	13·4	89·8
N.G. 104A	5-8-18	do.	16·1	12·84	1·80	9·3	79·7
N.G. 106	5-8-18	do.	16·9	13·98	2·03	10·4	82·7
N.G. 108	5-8-18	do.	19·2	17·39	1·21	13·7	90·6
N.G. 110	5-8-18	do.	17·8	15·72	1·45	12·1	88·3
N.G. 111	5-8-18	do.	18·6	16·65	·84	13·0	89·5
N.G. 113	5-8-18	do.	17·3	15·49	1·12	12·1	89·5
N.G. 115	5-8-18	do.	17·6	15·25	2·22	11·7	86·6

FINAL EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION A—SEPTEMBER, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Fibre in Cane.
N.G. 94	2-9-18	11 months	18·8	15·98	1·23	11·7	85·0	13·4
N.G. 98	2-9-18	do.	17·3	15·00	·86	11·2	89·3	13·1
N.G. 100	2-9-18	do.	18·6	17·16	·84	13·4	92·2	12·3
N.G. 102	2-9-18	do.	18·9	17·23	1·11	13·1	91·1	14·0
N.G. 103	2-9-18	do.	19·2	17·39	1·00	13·9	90·5	9·4
N.G. 104A	2-9-18	do.	17·3	15·14	1·40	11·4	87·5	13·0
N.G. 106	2-9-18	do.	17·6	15·04	1·86	11·6	85·4	9·4
N.G. 108	2-9-18	do.	21·0	19·26	1·11	15·0	91·4	12·2
N.G. 110	2-9-18	do.	20·1	18·60	·80	14·2	92·5	14·3
N.G. 111	2-9-18	do.	19·7	18·02	·88	14·1	91·4	11·8
N.G. 113	2-9-18	do..	18·7	16·92	1·10	13·1	90·4	12·0
N.G. 115	2-9-18	do.	19·8	17·94	1·96	14·0	90·6	11·6

FIRST PRELIMINARY EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION B—JUNE, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix.).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
N.G. 116	7-6-18	8 months ..	14·9	12·37	2·16	9·2	82·2
N.G. 117	7-6-18	do.	16·3	14·03	1·98	10·7	86·0
N.G. 118	7-6-18	do.	13·0	10·69	2·62	7·9	82·2
N.G. 122	7-6-18	do.	14·6	11·71	2·21	8·3	80·2
N.G. 125	7-6-18	do.	14·9	12·23	2·01	9·0	82·0
N.G. 126	7-6-18	do.	13·9	11·11	2·50	8·0	80·0
N.G. 128	7-6-18	do.	12·0	9·24	2·52	6·5	77·0
N.G. 129	7-6-18	do.	12·0	8·15	2·72	5·1	67·9
N.G. 130	7-6-18	do.	15·6	13·55	1·65	10·4	86·5
N.G. 131	7-6-18	do.	15·8	13·52	1·54	10·3	85·8

SECOND PROGRESSIVE EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION B—JULY, 1918.

N.G. 116	8-7-18	9 months ..	18·0	15·15	2·10	11·4	84·2
N.G. 117	8-7-18	do.	16·4	13·36	2·00	9·8	81·4
N.G. 118	8-7-18	do.	15·5	14·50	1·96	11·6	93·5
N.G. 122	8-7-18	do.	15·8	13·78	1·76	10·6	87·8
N.G. 125	9-7-18	do.	16·6	14·83	1·86	11·6	89·3
N.G. 126	9-7-18	do.	15·8	13·78	1·52	10·6	87·8
N.G. 128	9-7-18	do.	15·8	13·12	1·96	9·8	83·0
N.G. 129	9-7-18	do.	14·6	11·27	2·47	8·0	77·2
N.G. 130	9-7-18	do.	17·0	15·21	1·42	11·9	89·4
N.G. 131	9-7-18	do.	17·0	14·67	1·42	11·2	86·3

THIRD PROGRESSIVE EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION B—AUGUST, 1918.

N.G. 116	5-8-18	10 months	19·2	17·14	1·50	13·3	89·3
N.G. 117	5-8-18	do.	17·2	15·12	1·10	11·7	87·9
N.G. 118	5-8-18	do.	17·2	15·23	2·00	11·8	88·5
N.G. 122	5-8-18	do.	17·8	15·59	1·06	12·0	87·6
N.G. 125	5-8-18	do.	18·0	16·16	1·13	12·7	89·8
N.G. 126	6-8-18	do.	17·0	14·62	1·23	11·1	86·0
N.G. 128	6-8-18	do.	16·6	14·64	1·22	11·3	88·2
N.G. 129	6-8-18	do.	15·6	12·13	2·68	8·6	77·7
N.G. 130	6-8-18	do.	19·2	17·36	1·20	13·6	90·4
N.G. 131	6-8-18	do.	18·1	16·42	1·03	12·9	90·7

FINAL EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION B—SEPTEMBER, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Fibre in Cane.
N.G. 116	2-9-18	11 months	20·8	19·37	1·46	15·5	93·2	11·1
N.G. 117	2-9-18	do.	20·1	18·49	·96	14·3	92·0	13·1
N.G. 118	2-9-18	do.	18·0	16·33	1·52	13·0	90·7	10·1
N.G. 122	2-9-18	do.	19·1	17·31	1·16	13·3	90·6	13·1
N.G. 125	2-9-18	do.	18·6	17·13	1·02	13·3	92·4	13·2
N.G. 126	3-9-18	do.	19·4	17·66	·78	13·6	91·0	12·8
N.G. 128	3-9-18	do.	17·5	15·37	1·26	11·4	87·8	14·1
N.G. 129	3-9-18	do.	17·6	14·90	2·22	11·4	84·6	9·5
N.G. 130	3-9-18	do.	20·7	19·68	·78	15·6	95·0	12·4
N.G. 131	3-9-18	do.	19·4	18·14	·88	14·5	93·5	11·0

FIRST PRELIMINARY EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION D—JUNE, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
N.G. 133	7-6-18	8 months ..	18·7	16·23	2·24	12·4	86·8
N.G. 134	7-6-18	do.	16·0	13·69	2·52	10·4	85·4
N.G. 135	7-6-18	do.	13·2	8·72	3·65	5·3	66·0
N.G. 138	7-6-18	do.	11·0	5·80	4·16	2·6	52·7
N.G. 139	8-6-18	do.	12·1	6·99	3·86	3·6	57·7
N.G. 141	8-6-18	do.	15·9	12·77	1·96	9·3	80·3
N.G. 142	8-6-18	do.	14·0	9·91	2·44	6·5	70·7
N.G. 143	8-6-18	do.	14·2	10·39	2·44	7·0	73·1
N.G. 144	8-6-18	do.	12·8	7·30	3·92	3·7	57·1
N.G. 146	8-6-18	do.	11·8	6·30	4·41	2·9	53·3
N.G. 147	8-6-18	do.	15·8	12·85	1·89	9·4	81·3
N.G. 148	8-6-18	do.	14·7	11·71	2·31	8·5	80·0
N.G. 149	8-6-18	do.	15·6	12·93	2·00	9·5	80·7
N.G. 153	8-6-18	do.	14·5	13·20	2·26	10·4	91·0
N.G. 156	8-6-18	do.	14·5	12·17	1·76	9·1	83·8
N.G. 157	8-6-18	do.	15·6	12·88	1·80	9·5	82·5
N.G. 159	8-6-18	do.	15·7	11·42	2·14	7·7	72·7
N.G. 160	8-6-18	do.	15·0	12·23	1·51	9·0	81·4
N.G. 164	8-6-18	do.	15·1	13·50	1·49	10·5	89·4
N.G. 165	9-6-18	do.	15·2	12·85	2·38	9·6	84·4
N.G. 167	9-6-18	do.	15·0	12·23	1·82	9·0	81·4
N.G. 168	9-6-18	do.	16·7	14·83	1·62	11·5	88·8
N.G. 173	9-6-18	do.	16·8	15·07	2·22	11·6	89·6
N.G. 174	9-6-18	do.	16·7	15·64	1·54	12·5	93·6
N.G. 175	9-6-18	do.	13·7	10·82	2·16	7·8	78·9
N.G. 176	9-6-18	do.	14·5	11·25	2·69	8·0	77·5
N.G. 178	9-6-18	do.	12·7	10·45	2·20	7·7	82·2
N.G. 184	9-6-18	do.	10·9	5·28	4·32	1·9	48·4
N.G. 185	9-6-18	do.	11·3	5·88	4·15	2·5	52·0

SECOND PROGRESSIVE EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION D—JULY, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
N.G. 133	9-7-18	9 months ..	18·0	16·37	1·56	12·9	90·8
N.G. 134	9-7-18	do.	14·6	11·66	2·76	8·4	79·8
N.G. 135	9-7-18	do.	13·8	12·55	2·01	9·9	90·9
N.G. 138	9-7-18	do.	9·0	7·15	2·90	5·2	79·4
N.G. 139	9-7-18	do.	11·9	10·10	2·20	7·6	84·9
N.G. 141	10-7-18	do.	14·8	13·16	1·42	10·8	92·9
N.G. 142	10-7-18	do.	15·7	11·37	2·00	7·7	72·4
N.G. 143	10-7-18	do.	12·8	8·80	2·56	5·7	68·7
N.G. 144	10-7-18	do.	12·5	8·08	3·24	4·7	64·6
N.G. 146	10-7-18	do.	11·8	8·70	3·20	5·9	73·7
N.G. 147	10-7-18	do.	15·7	13·77	1·42	10·6	87·7
N.G. 148	10-7-18	do.	16·8	12·27	2·38	8·3	73·0
N.G. 149	10-7-18	do.	15·6	13·28	1·48	10·1	85·1
N.G. 153	10-7-18	do.	15·5	13·99	1·98	11·1	90·2
N.G. 156	10-7-18	do.	15·0	13·72	1·32	10·8	91·4
N.G. 157	10-7-18	do.	17·2	15·59	1·20	12·5	90·4
N.G. 159	10-7-18	do.	13·7	12·52	1·86	9·9	91·3
N.G. 160	10-7-18	do.	12·4	10·60	1·56	8·1	85·4
N.G. 164	11-7-18	do.	16·6	15·13	1·26	12·3	90·7
N.G. 165	11-7-18	do.	13·9	12·01	2·22	9·2	86·4
N.G. 167	11-7-18	do.	16·1	14·55	1·76	11·6	90·2
N.G. 168	11-7-18	do.	16·4	14·55	1·80	11·3	88·6
N.G. 173	11-7-18	do.	15·0	13·82	1·98	11·0	92·0
N.G. 174	11-7-18	do.	15·2	14·63	1·68	11·9	81·9
N.G. 175	11-7-18	do.	15·0	13·78	1·54	10·9	91·8
N.G. 176	11-7-18	do.	11·9	10·34	2·20	8·0	86·8
N.G. 178	11-7-18	do.	14·7	12·93	1·98	10·0	87·9
N.G. 184	11-7-18	do.	15·7	14·50	1·80	11·5	92·3
N.G. 185	11-7-18	do.	11·9	10·06	2·36	7·6	84·5

THIRD PROGRESSIVE EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION)—SECOND RATOON CROP.
DIVISION D—AUGUST, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
N.G. 133	6-8-18	10 months	20·2	18·25	1·25	14·3	90·3
N.G. 134	6-8-18	do.	18·6	17·00	·50	13·4	91·3
N.G. 135	6-8-18	do.	17·8	14·82	1·35	11·0	83·2
N.G. 138	6-8-18	do.	12·6	7·35	2·91	3·8	58·3
N.G. 139	6-8-18	do.	16·6	12·66	2·33	8·8	76·3
N.G. 141	6-8-18	do.	17·8	15·19	2·56	11·5	85·3
N.G. 142	6-8-18	do.	17·7	13·99	2·22	10·0	79·0
N.G. 143	6-8-18	do.	15·3	11·49	1·45	7·9	75·1
N.G. 144	6-8-18	do.	14·7	10·41	3·28	6·8	70·8
N.G. 146	6-8-18	do.	13·4	9·08	3·40	5·7	67·7
N.G. 147	6-8-18	do.	17·4	15·05	1·35	11·5	86·5
N.G. 148	6-8-18	do.	19·1	17·13	·96	13·4	89·7
N.G. 149	7-8-18	do.	18·0	15·92	1·22	12·3	88·4
N.G. 153	7-8-18	do.	17·3	14·80	1·64	11·2	85·5
N.G. 156	7-8-18	do.	18·1	15·60	1·70	11·9	86·2
N.G. 157	7-8-18	do.	17·8	15·25	1·60	11·6	85·7
N.G. 159	7-8-18	do.	17·7	15·90	·90	12·4	89·8
N.G. 160	7-8-18	do.	18·0	16·14	1·03	12·6	89·7
N.G. 164	7-8-18	do.	18·9	16·91	1·21	13·2	89·5
N.G. 165	7-8-18	do.	17·9	16·19	·70	12·7	90·4
N.G. 167	7-8-18	do.	17·8	15·83	·92	12·3	88·9
N.G. 168	7-8-18	do.	19·4	17·80	·62	14·1	91·8
N.G. 173	7-8-18	do.	20·0	18·50	·96	14·7	92·5
N.G. 174	7-8-18	do.	20·1	18·71	·90	14·9	93·1
N.G. 175	7-8-18	do.	17·5	15·24	·70	11·7	87·1
N.G. 176	7-8-18	do.	15·7	12·90	1·29	9·5	82·1
N.G. 178	7-8-18	do.	17·8	15·11	1·16	11·4	84·9
N.G. 184	7-8-18	do.	18·9	16·72	1·40	12·9	88·5
N.G. 185	7-8-18	do.	14·7	9·9	2·18	6·2	67·3

FINAL EXAMINATION OF PAPUAN CANES (WELLS' COLLECTION —SECOND RATOON CROP.
DIVISION D—SEPTEMBER, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Fibre in Cane.
N.G. 133	3-9-18	11 months	20·8	19·39	1·11	15·4	93·2	11·5
N.G. 134	3-9-18	do.	19·2	18·39	·58	14·9	95·8	10·9
N.G. 135	3-9-18	do.	19·4	17·30	1·20	13·0	89·2	13·9
N.G. 138	3-9-18	do.	13·9	9·20	2·78	5·6	66·2	11·9
N.G. 139	3-9-18	do.	17·9	14·17	2·20	9·8	79·2	13·5
N.G. 141	3-9-18	do.	19·8	18·56	1·98	14·6	93·7	12·3
N.G. 142	3-9-18	do.	16·6	13·44	2·38	9·8	80·9	11·3
N.G. 143	3-9-18	do.	16·9	14·35	1·28	10·5	84·9	13·3
N.G. 144	3-9-18	do.	16·2	13·05	2·96	9·4	80·6	11·8
N.G. 146	3-9-18	do.	15·6	11·82	3·10	8·3	75·8	9·5
N.G. 147	3-9-18	do.	19·9	18·50	1·40	14·5	93·0	12·2
N.G. 148	3-9-18	do.	19·1	17·71	1·02	13·6	92·7	14·0
N.G. 149	3-9-18	do.	19·6	18·07	1·02	14·0	92·2	13·2
N.G. 153	3-9-18	do.	18·4	16·30	1·48	12·9	88·6	9·3
N.G. 156	3-9-18	do.	19·5	17·57	1·40	13·8	90·1	10·9
N.G. 157	3-9-18	do.	17·6	15·74	1·78	12·0	89·4	12·9
N.G. 159	3-9-18	do.	19·3	17·59	1·21	13·9	91·1	10·8
N.G. 160	3-9-18	do.	18·4	16·49	1·38	13·0	89·6	9·8
N.G. 164	3-9-18	do.	20·5	18·93	1·22	14·9	92·3	12·0
N.G. 165	4-9-18	do.	19·1	17·90	1·18	14·0	93·7	13·0
N.G. 167	4-9-18	do.	19·4	17·66	1·20	14·0	91·0	10·7
N.G. 168	4-9-18	do.	20·6	19·37	·78	15·2	94·0	13·0
N.G. 173	4-9-18	do.	20·9	19·88	·90	15·4	95·1	14·6
N.G. 174	4-9-18	do.	20·2	18·92	·78	14·8	93·7	12·9
N.G. 175	4-9-18	do.	17·3	15·54	1·20	11·8	89·8	13·4
N.G. 176	4-9-18	do.	17·0	14·62	1·41	11·2	86·0	10·2
N.G. 178	4-9-18	do.	16·7	14·42	1·28	11·1	86·3	10·0
N.G. 184	4-9-18	do.	17·8	15·94	1·28	12·1	89·6	13·0
N.G. 185	4-9-18	do.	17·0	13·53	1·96	9·6	79·6	12.3

ANALYTICAL RESULTS TO DATE OF THE THREE PRECEDING SERIES OF PAPUAN CANES—PLANT, FIRST, AND SECOND RATOON CROPS—1916, 1917, AND 1918.

Division.	Variety of Cane.	PLANT CROP, 1916.					FIRST RATOON CROP, 1917.					SECOND RATOON CROP, 1918.					AVERAGE OF THREE YEARS.		
		Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	% Sucrose in Juice.	Purity of Juice.	C.C.S.
A—	N.G. 92 ..	17·4	15·67	·62	12·3	90·0	17·0	15·75	·46	12·4	92·5	..	..	..	..	..	* 15·71	91·3	12·4
	N.G. 93 ..	18·3	16·53	1·51	12·9	90·3	15·8	13·79	·51	10·4	87·4	..	..	..	..	..	* 15·16	88·8	11·7
	N.G. 94 ..	16·6	12·80	1·60	9·0	77·1	14·7	12·07	1·25	8·7	82·1	18·8	15·98	1·23	11·7	85·0	13·62	81·4	9·8
	N.G. 95 ..	13·7	10·03	2·08	6·9	73·2	17·8	15·18	1·18	11·3	85·3	..	..	..	..	..	* 12·61	79·3	9·1
	N.G. 96 ..	16·9	13·77	1·21	9·9	81·4	15·1	13·85	·80	10·6	91·7	..	..	..	..	..	* 13·81	86·6	10·3
	N.G. 98 ..	16·5	14·20	1·25	10·8	86·0	15·7	14·09	·74	10·9	89·7	17·3	15·00	·86	11·2	89·3	14·43	88·3	11·0
	N.G. 100 ..	10·5	5·49	3·12	2·4	53·2	16·1	14·78	·51	11·7	91·8	18·6	17·16	·84	13·4	92·2	12·48	79·1	9·2
	N.G. 101 ..	15·1	11·43	1·73	8·1	75·6	17·9	16·35	·68	12·9	91·3	..	..	..	..	..	* 13·89	83·5	10·5
	N.G. 102 ..	16·5	12·99	2·01	9·5	78·7	14·2	10·84	1·86	7·5	76·3	18·9	17·23	1·11	13·1	91·1	13·69	82·0	10·0
	N.G. 103 ..	15·9	13·15	·51	9·6	82·7	16·7	13·23	1·56	9·1	79·3	19·2	17·39	1·0	13·9	90·5	14·59	84·2	10·9
	N.G. 104A	11·9	6·19	2·15	2·7	52·0	18·4	15·78	·92	12·0	85·8	17·3	15·14	1·4	11·4	87·5	12·37	75·1	8·7
	N.G. 105 ..	13·6	9·79	1·78	6·6	71·9	15·8	12·52	1·56	9·0	79·2	..	..	..	..	..	* 11·15	75·6	7·8
	N.G. 106 ..	13·2	7·87	4·16	4·3	59·6	14·7	12·39	1·95	9·2	83·3	17·6	15·04	1·86	11·6	85·4	11·77	76·1	8·4
	N.G. 107 ..	17·6	15·69	·45	12·2	89·1	19·5	17·97	·54	13·9	92·2	..	..	..	..	..	* 16·83	90·6	13·1
	N.G. 108 ..	16·5	13·26	1·66	9·7	80·3	17·8	16·35	·78	12·8	91·8	21·0	19·26	1·11	15·0	91·4	16·29	87·8	12·5
	N.G. 110 ..	17·6	14·99	·93	11·0	85·1	18·8	17·26	·61	12·4	91·8	20·1	18·6	·80	14·2	92·5	16·95	89·8	12·5
	N.G. 111 ..	17·5	14·87	1·38	11·3	84·9	16·9	13·20	1·12	9·4	78·2	19·7	18·02	·88	14·1	91·4	15·36	84·8	11·6
	N.G. 113 ..	18·6	16·21	·73	12·1	87·1	18·7	17·17	·31	12·4	91·8	18·7	16·92	1·10	13·1	90·4	16·77	89·8	12·5
	N.G. 115 ..	15·3	12·48	1·92	9·1	81·5	18·7	16·71	·62	12·7	89·4	19·8	17·94	1·96	14·0	90·6	15·71	87·2	11·9
B—	N.G. 116 ..	18·2	15·71	1·01	12·2	86·3	19·0	17·21	·77	13·5	90·6	20·8	19·37	1·46	15·5	93·2	17·43	90·0	13·7
	N.G. 117 ..	16·5	13·51	1·56	10·0	81·8	17·0	14·94	1·08	11·4	87·9	20·1	18·49	·96	14·3	92·0	15·65	87·2	11·9
	N.G. 118 ..	14·7	11·69	1·38	8·6	79·5	16·7	15·00	·86	11·7	89·8	18·0	16·33	1·52	13·0	90·7	14·34	86·7	11·1
	N.G. 119 ..	13·9	9·60	1·78	6·3	69·0	14·0	12·45	·94	9·7	88·9	..	..	..	..	..	* 11·03	78·9	8·0
	N.G. 122 ..	13·2	10·05	2·77	7·1	76·1	16·4	15·27	·94	12·3	93·2	19·1	17·31	1·16	13·3	90·6	14·21	86·6	10·9
	N.G. 125 ..	15·9	12·61	1·22	9·3	79·3	16·9	15·72	1·02	12·6	93·1	18·6	17·18	1·02	13·3	92·4	15·17	88·2	11·7
	N.G. 126 ..	16·1	13·42	1·64	10·0	83·3	17·3	15·71	·86	12·2	90·7	19·4	17·66	·78	13·6	91·0	15·6	88·3	11·9
	N.G. 128 ..	15·9	13·61	1·04	10·3	85·5	17·8	15·68	·71	11·7	88·2	17·5	15·37	1·26	11·4	87·8	14·89	87·2	11·1
	N.G. 129 ..	14·6	9·99	2·60	6·5	68·3	15·3	11·53	1·52	8·0	75·3	17·6	14·90	2·22	11·4	84·6	12·14	76·1	8·6
	N.G. 130 ..	15·4	11·83	1·60	8·4	76·8	17·5	15·18	·75	11·4	86·8	20·7	19·68	·78	15·6	95·0	15·56	86·2	11·8
	N.G. 131 ..	18·1	15·76	·84	12·2	87·0	17·7	15·18	·80	11·5	86·7	19·4	18·14	·88	14·5	93·5	16·36	89·1	12·7
D—	N.G. 133 ..	15·3	12·69	1·01	9·5	82·9	19·8	18·20	·60	14·4	91·8	20·8	19·39	1·11	15·4	93·2	16·76	89·3	13·1
	N.G. 134 ..	15·1	12·94	1·56	10·0	85·6	18·0	16·18	·64	12·1	89·9	19·2	18·39	·58	14·9	95·8	15·84	90·4	12·3
	N.G. 135 ..	16·0	12·82	1·60	9·4	80·1	17·6	15·90	·83	12·3	90·4	19·4	17·30	1·20	13·0	89·2	15·34	86·6	11·6
	N.G. 138 ..	12·6	7·12	3·12	3·6	56·5	12·0	5·45	4·00	..	45·5	13·9	9·20	2·78	5·6	66·2	7·26	56·1	4·6
	N.G. 139 ..	16·2	11·16	2·50	7·4	68·8	13·8	9·17	2·50	5·7	66·0	17·9	14·17	2·20	9·8	79·2	11·5	71·3	7·6
	N.G. 140 ..	14·7	9·83	2·71	6·2	66·8	16·1	12·98	1·57	9·5	80·7	..	..	..	..	..	* 11·41	83·8	7·8
	N.G. 141 ..	16·0	12·72	1·83	9·4	79·5	18·7	16·58	·95	13·0	88·6	19·8	18·56	1·98	14·6	93·7	15·95	87·3	12·3
	N.G. 142 ..	14·3	10·37	2·65	7·0	72·5	15·5	11·78	2·15	8·1	76·0	16·6	13·44	2·38	9·8	80·9	11·86	76·5	8·3
	N.G. 143 ..	13·3	8·61	2·31	5·3	64·7	15·0	11·83	1·66	8·5	78·8	16·9	14·35	1·28	10·5	84·9	11·6	76·1	8·1
	N.G. 144 ..	14·9	12·40	2·40	9·4	83·2	17·1	13·81	1·56	10·2	80·8	16·2	13·05	2·96	9·4	80·6	13·09	81·5	9·7
	N.G. 146 ..	13·1	8·03	2·90	4·5	61·2	16·0	11·78	1·80	8·0	73·7	15·6	11·82	3·10	8·3	75·8	10·54	70·2	6·9
	N.G. 147 ..	17·4	15·48	1·01	12·2	88·9	19·8	17·63	1·56	13·7	84·5	19·9	18·50	1·40	14·5	93·0	17·2	88·8	13·5
	N.G. 148 ..	15·5	12·48	1·38	9·1	80·5	18·7	16·71	1·20	13·0	88·9	19·1	17·71	1·02	13·6	92·7	15·63	87·4	11·9
	N.G. 149 ..	16·0	13·06	1·22	9·6	81·6	18·0	15·81	·83	11·9	87·8	19·6	18·07	1·02	14·0	92·2	15·65	87·2	11·8
	N.G. 152 ..	16·6	14·20	1·38	10·9	85·5	..	..	..	..	..	..	..	..	..	..	† 14·20	85·5	10·9
	N.G. 153 ..	15·6	12·23	1·92	8·9	78·3	16·2	12·71	1·66	9·1	78·4	18·4	16·30	1·48	12·9	88·6	13·75	81·8	10·3
	N.G. 156 ..	16·1	13·31	1·04	9·9	82·6	18·0	14·61	·60	10·5	81·2	19·5	17·57	1·40	13·8	90·1	15·16	84·6	11·4
	N.G. 157 ..	16·3	13·26	·85	9·8	81·3	16·4	14·17	1·25	10·7	86·4	17·6	15·74	1·78	12·0	89·4	14·39	85·7	10·8
	N.G. 159 ..	16·1	13·07	1·56	9·7	81·1	18·3	15·51	1·01	11·7	84·8	19·3	17·59	1·21	13·9	91·1	15·39	85·7	11·8
	N.G. 160 ..	14·5	11·88	2·77	8·9	81·9	16·9	14·41	·80	11·0	85·2	18·4	16·49	1·38	13·0	89·6	14·26	85·6	11·0
	N.G. 164 ..	17·0	13·77	1·25	10·1	81·0	18·1	17·02	·62	13·6	94·0	20·5	18·93	1·22	14·9	92·3	16·57	89·1	12·9
	N.G. 165 ..	14·6	11·88	1·34	8·9	81·3	18·4	16·84	·75	13·3	91·5	19·1	17·90	1·18	14·0	93·7	15·54	88·3	12·1
	N.G. 167 ..	16·9	14·17	1·05	10·7	83·8	19·0	17·48	·92	13·8	92·0	19·4	17·66	1·20	14·0	91·0	16·44	88·9	12·8
	N.G. 168 ..	18·4	15·95	·73	12·3	86·6	19·0	17·07	1·10	13·2	89·9	20·6	19·37	·78	15·2	94·0	17·46	90·2	13·6
	N.G. 173 ..	17·6	15·48	·92	11·7	87·9	18·3	16·31	1·30	12·2	88·2	20·9	19·88	·90	15·4	95·1	17·22	90·4	13·1
	N.G. 174 ..	16·0	13·06	1·22	9·8	81·6	20·0	18·46	·80	14·8	92·3	20·2	18·92	·78	14·8	93·7	16·81	89·2	13·1
	N.G. 175 ..	17·3	15·42	·67	11·8	89·1	16·0	14·73	1·76	11·2	92·1	17·3	15·54	1·20	11·8	89·8	15·23	90·3	11·6
	N.G. 176 ..	15·0	10·89	2·35	7·2	72·6	17·4	14·77	1·50	11·8	84·8	17·0	14·62	1·41	11·2	86·0	13·43	81·1	10·1
	N.G. 178 ..	14·6	9·72	2·60	6·1	66·5	16·8	14·41	1·25	11·0	85·8	16·7	14·42	1·28	11·1	86·3	12·85	79·5	9·4
	N.G. 184 ..	15·0	12·40	2·08	9·4	82·6	17·5	14·13	1·76	10·3	80·7	17·8	15·94	1·28	12·1	89·6	14·16	84·3	10·8
	N.G. 185 ..	15·6	10·76	2·31	6·9	68·9	18·7	16·31	1·00	12·4	87·3	17·0	13·53	1·96	9·6	79·6	13·53	78·6	9·6
	N.G. 186 ..	14·2	11·30	1·52	8·2	79·5	..	..	..	..	..	..	..	..	..	..	† 11·30	79·5	8·2

* Average of plant and first ratoon crops.

† Plant crop only.

The results of the present crop as second ratoons will be found in the following table under the heading of "Second Ratoon Crop, 1918." This table shows the crop results of the preceding plant and first ratoon crops as well. There are only a few canes that can be selected with confidence for distribution. Quite a number were similar canes to those that were in the original collection Mr. Tryon brought over in 1895, and which had been tested before. Out of the above lot and the first shipment of twenty previously experimented with, fifteen have been selected for a final competitive trial. These are New Guinea 81, 83, 87, 88, 89, 94, 102, 103, 123, 130, 141, 147, 161, 164, and 165. The selection has been made upon their combination as croppers, sugar producers, and their freedom from disease. At the Bundaberg Station it has been possible to select a larger number—viz., twenty-nine. Where no results are shown in the first and second ratoon crops in the above tables, the varieties had died out :—

CROP RESULTS TO DATE OF THREE PRECEDING SERIES OF PAPUAN CANES—PLANT, FIRST, AND SECOND RATOON CROPS—1916, 1917, AND 1918.

Division.	Name or Number of Variety.	PLANT CROP, 1916.			FIRST RATOON CROP, 1917.			SECOND RATOON CROP, 1918.			TOTAL YIELD, THREE YEARS.	
		Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
A— ..	N.G. 92 ..	13 m'ths.	25·2	3·1	10 m'ths.	11·1	1·4	..	..	..	*36·3	4·5
	N.G. 93 ..	do.	42·3	5·4	do.	4·1	·4	..	..	..	*46·4	5·8
	N.G. 94 ..	do.	37·0	3·3	do.	12·2	1·1	11 m'ths.	7·2	·8	56·4	5·2
	N.G. 95 ..	do.	42·1	2·9	do.	32·6	3·7	..	..	..	*74·7	6·6
	N.G. 96 ..	do.	44·3	4·3	do.	9·0	1·0	..	..	..	*53·3	5·3
	N.G. 98 ..	do.	58·3	6·3	do.	8·8	·9	11 m'ths.	5·4	·6	71·5	7·8
	N.G. 100 ..	do.	49·7	1·1	do.	10·8	1·2	do.	8·2	1·1	68·7	3·4
	N.G. 101 ..	do.	28·7	2·3	do.	29·0	3·7	..	..	..	*57·7	6·0
	N.G. 102 ..	do.	56·1	5·3	do.	10·2	·8	11 m'ths.	7·3	·9	73·6	6·8
	N.G. 103 ..	do.	48·8	4·6	do.	35·3	3·2	do.	12·1	1·7	96·2	9·5
	N.G. 104A ..	do.	46·2	1·2	do.	43·5	5·2	do.	11·7	1·3	101·4	7·7
	N.G. 105 ..	do.	34·3	2·2	do.	14·2	1·3	..	..	..	*48·5	3·5
	N.G. 106 ..	do.	52·5	2·2	do.	23·5	2·2	11 m'ths.	9·0	1·0	85·0	5·4
	N.G. 107 ..	do.	30·7	3·7	do.	16·3	2·3	..	..	..	*47·0	6·0
	N.G. 108 ..	do.	50·6	4·9	do.	25·9	3·3	11 m'ths.	7·7	1·2	84·2	9·4
	N.G. 110 ..	do.	35·9	3·9	do.	15·4	1·9	do.	4·5	·6	55·8	6·4
	N.G. 111 ..	do.	53·6	6·0	do.	22·5	2·1	do.	12·7	1·8	88·8	9·9
	N.G. 113 ..	do.	46·5	5·6	do.	16·3	2·0	do.	8·2	1·1	71·0	8·7
	N.G. 115 ..	do.	47·1	4·2	do.	23·5	3·0	do.	6·3	·9	76·9	8·1
B— ..	N.G. 116 ..	13 m'ths.	23·5	2·8	10 m'ths.	30·1	4·1	11 m'ths.	14·6	2·3	68·2	9·3
	N.G. 117 ..	do.	31·2	3·1	do.	9·5	1·1	do.	8·4	1·2	49·1	6·4
	N.G. 118 ..	do.	24·8	2·1	do.	21·7	2·5	do.	8·1	1·1	54·6	5·7
	N.G. 119 ..	do.	20·3	1·2	do.	2·7	·2	..	..	..	*23·0	1·4
	N.G. 122 ..	do.	37·3	2·6	do.	40·1	5·0	11 m'ths.	8·2	1·1	85·6	8·7
	N.G. 125 ..	do.	50·0	4·6	do.	34·4	4·3	do.	4·5	·6	88·9	9·5
	N.G. 126 ..	do.	28·0	2·8	do.	34·4	4·1	do.	12·9	1·8	75·3	8·7
	N.G. 128 ..	do.	28·5	2·9	do.	22·6	2·6	do.	5·8	·7	56·9	6·2
	N.G. 129 ..	do.	31·8	2·0	do.	7·5	·6	do.	10·9	1·2	50·2	3·8
	N.G. 130 ..	do.	36·8	3·0	do.	43·5	5·0	do.	16·4	2·5	96·7	10·5
	N.G. 131 ..	do.	28·5	3·4	do.	13·6	1·6	do.	14·9	2·2	57·0	7·2
D— ..	N.G. 133 ..	13 m'ths.	53·0	5·0	10 m'ths.	29·0	4·2	11 m'ths.	16·7	2·6	98·7	11·8
	N.G. 134 ..	do.	53·5	5·3	do.	37·5	4·5	do.	16·2	2·4	107·2	12·2
	N.G. 135 ..	do.	40·4	3·8	do.	12·0	1·5	do.	7·2	·9	59·6	6·2
	N.G. 138 ..	do.	45·1	1·6	do.	21·7	..	do.	11·1	·6	87·9	2·2
	N.G. 139 ..	do.	51·0	3·7	do.	33·5	1·9	do.	21·6	2·1	106·1	7·7
	N.G. 140 ..	do.	33·0	2·0	do.	3·6	·3	..	..	..	*36·6	2·3
	N.G. 141 ..	do.	43·0	4·0	do.	21·7	2·7	11 m'ths.	12·6	1·8	87·3	8·5
	N.G. 142 ..	do.	46·1	3·2	do.	20·2	1·6	do.	9·9	1·0	76·2	5·8
	N.G. 143 ..	do.	49·0	2·5	do.	18·1	1·5	do.	13·1	1·4	80·2	5·4
	N.G. 144 ..	do.	55·7	5·2	do.	22·2	2·2	do.	9·6	·9	87·5	8·3
	N.G. 146 ..	do.	29·8	1·3	do.	7·9	·6	do.	9·3	·8	47·0	2·7
	N.G. 147 ..	do.	39·1	4·7	do.	21·7	3·0	do.	10·8	1·6	71·6	9·3
	N.G. 148 ..	do.	44·5	4·0	do.	20·8	2·7	do.	5·4	·7	70·7	7·4
	N.G. 149 ..	do.	48·4	4·6	do.	19·3	2·3	do.	23·5	3·3	91·2	10·2
	N.G. 152 ..	do.	25·0	2·7	..	..	..	..	..	..	†25·0	2·7
	N.G. 153 ..	do.	35·7	3·1	10 m'ths.	9·0	·8	11 m'ths.	12·9	1·7	57·6	5·6
	N.G. 156 ..	do.	28·0	2·7	do.	12·1	1·2	do.	11·9	1·6	52·0	5·5
	N.G. 157 ..	do.	41·2	4·0	do.	14·5	1·5	do.	7·5	·9	63·2	6·4
	N.G. 159 ..	do.	41·2	3·9	do.	19·9	2·3	do.	13·5	1·9	74·6	8·1
	N.G. 160 ..	do.	46·1	4·1	do.	12·0	1·3	do.	8·9	1·2	67·0	6·6
	N.G. 164 ..	do.	23·0	2·3	do.	6·8	·9	do.	17·6	2·6	47·4	5·8
	N.G. 165 ..	do.	42·1	3·7	do.	18·6	2·5	do.	18·0	2·5	78·7	8·7
	N.G. 167 ..	do.	34·4	3·6	do.	15·6	2·1	do.	9·2	1·3	59·2	7·0
	N.G. 168 ..	do.	39·1	4·8	do.	11·4	1·5	do.	14·8	2·2	65·3	8·5
	N.G. 173 ..	do.	33·4	3·9	do.	5·7	·7	do.	16·8	2·6	55·9	7·2
	N.G. 174 ..	do.	33·9	3·3	do.	16·3	2·4	do.	7·2	1·1	57·4	6·8
	N.G. 175 ..	do.	37·8	4·4	do.	15·0	1·7	do.	7·2	·9	60·0	3·9
	N.G. 176 ..	do.	39·0	2·8	do.	6·3	·7	do.	3·9	·4	49·2	3·4
	N.G. 178 ..	do.	22·1	1·3	do.	10·8	1·2	do.	8·1	·9	41·0	5·6
	N.G. 184 ..	do.	24·6	2·3	do.	12·0	1·2	do.	8·9	1·1	45·5	4·6
	N.G. 185 ..	do.	24·8	1·7	do.	9·0	1·1	do.	17·9	1·6	51·7	4·4
	N.G. 186 ..	do.	20·3	1·6	..	..	..	..	..	..	†20·3	1·6

* Total yield plant and first ratoon crop only.

† Plant crop only.

2. Experiments with Miscellaneous Canes.

The following varieties have been introduced to the Experiment Station at different periods, and tests are now concluded, viz.:—Hambledon Queensland Seedling 458, Gingila (a graft of Badila and Mauritius Gingham), and Petite Senneville. A striped sport of Mauritius 1900 Seedling produced at the station has also been included.

The details of the plant crop and descriptions of the varieties appear in the 1916 Report.

Analytical tests of the second ratoons were made as usual, and are given hereunder, including the complete chemical data and the crop results:—

First Preliminary Examination of Miscellaneous Canes—Second Ratoon Crop—June, 1918. Division D.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.
Gingila	9-6-18	8 months	19·0	17·12	1·48	13·9	90·0
Striped Sport 1900 Seedling	9-6-18	do.	15·7	14·41	1·82	11·4	91·5
H.Q. 458	9-6-18	do.	17·6	16·00	1·60	12·6	90·5
N.G. 16	9-6-18	do.	16·5	14·21	1·92	10·8	86·5
Petite Senneville	9-6-18	do.	19·0	17·00	1·40	13·2	89·1

Second Progressive Examination of Miscellaneous Canes—Second Ratoon Crop—July, 1918.

Gingila	9-7-18	9 months	19·8	18·14	1·26	14·7	91·5
Striped Sport 1900 Seedling	9-7-18	do.	17·0	15·57	1·30	12·7	91·5
H.Q. 458	9-7-18	do.	18·5	16·75	1·51	13·4	90·5
N.G. 16	9-7-18	do.	17·2	14·97	1·71	11·7	87·0
Petite Senneville	9-7-18	do.	19·2	17·32	·98	14·0	90·0

Third Progressive Examination of Miscellaneous Canes—Second Ratoon Crop—August, 1918.

Gingila	6-8-18	10 months	21·7	20·02	1·10	15·9	92·3
Striped Sport 1900 Seedling	6-8-18	do.	20·1	18·68	1·02	14·9	92·3
H.Q. 458	6-8-18	do.	18·4	16·38	1·46	12·7	89·0
N.G. 16	6-8-18	do.	20·0	17·80	1·56	13·8	89·0
Petite Senneville	6-8-18	do.	20·6	19·08	·82	15·2	92·6

Final Examination of Miscellaneous Canes—Second Ratoon Crop—September, 1918.

Variety of Cane.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity.	Fibre in Cane.
Gingila	4-9-18	11 months	22·3	21·04	·72	16·5	94·3	13·2
Striped Sport 1900 Seedling	4-9-18	do.	21·2	19·85	·68	16·0	93·6	10·7
H.Q. 458	4-9-18	do.	21·6	20·48	·58	16·5	94·8	11·2
N.G. 16	4-9-18	do.	21·5	19·70	·70	15·5	91·6	11·2
Petite Senneville	4-9-18	do.	20·9	19·85	·78	16·6	95·0	8·2

Analytical Results to Date of Miscellaneous Canes—Plant, First and Second Ratoon Crops—Division D—1916, 1917, and 1918.

Variety of Cane.	Plant Crop, 1916.					First Ratoon Crop, 1917.					Second Ratoon Crop, 1918.					Average of Three Years.		
	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	% Sucrose in Juice.	Purity of Juice.	C.C.S.
Gingila	15·7	13·31	·89	10·1	84·7	21·9	20·67	·32	16·4	94·7	22·3	21·04	·72	16·5	94·3	18·34	91·2	14·3
Striped Sport 1900 Seedling	17·5	15·64	·69	12·4	89·3	21·7	20·40	·21	16·3	94·0	21·2	19·85	·68	16·0	93·6	18·96	92·1	14·9
H.Q. 458	18·0	15·92	·83	12·6	88·4	20·2	18·78	·20	15·1	91·6	21·6	24·80	·58	16·5	94·8	19·83	91·6	14·7
N.G. 16	16·9	14·33	·86	11·0	84·7	20·5	19·61	·27	16·1	95·6	21·5	19·70	·70	15·5	91·6	17·88	90·6	14·2
Petite Senneville	17·0	14·44	·49	10·9	84·9	19·9	18·16	·46	14·1	91·3	20·9	19·85	·78	16·6	95·0	17·49	90·4	13·8

CROP RESULTS TO DATE OF MISCELLANEOUS CANES—PLANT, FIRST AND SECOND RATOON CROPS—1916, 1917, AND 1918.

Country.	Variety of Cane.	PLANT CROP, 1916.			FIRST RATOON CROP, 1917.			SECOND RATOON CROP, 1918.			TOTAL YIELD: THREE YEARS.	
		Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
Queensland	Gingila	13 months	33·9	3·4	10 months	12·6	2·0	11 months	9·4	1·6	55·9	7·0
Queensland	Striped Sport 1900 Seedling ..	13 months	39·4	4·8	10 months	17·1	2·8	11 months	9·8	1·6	66·3	9 2
Queensland	H.Q. 458	13 months	36·6	4·6	10 months	32·4	4·9	11 months	4·8	·8	73·8	10·3
New Guinea	N.G. 16	13 months	46·1	5·0	10 months	13·6	2·2	11 months	17·3	2·7	77·0	9·9
Mauritius ..	Petite Senneville	13 months	38·8	4·2	10 months	13·6	1·9	11 months	10·4	1·7	62·8	7·8

DATES OF ARROWING OF ABOVE PAPUAN AND MISCELLANEOUS CANES.

Gingila	27th May	N.G. 16 ..	11th June
Petite Senneville	29th May	N.G. 133 (partially)	16th June
N.G. 144	29th May	N.G. 142 ..	16th June
N.G. 146	4th June	N.G. 164 ..	10th July
N.G. 139	4th June	N.G. 184 ..	10th July
N.G. 185 (partially)	4th June	N.G. 128 ..	15th June
Striped Sport 1900 Seedling ..	6th June	.. .. ..	..
N.G. 140	6th June	.. .. ..	..
N.G. 148	6th June	.. .. ..	..

3.—TESTS TO DETERMINE THE ACTION OF FERTILISERS ON PLANT CROPS OF CANE AND THEIR EFFECT ON SUCCEEDING RATOON CROPS.

During the course of a number of manurial experiments at this Station, the fact has frequently been noted that where the land has been treated with lime and green manure the subsequent application of fertilisers to plant crops has not increased the yield notably. When the cost of the manures is taken into consideration, the fact cannot be overlooked that the fertilising of a plant crop may not be a payable proposition as far as the plant crop itself is concerned.

There is, however, another aspect of the question, which is that extremely payable results are obtained in the succeeding ratoon crops, where results often show an increase of 15 tons per acre due to the use of manures on this class of crop. The question arises : Is the action of the manure alone responsible for this increase ? or does the application of fertiliser to plant cane result in a more vigorous stooling, and, in consequence, being of higher vitality, causes it to throw a stronger and more robust ratoon ? In order to arrive at this point, two plots have been planted out with cane known as New Guinea 24B, which have been treated as follows :—

Plot 1.—Not fertilised in the plant crop, but all succeeding ratoon crops will be manured.

Plot 2.—Will receive manure in both plant and ratoons.

Details of the analytical and crop results of the first ratoon crop appear hereunder. This experiment bore out the contention that fertilisers do not make much difference in the yields of plant cane where such crops have been first treated with lime and green manures. Unfortunately the first ratoon crop met disaster in the shape of the cyclone and the tremendously abnormal rainfall of January and early February—some 91 inches. This enormous fall had the effect of washing all manures out of the soil. In no case on the station were fertilisers of any value this season ; they were all lost. It has been thought better to include the results of this year, as they may have some bearing on next year's yield :—

EXPERIMENTS AS TO THE VALUE OF FERTILISERS APPLIED TO A PLANT CROP AND THEIR SUBSEQUENT EFFECT ON THE YIELD OF RATOONS—FIRST RATOON CANE, N.G. 24B—1918.

Plot.	Treatment.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	Fibre in Cane.
1	No fertiliser applied to plant crop, but succeeding ratoon crops fertilised	4-9-18	11 months	20·6	19·27	·68	15·3	93·5	11·7
2	Plant crop treated with mixed fertilisers and ratoon crops also fertilised	4-9-18	do.	20·8	19·46	·71	15·5	93·6	11·7

Crop Results from Experiments as to the Value of Fertilisers Applied to a Plant Crop and their Subsequent Effect on the Yield of Ratoons—First Ratoon Cane. N.G. 24B—1918.

Plot.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	No fertiliser applied to plant crop, but succeeding ratoon crops fertilised	11 months	21·1	3·2
2	Plant crop treated with mixed fertilisers, and ratoon crops also fertilised	do.	21·7	3·3

Yields to Date in the above Manurial Experiments—Plant and First Ratoon Crops, N.G. 24B—1917 and 1918.

Plot.	Treatment.	Plant Crop, 1917.			First Ratoon Crop, 1918.		
		Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	No fertiliser applied to plant crop, but succeeding ratoon crops fertilised	13 months	48·2	7·0	11 months	21·1	3·2
2	Plant crop treated with mixed fertilisers, and ratoon crops also fertilised	do.	48·6	6·7	do.	21·7	3·3

4.—Tests to Determine the Value of Subsoiling Ratoon Crops.

The method of ratooning cane in vogue at this station may be briefly described as follows:—Centres of drills are split with a swing plough and subsoiled, the stools are then cut away from and also subsoiled, manure is applied to the stools, and the centres immediately worked down with a scuffler. As this method is somewhat slow, and the cost of cultivation has now to be seriously studied, in some cases where the cane is not under experiment, such as that for propagation and distribution purposes, the ratooning has been confined to simply loosening the soil. In some cases the only treatment received has been a deep double cultivation with the riding spring-tooth cultivator. In watching the results, the latter method has often compared favourably with the former, and it may be that a well-fertilised cane stool growing on ground which has been previously deeply cultivated before planting may possess sufficient vitality to produce a flourishing ratoon crop without further treatment other than a loosening of the surface hard pan.

In the preparation of land for planting it has been noticed that where land has previously been subsoiled the subsoil, even after a lapse of as long as four years, is of a considerably more friable and porous nature than where no subsoiling has been given. This is borne out when rain falls, as during harvesting great trouble is often experienced through teams bogging on such land. On subsoiled ground, apparently, the only setting of the land occurs in the first 9 inches of soil, whilst below this depth the soil is in a comparatively loose condition. As the point is of considerable value in lowering the cost of production, it fully justifies experiment. To this end plots have been treated as follows:—

Plot. 1—Plant and ratoon crops subsoiled.

Plot 2.—Plant crop subsoiled, but ratooning will be carried out with the spring-tooth cultivator only.

The first ratoon crop of this experiment has now been harvested and the results are set out below:—

Experiments to Determine the Value of Subsoiling Ratoon Crops—N.G. 24B—First Ratoon Crop, 1918.

Plot.	Treatment.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	Fibre in Cane.
3	Plant and ratoon crops will be subsoiled	4-9-18	11 months	21·0	19·92	·72	15·9	94·8	**11·7**
4	Plant crop subsoiled, but succeeding crops ratooned with spring-toothed cultivator only	..	do.	20·7	19·60	·58	15·7	94·6	11·7

CROP RESULTS OF EXPERIMENTS TO DETERMINE THE VALUE OF SUBSOILING RATOON CROPS—N.G. 24B—FIRST RATOON CROP, 1918.

Plot.	Treatment.	Age of Cane.	Yield of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
3	Plant and ratoon crops will be subsoiled	11 months	21·5	3·9
4	Plant crop subsoiled, but succeeding crops ratooned with spring-toothed cultivator only	do	24·8	3·9

It will be seen that, as far as the first ratoon crop is concerned, the spring-tooth cultivation gave better results than the subsoiling. However, conditions have been so upset this year that it will be wiser to wait for the returns of the second ratoon crop next year before forming conclusions.

5.—SUBSOILING VERSUS ORDINARY CULTIVATION.

At the request of many farmers in the Mackay district for a repetition of experiments as to the value of subsoiling as compared with ordinary farmers' cultivation, an experiment of this nature was laid down last year. The previous test of this nature was made in 1902 when the results were as follows :—

Treatment.	Yield of Cane per Acre.	Yield of Sugar per Acre.
Deep subsoiling (21 inches) supplemented by thorough cultivation	49·6	6·7
Ordinary farmers' treatment	29·6	3·7

The cane grown by the deep subsoil and thorough cultivation had a higher sucrose, higher purity, lower glucose, and a notably less content of fibre, thus resulting in a higher total amount of commercial cane sugar than in the cane grown by " ordinary cultivation."

This year the results of the plant crop have come to hand, but, due to the damage wrought by the cyclone, the results are markedly low. It was estimated that more than 50 per cent. of this cane was destroyed, the wind striking the cane at right angles to the rows. The chemical figures and crop results are given in the following tables :—

FURTHER EXPERIMENTS ON THE VALUE OF SUBSOILING—N.G. 24A—PLANT CROPS, 1918.

Plot.	Treatment.	Date of Analysis.	Age of Cane.	Total Solids (Brix).	% Sucrose in Juice.	% Glucose in Juice.	C.C.S.	Purity of Juice.	Fibre in Cane.
1	Plant crop subsoiled, and succeeding ratoon crops will also be subsoiled	4-9-18	13 months	20·6	19·32	·72	15·5	93·7	11·2
2	Plant crop not subsoiled, and succeeding crops will be ratooned by ploughing 10 in. deep	do.	do.	20·8	19·53	·68	15·6	93·8	11·2

CROP RESULTS TO TEST VALUE OF SUBSOILING RATOON CROPS—N.G. 24A—PLANT CROP—1918.

Plot.	Treatment.	Date of Analysis.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Plant crop subsoiled, and succeeding ratoon crop also will be subsoiled	4-9-18	13 months	14·2	2·7
2	Plant crop not subsoiled, and succeeding crops will be ratooned by ploughing 10 in. deep	4-9-18	do.	11·5	1·8

Note.—This experiment differs from the preceding one, inasmuch as one plot only was subsoiled. In No. 4 both plant crops were subsoiled, but one plot of the ratoons was not subsoiled. In the present experiment the test is a straight-out one between subsoiling and non-subsoiling, and the results from the ratoon crops will be awaited with interest.

Distribution of Cane Varieties at Mackay.

In spite of the cyclone, sufficient cane was available for distribution this year, and farmers came to the station in a continuous stream on the 19th August. In all, 108 growers applied. The principal varieties chosen were Q. 813, 903, 970, 1121, H.Q. 458, Badila Seedling, Hybrid No. 1, M. 55, and 87.

Crates of the selected new Papuan canes were forwarded to the experimental plots of Messrs. Ruge, Proserpine ; Black Bros., Kalamia ; and Jas. Mackersie, Ayr.

A number of packages of cane were also despatched to outside growers.

6.—WORK OF THE SOUTHERN SUGAR EXPERIMENT STATION AT BUNDABERG.

Mr. James Pringle, the chemist in charge of the Southern Sugar Experiment Station at Bundaberg, continues to carry out his duties in the most satisfactory manner, and his work is much appreciated. The tables in connection with the experiments have been prepared by him, and he has also supplied notes upon the crops for use by the General Superintendent in compiling this portion of the report.

R. Rasmussen, foreman, resigned on the 23rd July to take up farming on his own account, and A. Evans was appointed in his place, while a returned soldier, named J. C. Thomsen, was engaged as ploughman. Both men are to be highly commended for their strict and skilful attention to duty.

Meteorological.

The past season from a climatic standpoint may be termed favourable up to the early part of the present year, though even in January and February the weather was not so warm as it usually is, which adversely affected growth. There was an exceptionally heavy fall in January, as will be seen from the Rainfall Table. Unfortunately, this station also received a severe blow this season, though of a different nature to that which visited Mackay. In July one of the most severe frosts experienced in Bundaberg visited the district, and practically affected the whole of the station cane, destroying all the green foliage of the crop and ruining almost every eye on the stick, thus leaving scarcely anything for plants. This was unfortunate, as land had been got ready for planting out selected varieties from the Papuan canes. The frost killed every eye on these varieties, thus rendering them quite unfit for planting and throwing the work back in this connection for another twelve months. Fortunately, the imported Java, Hawaiian, and Mauritius canes were planted in a small garden sheltered by buildings, so that these escaped damage and have now been planted out.

The following table shows the rainfall during the growing season :—

Month.	Rainfall.	Month.	Rainfall.
August, 1917	1·720	April, 1918	5·085
September, 1917	3·660	May, 1918	·150
October, 1917	2·492	June, 1918	—
November, 1917	5·676	July, 1918	·952
December, 1917	4·236	August, 1918	1·200
January, 1918	16·848	September, 1918	·580
February, 1918	5·368		
March, 1918	3·310	Total ..	51·277

Experiments dealt with in the Following Section.

(*a*) Liming, cultivation, and manurial trials with D 1135 (second ratoons).

(*b*) Experiments with Badila cane planted in rows having different widths—viz., 5 ft., 6 ft., and 7 ft. apart. Second ratoons.

(*c*) Experiments with Badila cane, of which the top plants only, middle plants only, and bottom and middle plants only were separately planted (second ratoons).

(*d*) Experiments with planting cane sets by hand *versus* machine planting of same. Results of plant crop, 1917.

(*e*) Experiments with ordinary cultivation *versus* no subsequent cultivation. Results of plant crop, 1917.

(*f*) Analytical results of miscellaneous canes.

(*g*) Commercial cane sugar in 29 of the best Papuan canes selected from Wells' collection.

(*a*) Liming Cultivation and Manurial Experiments—Second Ratoons.

After cutting the first ratoon crop last year, these plants were carefully ratooned, and, while they all came away well, those carrying fertiliser showed a marked difference in colour and growth, and drew the attention of all visitors to the station. It was intended to allow these

experiments to stand over till 1919, but the disastrous frost experienced called for their immediate cutting. These experiments run in series, but for the sake of convenience the analytical tables and crop results are here given together :—

ANALYTICAL RESULTS OF LIMING EXPERIMENTS WITH AND WITHOUT SUBSOILING—D 1135—SECOND RATOONS—SEPTEMBER, 1918.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	C.C.S. in Cane.
1	D 1135 ..	Subsoiled; lime applied before plant crop, 1 ton per acre	12 months	11-9-18	19·2	17·20	·62	90·6	15·30	13·44
2	D 1135 ..	Not subsoiled; lime as in plot 1	do.	11-9-18	18·8	16·70	·64	82·3	14·86	12·95

CROP RESULTS FROM LIMING EXPERIMENTS WITH AND WITHOUT SUBSOILING—SECOND RATOONS—D 1135—1918.

Plot Number.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Subsoiled; lime applied before plant crop, 1 ton per acre ..	12 months	17·32	2·33
2	Not subsoiled: lime as in Plot 1	do.	18·14	2·34

ANALYSES OF LIMING EXPERIMENTS WITH AND WITHOUT MANURES—D 1135—SECOND RATOONS, SEPTEMBER, 1918.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	C.C.S. in Cane.
1	D 1135 ..	Mixed manure consisting of Sulphate of Ammonia 1 cwt., Nitrate of Soda 1 cwt., Sulphate of Potash 1 cwt., and Meatworks manure 1 cwt. Lime at the rate of 1 ton per acre applied before Plant Crop	12 months	11-9-18	19·7	17·73	·71	90·0	15·77	13·88
2	D 1135 ..	No manure, but Lime applied to Plant Crop, as in Plot 1	do.	11-9-18	18·8	16·80	·62	89·3	14·95	13·09

CROP RESULTS FROM LIMING WITH AND WITHOUT MIXED MANURES—D 1135—SECOND RATOONS, 1918.

Plot Number.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Mixed manure, consisting of Sulphate of Ammonia 1 cwt., Nitrate of Soda 1 cwt., Sulphate of Potash 1 cwt., and Meatworks manure 1 cwt. Lime at the rate of 1 ton per acre applied before Plant Crop	12 months	26·63	3·69
2	No manure, but Lime applied to Plant Crop as in Plot 1 ..	do.	18·81	2·46

ANALYTICAL RESULTS OF EXPERIMENTS WITH AND WITHOUT MANURES—D 1135—SECOND RATOONS, SEPTEMBER, 1918.

No. of Plot.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice	% Sucrose in Cane.	C.C.S. in Cane.
1	D 1135 ..	Mixed manure, consisting of Sulphate of Ammonia 1 cwt., Nitrate of Soda 1 cwt., Sulphate of Potash 1 cwt., and Meatworks manure 1 cwt. No Lime; no subsoiling	12 months	11-9-18	19·2	17·07	·88	88·9	15·19	13·24
2	D 1135 ..	No manure; no Lime; no subsoiling	do.	11-9-18	17·9	15·97	·76	87·4	14·21	12·45

CROP RESULTS FROM EXPERIMENTS WITH AND WITHOUT MANURES—D 1135—SECOND RATOONS, 1918.

Plot Number.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Mixed manure, consisting of Sulphate of Ammonia 1 cwt., Nitrate of Soda 1 cwt., Sulphate of Potash 1 cwt., and Meatworks Manure 1 cwt. No Lime or subsoiling	12 months	37·29	4·93
2	No manure; no Lime; no subsoiling	do.	14·62	1·82

The yields from the manured plots, especially the last of the series, are again highly satisfactory. The manure applied was not by any means an expensive one, nor was very much used. The frost, too, did not do so much damage to the manured cane as it did to the unmanured. It will be seen apparently that the lime and subsoiling have had little effect on those plots where they were tried. This bears out the results of the plant and first ratoon crops. In the second series, where lime was used with the fertilisers, the results were not so good as where the fertilisers were used alone in the third series. The latter has given, as it did last year, remarkably good results, showing a difference of 22·67 tons in favour of the manures. Given normal seasons, it is evident that the manuring of ratoons will pay. The great difficulty is the long stretches of dry weather so frequently experienced in Bundaberg. This difference is slightly better than in the first ratoons of last year, which showed an increase of 20·21 tons for manures.

This experiment will be continued into the third ratoon stage.

(*b*) EXPERIMENTS WITH BADILA CANE (SECOND RATOONS) PLANTED IN ROWS HAVING DIFFERENT WIDTHS—VIZ., 5 FT., 6 FT., AND 7 FT. APART.

Owing to the frost, these interesting experiments in the second ratoon stage were obliged to be harvested. It was hoped that they could stand over till next year and make a crop. This variety requires at least two years in the Bundaberg district. The analytical and crop results appear hereunder :—

ANALYTICAL RESULTS OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (BADILA), SECOND RATOONS—SEPTEMBER, 1918.

Plot Number.	Variety of Cane.	Distance between Rows.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	C.C.S. in Cane.
1	Badila	5 feet ..	12 months	12-9-18	21·9	20·33	·16	92·8	18·39	16·49
2	Ditto	6 feet ..	12 months	12-9-18	20·2	19·00	·17	94·1	17·19	15·53
3	Ditto	7 feet ..	12 months	12-9-18	18·7	17·37	·19	92·8	15·68	14·01

CROP RESULTS OF CANE PLANTED IN ROWS HAVING DIFFERENT WIDTHS—N.G. 15 (OR BADILA). SECOND RATOONS, 1918.

Plot Number.	Distance between Rows.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	5 feet	12 months	12·91	2·13
2	6 feet	12 months	10·36	1·60
3	7 feet	12 months	9·95	1·39

It is at once apparent from the crop data that the results of the plant and first ratoon crops are amply confirmed—that is, that close planting gives the best results. This has been borne out at the Mackay Sugar Experiment Station and in experiments made in other countries. The high commercial cane sugar is noticeable considering the frosted state of the cane. This trial will go on for a further crop of third ratoons.

(*c*) EXPERIMENTS WITH BADILA CANE OF WHICH THE TOP PLANTS ONLY, MIDDLE PLANTS ONLY AND BOTTOM AND MIDDLE PLANTS ONLY WERE SEPARATELY PLANTED (SECOND RATOONS).

This series of Badila experiments were to have gone forward to next year but for the frost. They had to be harvested, however, and the results are given below :—

ANALYTICAL RESULTS OF EXPERIMENTS IN PLANTING TOPS, MIDDLES, AND MIDDLES AND BOTTOMS OF CANES—N.G. 15 (OR BADILA).—SECOND RATOONS, SEPTEMBER, 1918.

Plot Number.	Variety of Cane.	Seed Used.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	C.C.S. in Cane.
1	Badila ..	Tops only planted ..	12 months	12-9-18	20·4	19·03	·17	90·3	17·22	15·70
2	Ditto ..	Middles only planted	12 months	12-9-18	20·3	18·87	·18	92·9	17·07	15·32
3	Ditto ..	Bottoms and middles planted	12 months	12-9-18	19·9	18·33	·21	92·1	16·58	14·80

CROP RESULTS FROM EXPERIMENTS IN PLANTING TOPS, MIDDLES, AND MIDDLES AND BOTTOMS OF CANES—N.G. 15 (OR BADILA).—SECOND RATOONS. 1918.

Plot Number.	Seed used.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Tops only planted	12 months	10·27	1·61
2	Middles only planted	12 months	6·68	1·02
3	Middles and bottoms planted	12 months	7·55	1·12

The crop results still show that top plants give the best results. Some experiments carried out in North Queensland tend to show that bottom plants are the next best, and it is intended to carry out some trials at Bundaberg, using different parts of the plant for seed.

(*d.*) EXPERIMENTS WITH PLANTING CANE SETS BY HAND VERSUS MACHINE PLANTING OF SAME—RESULTS OF THE PLANT CROP, 1917.

These plots were planted in March, 1916, for the purpose of determining how much loss took place when cane sets were planted by the machine known as the " cane planter " in place of planting by hand. These experiments were carefully made and every care was taken, so that the preparation of the two pieces of land was identical and all other conditions, except the planting, absolutely uniform. Due to the large amount of cane to be cut last year upon the Station, the results did not come to hand for last year's report, so they are now included. It will be impossible to get the yields from the ratoon crops this year in time for this report either. The analytical data and results of the plant crop appear below :—

ANALYTICAL RESULTS FROM EXPERIMENTS IN MACHINE PLANTING VERSUS HAND PLANTING—PLANT CANE D. 1135—SEPTEMBER, 1917.

Plot Number.	Variety of Cane.	Method Used.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	% C.C.S. in Cane.
1	D. 1135 ..	Cane sets planted by the machine known as the cane planter	18 months	24-9-17	21·0	20·13	·26	95·8	17·92	16·34
2	D. 1135 ..	Cane sets planted by hand	18 months	24-9-17	20·3	19·40	·16	95·5	17·26	15·75

CROP RESULTS FROM EXPERIMENTS IN MACHINE PLANTING VERSUS HAND PLANTING. PLANT CANE D. 1135.—1917.

Plot Number.	Variety of Cane.	Method Used.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	D. 1135	Cane sets planted by the machine known as a cane planter	33·30	5·44
2	D. 1135 ..	Cane sets planted by hand	36·80	5·79

From the crop results it is seen that the loss due to machine planting was 3½ tons of cane per acre. Results from the ratoon crops must be awaited before any conclusions are drawn.

(*e.*) EXPERIMENTS WITH ORDINARY CULTIVATION VERSUS NO SUBSEQUENT CULTIVATION—RESULTS OF PLANT CROP, 1917.

In order to test the efficacy of continued after-cultivation with the Planet Junior *versus* no subsequent cultivation at all, a considerable area of land was given exactly similar treatment up to planting. As soon as the plants appeared the cane was divided into two plots, in one of which the horse cultivator was kept moving while the second received no horse cultivation, only hand chipping. The analytical data and crop results of this trial follow :—

RESULTS OF ANALYSIS OF EXPERIMENTS TO DETERMINE WHETHER SUBSEQUENT CULTIVATION WITH THE HORSE CULTIVATOR, AFTER THE PLANTING OF CANE IN RED SOIL, GIVES A HIGHER YIELD THAN WHERE NO SUBSEQUENT HORSE CULTIVATION IS PRACTISED. D. 1135—PLANT CROP—SEPTEMBER, 1917.

Plot Number.	Variety of Cane.	Treatment.	Age of Cane.	Date of Analysis.	Density of Juice (Brix.)	Sucrose in Juice %	Glucose in Juice %	Purity of Juice.	Sucrose in Cane %	C.C.S. in Cane.
1	D. 1135 ..	Horse cultivator used between rows	18 months	24-9-17	20·4	19·26	·32	94·4	17·14	15·46
2	D. 1135 ..	No horse cultivation ..	18 months	24-9-17	20·0	18·86	·50	94·3	16·78	15·17

CROP RESULTS FROM EXPERIMENTS TO DETERMINE WHETHER SUBSEQUENT CULTIVATION WITH THE HORSE CULTIVATOR AFTER THE PLANTING OF THE CANE IN RED SOILS GIVES A HIGHER YIELD THAN WHERE NO SUBSEQUENT HORSE CULTIVATION IS PRACTISED.

Plot Number.	Treatment.	Age of Cane.	Weight of Cane per Acre in English Tons.	Yield of Commercial Cane Sugar per Acre in English Tons.
1	Horse cultivator used between rows	18 months	46·70	7·22
2	No horse cultivation	18 months	45·56	6·91

The difference for horse cultivation was only 1·14 tons in the plant crop, but it should show up more conclusively in the ratoons. The red soils being so light and porous will probably not exhibit the advantages of subsequent cultivation to the same extent as the alluvial soils at Mackay.

(*f.*) ANALYTICAL RESULTS OF MISCELLANEOUS CANES.

Analyses of the following canes :—Badila Seedling, Gingila, Gingor, and Shahjahanpur No. 10—were made in September. The three former varieties were badly damaged by frost, but the Indian variety known as Shahjahanpur No. 10 was absolutely untouched, and stood out beautifully green in strong contrast to the frosted canes around it. It may be noted in regard to this variety that, though a high fibre cane, it is also of good sugar content, and, having strong frost-resisting qualities, it may prove of great value in low-lying localities. It was the only variety that withstood the frost of July 15th in the field. This bears out the reputation accompanying it on its introduction to Queensland. This cane was sent from the Shahjahanpur Sugar Experiment Station in India to this Bureau accompanied by a letter from the Agricultural Chemist to the Government stating: " We find it a good variety for the Rohilkhand country where the winter is severe." If this cane fulfils its present promise, we shall be pleased to distribute it to growers requiring a cane adapted to frost conditions.

ANALYTICAL RESULTS OF MISCELLANEOUS CANES—PLANT CROP. SEPTEMBER, 1918.

Country.	Name or Number of Variety.	Age of Cane.	Date of Analysis.	Density of Juice (Brix).	% Sucrose in Juice.	% Glucose in Juice.	Purity of Juice.	% Sucrose in Cane.	C.C.S. in Cane.
Queensland	Badila seedling ..	24 months	22-8-18	19·9	18·33	·35	92·6	16·60	14·55
Queensland	Gingila	24 months	22-8-18	17·5	16·16	·33	92·3	14·38	12·84
Queensland	Gingor	24 months	22-8-18	14·6	10·03	2·80	68·7	8·92	6·40
India	Shahjahnapur No. 10	27 months	22-8-18	20·6	19·27	·17	93·5	16·57	14·81

(*g.*) COMMERCIAL CANE SUGAR IN 29 OF THE BEST PAPUAN CANES SELECTED FROM WELLS' COLLECTION.

As mentioned previously, a larger number of varieties of the new Papuan canes showed more promise at Bundaberg than at Mackay. It was intended to have planted these out in August, but, as stated, the disastrous frost killed every eye. This set back the work for another twelve months. Chemical tests have been made of those varieties which are embodied in the table following :—

COMMERCIAL CANE SUGAR IN 29 PAPUAN VARIETIES. SELECTED FOR PLANTING OUT IN COMPETITION IN 1919.

Country.	Number of Variety.	% Commercial Cane Sugar in Cane.
New Guinea	N.G. 72	15·37
Ditto	N.G. 75	15·48
Ditto	N.G. 81	14·91
Ditto	N.G. 83	16·73
Ditto	N.G. 87	14·80
Ditto	N.G. 88	13·10
Ditto	N.G. 89	14·70
Ditto	N.G. 90	14·32
Ditto	N.G. 93	12·00
Ditto	N.G. 94	13·79
Ditto	N.G. 102	14·92
Ditto	N.G. 103	15·18
Ditto	N.G. 107	12·70
Ditto	N.G. 108	15·86
Ditto	N.G. 123	14·60
Ditto	N.G. 130	15·71
Ditto	N.G. 135	11·95
Ditto	N.G. 141	14·67
Ditto	N.G. 147	16·61
Ditto	N.G. 148	15·49
Ditto	N.G. 151	15·52
Ditto	N.G. 161	15·00
Ditto	N.G. 164	14·94
Ditto	N.G. 165	16·46
Ditto	N.G. 167	15·07
Ditto	N.G. 173	15·23
Ditto	N.G. 174	13·33
Ditto	N.G. 177	16·56
Ditto	N.G. 184	12·41

"COMMERCIAL CANE SUGAR."

The expression "Commercial Cane Sugar" is one that has been adopted by the Queensland Cane Prices Board, and is calculated as follows :—

$$\text{Total soluble solids in juice} \times \frac{100 - (3 + \text{Fibre})}{100} = \text{total soluble solids in cane.}$$

$$\text{Sucrose in juice} \times \frac{100 - (5 + \text{Fibre})}{100} = \text{Sucrose in cane.}$$

$$\text{Total soluble solids in cane} - \text{Sucrose in cane} = \text{Impurities in cane.}$$

$$\text{Sucrose in cane} - \frac{\text{Impurities in cane}}{2} = \text{Commercial cane sugar.}$$

FIELD DAY AT BUNDABERG STATION.

A highly successful Field Day was held at this Station on the 1st June, at which about 200 farmers attended. The visitors were welcomed by the Minister for Agriculture, Mr. W. Lennon, and were then taken over the Station, where the various experiments were explained. Great interest was displayed in the large number of varieties, especially those brought in from outside countries. After luncheon a demonstration of farm implements took place, concluding a pleasant and instructive day.

Distribution of Varieties.

A free distribution of cane varieties was made in March this year, when about seventy growers attended and secured new kinds of cane. Packages were also sent to various mills, farmers' associations, and individuals along the railway lines north and south of Bundaberg. The following varieties were most sought after :—Q 813, HQ 114, Badila Seedling, Hybrid No. 1, Mahona, Q 1092, Q 1098, HQ 426, M 87, M 89, and M 55 ; three of these varieties—Q 813, Hybrid No. 1, and HQ 114—seem to be coming rapidly into favour in this and the surrounding districts, especially the Q 813.

New Experiments.

Cane has been planted upon land that has been growing lucerne for a number of years. Many farmers in the Woongarra district maintain that on the red soils cane will not grow after lucerne. An area was prepared and divided into three parts, each of which was treated as under :—

1. Plot treated with lime and green manure before planting.
2. Plot treated with lime only.
3. No lime or green manure.

In other respects the treatment of this land will be identical. The cane was planted in August.

New varieties have been planted out on a larger scale to provide seed for future experiments. These include H 109, H 146, H 227, HQ 77, EK 1, EK 2, EK 28, No. 100 Bont, and No. 247 Generatie ; also M 168^{04}.

Silage of Cane Tops.

A small silo has been installed at the Station and filled with chaffed cane tops for the purpose of ascertaining the value of this for feeding purposes.

7.—INITIATION OF A NORTHERN SUGAR EXPERIMENT STATION AT SOUTH JOHNSTONE.

The piece of land chosen as a site for a Northern Experiment Station is upon the opposite side of the river from the South Johnstone Sugar Mill. The land is of fair average quality, low in available phosphoric acid and lime, and, like most of the soils in this neighbourhood, containing a larger percentage of magnesia than lime. Work has been commenced in the erection of the necessary building , which will consist of a laboratory, chemist's residence, foreman's residence, men's quarters, and stables. It is hoped that experiment work will be commenced after the next wet season.

8.—LABORATORY WORK

The large amount of chemical data shown in this report is not the only work carried out by the laboratories, bu they are of direct help to growers in the analyses of their soils, waters, limestones, fertilisers, and sugar-canes. In the latter connection, the large number of analyses carried out at the Bundaberg Experiment Station by Mr. Pringle deserves attention. The following tables show the amount of chemical work performed :—

Detailed Report of Analytical Work Performed in the Laboratory of the Sugar Experiment Station, Mackay, for the Season 1917-18.

Materials.	Number of Samples Analysed.
Sugar-canes for farmers	20
Sugar-cane juices (Station)	223
Sugar-cane fibres	80
Limestones	2
Total	325

Analyses of Canes and Juices carried out at the Laboratory, Sugar Experiment Station, Bundaberg.

Materials.	Number of Samples Analysed.
Sugar-canes and juices for growers	453
Sugar-canes and juices for Agricultural Show, Bundaberg	117
Sugar-canes and juices for Agricultural Show, Gin Gin	142
Sugar-canes and juices for Experiment Station	90
Total	802

In addition to the above, the following analyses have been made for the Bureau by the Agricultural Chemist, Mr. J. C. Brünnich, to whom thanks are due :—

Materials.	Number of Samples Analysed.
Soils	12
Waters	4
Limestone	6
Fertilisers	14
Sugar-canes	3
Sugar and molasses	8
Total	47

9.—WORK OF THE DIVISION OF ENTOMOLOGY.

This highly important branch of the Bureau's activities is under the control of Dr. James F. Illingworth, whose work is arousing the greatest interest amongst the farmers who are so vitally concerned in the suppression of insect pests in general and the attacks of grubs in particular. Dr. Illingworth has assisting him Mr. Edmund Jarvis and Mr. A. A. Girault.

The laboratory and residences are situated at Meringa, outside of Cairns.

The following report on the entomological work for the past twelve months has been written by Dr. Illingworth :—

"I must report very satisfactory progress during the past year. Our knowledge of the habits of the grubs has been materially increased, and we are beginning to see daylight in the matter of their control.

As suggested in our earlier reports, our problem is naturally one largely for the field ; and by following along this line consistently we are beginning to see the beneficial results of cultural methods. It will be remembered that even in our first reports I laid particular emphasis upon the importance of supplying abundant humus as a control measure, and began an investigation of the value of cultivation and late planting for infested soils. At the present time, I feel that we are able to demonstrate that both of these factors are of very great importance in controlling the grub-pest.

On the Value of Organic Matter in the Soil.

Early in the game, from our knowledge of the feeding habits of the grubs, I was confident of the value of humus-forming material as a factor in their control. Hence, we have followed the matter up with increasing interest.

Our laboratory experiments of placing megass in the soil of potted cane plants proved very encouraging ; for the grubs quickly destroyed the roots of the plants in the check pots—*i.e.*, those containing no megass, while in the ones under treatment they fed upon this organic material in preference to eating the roots of the growing cane Dr. J H. Reed tells me that he tried a similar experiment with the same result, the only difference being that he used chop-chop to mix with the soil.

Everyone who has had anything to do with the growing of cane on infested land has probably noticed that some of the stools at the ends of the rows are of more sturdy growth, and that these stools often keep their footing when the balance of the field goes down. This matter has been variously explained by growers, some contending that the increased growth may be accounted for by the fact that these stools are less crowded. However, if this was the correct explanation, we would naturally expect to find the same increased growth along the sides of the field, which does not usually appear. My explanation, and one that is borne out by experimentation, is that there is more humus-forming material in these particular spots, for in working the land the trash is naturally dragged to the ends, where it eventually becomes broken up and mixed with the soil.

Again, it appears to be rather common experience that grubs are not so bad on land after it has been thrown out of cultivation for three or four years. I believe this may be explained, also, on the grounds of accumulated humus, for, usually, the weeds and trash are allowed to remain while the land is idle, and these are eventually worked into the soil.

On the other hand, the immunity of cane planted on particularly rich land, such as river flats, is evidently due to the fact that soils subject to occasional overflow are naturally rich in organic matter. Nevertheless, even these soils can be quickly ruined by continual cropping, combined with the burning of all trash. In such cases, the appearance of grubs in the cane is an almost sure indication that the ground requires more humus. An instance of this kind has been under investigation recently. The field lying on the river bank has a soil of great depth, and has been planted to sugar-cane for years. I am told that as many as eight years ago the grubs were found in great numbers under the stools ; but the cane showed no injury from them. The soil being evidently rich enough to feed them, they were not forced to resort to the living cane roots for subsistence. During the past season, however, the cane in this field suffered severely ; and

investigation shows that there are as many grubs in this soil as in our worst districts. Their destruction of the roots, combined with the cyclone, put all the cane down, and it became badly deteriorated.

I realise that the conservation of trash on red volcanic soils is a difficult matter, especially with our present implements ; but it must be done unless a great deal of time is given up to green-manuring. On soils that will scour, however, there is little excuse for the destruction of all trash. The waste from the ratoon crop should be worked in, and this followed with a heavy green crop of corn or beans to put the soil in prime condition for a new run of cane. If this regular rotation is followed up, the land will not deteriorate ; and I feel rather confident that there will be a marked decrease in the injury from the grubs.

More recently I have made the following investigation at Hambledon, where they have the best system of supplying humus that I have seen :—

All the waste from the mill is composted and left for about a year before it is put on the land.

This compost is made by building up layers of the various by-products from the mill, filter-press, trash from the carriers, ashes from wood, megass, and so forth ; nothing is permitted to go to waste ; even dead animals are buried in the pile.

About thirty loads of this, or about 20 tons, are applied to the acre. It is certainly a very valuable fertiliser, and the cane shows a marked increase in growth where it has been applied. There is one block near the residence of Mr. A. L. Walker which is a most excellent experiment. Part of this he treated with the compost, leaving the remainder. The treated cane is almost a foot taller than the other.

The soil of this farm scours well, and for this reason it is an easy matter to work in trash. Mr. Walker tells me that he leaves the trash from the two last ratoon crops—*i.e.*, volunteering the last ratoons by simply relieving over the rows. After the last crop is cut he ploughs in this double trash and applies compost or a green crop, which is worked in preparatory to a new series of cane.

In one field, which he was preparing for September planting at the time of my visit, a bean crop had been turned under, then the soil was treated with about 20 tons of compost. At the third ploughing, the soil was distinctly blackened by the rich supply of humus ; and though the surface was clean, Mr. Walker told me that the plot was to have five ploughings altogether, before planting, to get it in perfect tilth. Is it any wonder that he cuts 50-ton crops without other fertilisers on land that was once thoroughly infested with white grubs ?

Late Planting.

Late planting appears to be of considerable importance for infested areas. If the cane is regularly cultivated, the soil is actively worked during the flight and oviposition of the beetles ; and from present observations this constant stirring of the soil either deters the beetles from laying their eggs, or, if they are laid, breaks up the egg-chambers, which are only a few inches below the surface, and prevents the hatching of the young grubs. At any rate, cane planted in October last year is in very good condition in every infested district that I have visited, even though, in some cases, there is grub-destroyed cane immediately adjoining.

I have been greatly interested in the rather general acceptance of the idea of late planting for infested soils. Almost everywhere that we go we find the farmers routing out the grubby fields ; and a number have told me that it is their intention to work the ground thoroughly preparatory to late planting. There is certainly no time better for killing weeds ; and by maintaining this clean fallow, the cane should require very little chipping, thus removing one of the great objections to late planting—*i.e.*, the difficulty of keeping the crop clean during the wet weather. Let me repeat, then, and urge that the infested red volcanic soils be thoroughly worked and cleaned preparatory to planting in September or October. During the process of ploughing three or four times it is possible to work a great deal of trash and other organic matter into the soil ; and it is certainly worth all the extra effort that is required to conserve this humus-forming material, for, as explained above, it undoubtedly is a vital factor in grub control.

Let me call attention to a very interesting experiment at Greenhills, where in one field (L6) half of the cane was planted in June, 1917, and the rest in October. The latter half is now beautiful cane, very erect and green, in marked contrast to the early planted half, which went down in the cyclone after a very bad attack of grubs. Furthermore, this early planted cane deteriorated so badly that hardly any of it was fit for milling. This field is particularly interesting, because the two plantings are side by side, having the same care and exactly the same soil.

While several have told me that they have known late plantings to fail, it appears that the principal difficulty is due to the lack of cultivation. Investigation, in several instances, showed that the soil became too wet for working, or the farmers had too much work on hand, just at the time that the beetles were flying.

It must be made clear, then, that late planting will only succeed on soils which are so easily drained that they may be thoroughly worked through December and January. Most of our red volcanic soils are of this character ; and these are the ones that are usually infested when planted early. Let me emphasise that it is *thorough cultivation during the flight of the beetles* that does the business, and that late planting is only to facilitate this.

I feel confident that the problem can be handled best on the heavy wet soils by the application of abundant humus. Since these soils scour well, trash and green crops can be easily worked into them. After this preparation, I would advise early planting, for there is no question that this is best where it will succeed. The point here is, that the grubs will leave the growing roots alone if the soil is rich in organic matter.

A Study of the Rooting Systems of Sugar-cane.

We have been making some investigations of the rooting systems, particularly in regard to depth, with the idea in mind that if we could get a variety that would root more deeply than Badila it would be more apt to stand up when attacked by grubs. We naturally looked to D1135, since this cane ratoons so well and has an erect growth. It is also the variety grown largely at Mossman, where it is considered rather resistant to grubs. Digging in the stools, we found that the principal roots of this cane extended downward often to a depth of 16 or 18 inches, which is in marked contrast to Goru, with most of its roots extending laterally, often reaching across to the next row. D1135 is a good milling cane with plenty of fibre ; and, even though it is of only average density, it will be a valuable variety to grow if it can be shown that it is grub-resistant. There are several fields of it in the grub-infested region about Meringa, and so far they are in very good condition.

Further investigation gives every evidence of the superiority in ratooning qualities of D 1135. It is a cane that comes away with abundant shoots, and hence requires vigorous ratooning. It is well to slice right into the stool on each side, so that too many stalks will not develop and result in a grassy crop.

Mr. C. V. Hives has called my attention to an interesting experiment which he has had with D1135 and Goru. He planted four rows of the latter variety down through the centre of a field of D1135. The first ratoons on this block were cut last June ; and after ratooning the second time he found that practically all of the Goru died out entirely, while the D1135 is doing very well. Undoubtedly this result is due to the character of the roots of the two canes.

In ratooning during dry weather Goru often succumbs, while under moist conditions it usually does well. I believe that this is due to the fact that the main roots, which are lateral, are broken off in ploughing and the stool dries out too much. This supposition is borne out by the fact that Goru, which was not ploughed, on the same farm, is growing well.

Again, referring to the ratooning qualities of D1135, Mr. P. Wienert showed me one of his fields at Fishery Creek, which was planted with Badila in 1916 ; he supplied the misses, which were abundant, with D1135. At the time of my recent visit, practically all of the Badila had been killed out by the Borer Beetle, and the shoots of D1135 were very conspicuous because of their great vigour ; none of them had suffered in the least from the pest.

Lepidiota Frenchi at Meringa.

This grass-feeding species, recently described in detail by Mr. Jarvis, is becoming a serious pest of sugar-cane at Meringa. In one field of first ratoons the grubs have gradually worked back from the grassy roadside, completely destroying patches of the cane by eating off all the roots. In digging up the dying stools we found from six to ten large third-stage grubs of this species. These same grubs, in their younger stages, did considerable damage to the plant cane last year, and now, in their final stage, they are cleaning up some of the ratoons entirely. The grubs if left alone will not emerge as beetles until next December, for they have a two-years' life cycle. Large grubs ploughed up during November in grassy land are very apt to belong to this species, for all the grubs of the common greyback beetle are very deep in the soil at that season, or else they have changed to the adult insect preparatory to emergence at the first heavy rain.

Fields attacked by the *frenchi* grubs have a peculiar spotted appearance, for here and there, a chain or so in extent, the cane is yellow and often dead, while the surrounding cane is dark-green and thrifty. In one field of plant cane at Meringa, fully one-third of the crop was damaged in this way. The land had not been in cane for some time, and was covered with a heavy growth of burr and grass. The soil was thoroughly worked previous to planting cane ; and though many small grubs were noticed when ploughing the first time, in May, no attention was given to destroying them.

It is interesting to note that the damage from this species was materially lessened after the heavy rains of November ; the cane became greener and threw out fresh roots. Extensive digging showed that the number of grubs was materially less and that many of them had been killed in the soil, for we often found them decayed or, if near the surface, dried up. Since these fields were literally swarming with the parasitic wasps for a month or more, we naturally concluded that they were responsible for much of this mortality among the grubs.

Experiments with poisons in this same field proved very encouraging. Arsenate of soda mixed with megass and applied in a furrow along the sides of infested stools apparently killed all the grubs, for none were to be found in the treated section three weeks after application, though they continued abundant in the remainder of the row, an average of three being found under each stool.

Experiments with repellents, on the other hand, gave but negative results. Creosote sprayed on megass and placed in furrows alongside the stools failed to retard the grubs, though the odour was very strong in the soil after three weeks. Furthermore, any roots that came in contact with the creosote fumes were killed, and the plants showed a decided yellowing.

Experimental Plots.

As has been indicated in our monthly reports, our experimental blocks are located at Meringa and on the Greenhills Estate. Both of these regions are commonly subjected to the attacks of grubs, as is well known.

The experimental field at Meringa has been divided into fifteen plots, so that we may make a thorough test of the value of poisons, fertilisers, &c., as controlling factors.

The cane was planted in this area early in April of this year, and is doing splendidly at the present time. There is a remarkable development on those plots which were formerly under Mauritius beans, the cane being almost double the size of that which did not have this rich supply of humus.

Experimentation at Greenhills is largely to test out various cultural methods, and to make further tests of poisons for the grubs. Since these experiments are carried on in co-operation with the running of the estate, they are on a very much larger scale than at Meringa. However, most of them are in the early stages, so that we must wait some time for results. We have already noted above the results of late planting on this estate.

Further Artificial Methods of Control.

Destroy feeding trees.—As pointed out in the publications from this office, the greybacked beetles show a decided preference for feeding upon the foliage of the Moreton Bay Ash. Since these trees are commonly distributed through the forest and often in the vicinity of grub-infested land, it would appear to be a profitable procedure to have them all cut out within a circumference of about a mile of such fields. Moreover, these trees also appear to be the favourite food plant of both *Lepodiota frenchi* and *L. rothei*. In the region immediately around Meringa, all of these beetles appear to travel about half a mile back into the forest, though no doubt they would travel double this distance if feeding trees were scarce. There is also the possibility that beetles forced thus far from their breeding-ground to feed would not be likely to return to the canefield to lay their eggs, but would probably place them at the roots of native grasses in the forest, as they did before sugar-cane was introduced.

Use of Fires, Light Traps, &c.—Mr. Jarvis's experiments during 1916 certainly showed that our common cane beetles are greatly attracted to lights, and this line of experiments is worth following up, for it is a subject that lends itself to extensive application. Numerous light traps should be rigged up at the first appearance of the beetles. A trap can be made by simply suspending a lantern over a tub of water, with a little kerosene on the surface. The trap should be sufficiently elevated to have the light visible from every direction. The flying beetles bump against the glass and fall into the kerosene-covered water, where they are quickly killed.

Recent experiments with small fires are encouraging; and undoubtedly vast numbers of beetles during their flight succumb in the fires in the canefields. Anyway, we are continuing investigation of this important matter, and advocate small fires started just at dusk and kept up for about an hour every evening during the flight of the beetles. Where a large field of trash is to be burnt at this time, it would be well to conserve it by separating it into small blocks, burning a little each evening. It may be profitable to save up rubbish of all kinds for fires at this time.

It is our desire in the experiments with light traps to so simplify them that they may come into common use in canegrowing regions.

A very successful type was simply a large pan, about a yard square, with sides about 4 inches high, the light being furnished by an ordinary acetylene lamp. A sheet of glass, 9 inches by 2 feet, attached to the stem of the lamp with a string, was found to give excellent results in heading off the beetles which circle about the flame, landing them in the tray of kerosene covered water.

It was found best to have the pan placed on the ground, for, if elevated, the circling beetles often land beneath it and in many cases never find their way into the trap.

It was interesting to learn that though the light appears to have little attraction for the greyback or *frenchi* beetles, after they have reached their feeding trees, *rothei* continues to enter the trap throughout the night. This latter species, though usually rather uncommon, was very abundant last season at Meringa, breeding in an old field of volunteer cane, abandoned for the present. These beetles begin dropping from the feeding trees about 9 p.m., and from that time there is a continuous hum as they come to the lamps.

From what is said above, it is evident that the time to catch both the greybacks and *frenchi* in light traps was just at dusk, in the region of infestation, before the beetles reach the feeding trees. Few results are obtained by exposing the lights for more than an hour. The value of this treatment was, however, that the female beetles were destroyed before they could lay their eggs.

Natural Methods of Control.

Muscardine fungus :—*" Experiments started in August, 1917, with the green fungus have shown that *Lepidiota frenchi* is victimized by this vegetable parasite."

" Second-stage grubs of the above beetle were placed in cages containing infected soil of various degrees of moisture with the result that those kept in very damp earth died in from nineteen to forty-nine days, while the percentage attacked by the fungus in drier soil was smaller and extended over a longer period. Judging by the results of another experiment with the same

* The sections under quotations are from notes by Mr Jarvis in our monthly reports.

species, it seems probable that high soil temperatures do not favour the development of the fungus, since three-fourths of those confined in cages kept at about 70 degrees Fah. succumbed within a month, whereas those subjected to higher soil temperatures remain unaffected. We propose carrying out further experiments along these lines in order to determine the action of this fungus or newly hatched first-stage grubs of our greyback beetle. In this connection it may be mentioned that a bacterial disease of white grubs in America is engaging the attention of entomologists, and possibly if introduced into Queensland might prove beneficial. Grubs attacked by this organism, which is a species of *Micrococcus*, are characteristically blackened at the affected parts."

"Excessive wet apparently favours its development, so that our climate here, during the wet season, should afford suitable conditions for infection in the field, since at that time of year (January to March) grubs of *albohirta* are doing the most damage."

"The *Bacterium* in question is able to exist for over a year under artificial conditions, and has been successfully reproduced in healthy grubs by making an incision in the skin and placing them in infected soil."

Parasitic wasps.—"Breeding experiments with scoliid parasites have been attended with marked success, and we are working out the life history and metamorphoses of our two most common species of digger wasps, *Campsomeris tasmaniensis* and *C. radula*."

"A single egg is laid on each grub and hatches after an interval of about three days, when the tiny larva at once buries its head into the body of the paralysed grub and proceeds to imbibe its juices."

"So rapidly does it develop at this stage that nine days later those destined to be female wasps have become plump white maggots nearly an inch in length and have ceased feeding."

"Larvae of male wasps, although much smaller than those of the opposite sex, take just as long to mature. The shortest periods recorded by us, however, are seven days for the male, eight for the female; while nine days appear to be the average time for both sexes."

"Having withdrawn its head from the shrunken distorted body of its victim, the maggot, after resting a few hours, spins an oval, parchment-like cocoon of tough brown silk in which it gradually changes to a pupa and finally into the perfect wasp which escapes by cutting out a circular trap door at one end of the cocoon."

"The average time passed in the pupal stage is thirty-six days for the male and thirty-nine days for female wasps."

"We have found that *C. radula* will deposit eggs upon second-stage grubs of the greyback beetle, but apparently will not lay upon third-stage grubs of *Dasygnathus australis* or even paralyse them."

"Data obtained at Meringa would lead us to suppose that this digger wasp plays an important part in the control of *L. frenchi*."

"Single females bred from cocoons laid two eggs per day. One wasp of the above species was confined with six large *frenchi* grubs in a cage containing 72 cubic inches of soil; and when examined 24 hours later, two grubs had eggs on them, two had been paralysed, and the remainder killed."

"On the preceding day, however, the same wasp paralysed twelve grubs, laying an egg upon one of them; she left only three uninjured of the original fifteen placed into the cage."

"Upon several occasions during early morning, after rain, we have observed great numbers of male wasps of both species flying energetically over the surface of the land supporting young cane plants injured in places by larvae of *frenchi*. Few or no females were noticed on the wing at such times, but upon digging beneath affected stools several were unearthed together with grubs they had paralysed."

"We may therefore conclude that, although not much in evidence above ground, the females, nevertheless, are usually well represented in the field."

"Such conclusion is amply borne out by our indoor tests, since out of eighteen wasps of this species, obtained from eggs laid by a female caught at Meringa on 26th September, 1917, nine proved to be males and the same number females, and all of them emerged practically at the same time."

"The male wasps have a habit of congregating in numbers at sundown, particularly during wet weather; and pass the night resting side by side on dead twigs so that on certain spots one can easily collect them by handfulls."

Recently rather careful observations failed to reveal the presence of these wasps either at Mossman or on the Johnstone River, which is rather interesting, since they are so much in evidence in the Mulgrave district. The Muscardine fungus, too, must be rather rare in these districts, for I heard of only one instance where it was found attacking grubs, south of Innisfail. There is a possibility that we might assist materially in grub destruction by introducing these friendly agents in localities where they are not already found. In these new localities the parasites would possibly escape their natural enemies for a time; and, if so, would do a vast amount of good.

Other Grub Destroyers.—It is a revelation to follow the plough during July and note the cleaning up of the grubs by the birds. In one field at Meringa, fully 150 ibises were following two ploughs, leaving not a single grub in their wake. They were spread out the whole length of the furrow, which was about 15 chains long, so that their keen eyes detected everything. By following close to the plough we saw that many grubs were turned out from under the stools, but as soon as the birds had passed along not one remained. The appetites of these birds is marvellous, for they follow the ploughs assiduously all day long. The contents of their stomachs have been examined when grasshoppers were abundant, and no less than 2,000 young locusts were found in a single bird. They are certainly valuable allies of the farmer, and it is a fine thing that they are protected. However, they are still very timid, showing that they are subject to more or less injury by ruthless humans.

The pewee larks, too, do a lot of good work behind the ploughs, though they are not large enough to swallow the largest grubs. I have often watched them breaking up these big fellows before they tried to down them.

We need further observations on the bandicoot, for they are certainly great destroyers of insect pests. We have already called attention to their useful habits in former reports, but it will be interesting to record a specimen recently dissected by Mr. Girault. Though the animal, which was fully grown, had been killed some time before by dogs, he was able to get out the alimentary canal almost intact. His notes state that the following remarkable contents of the stomach were easily identified :—1 unknown scarabaeid grub ; 30 slender, pale caterpillars of the same species and about 1¼ inch long ; fragments of two moderate-sized beetles ; 1 oat-like seed ; 2 large chrysomelid beetles ; 2 large ants ; 1 large unknown beetle ; fragments of a longicorn beetle ; cane leaf, pith ; and about 3 cc. of dark green matter, composed of mixed insect remains with vegetable matter, the latter accounted for by the caterpillars, perhaps.

Other Cane Pests.

Borer Beetles.—These insects are becoming increasingly abundant in the canegrowing sections of North Queensland, due largely to the lack of care in the selection of clean seed. In one instance I found a farmer deliberately using this cane for seed, because it was so badly attacked by the borers that it was worthless for milling. It is easy to surmise the result of such a practice.

I was greatly interested during a recent visit to the Mossman district to discover that the tachinid parasites (*Ceromasia sphenophori*) are well established there. It will be remembered that Mr. F. Muir, the entomologist of the Hawaiian Sugar Planters, brought these flies to the district in 1910, where he bred them on borers in large cages, preparatory to the long trip to Hawaii. I do not recall whether any of the flies were liberated deliberately at Mossman ; but in the breeding of parasites specimens escape from time to time as the doors of the cages are opened. At any rate, the flies are now thoroughly established there, and are doing most excellent work. I was unable to find any of the borers that had escaped the search of these persistent parasites, except where the canes were so buried up in trash that the flies could not get at them.

This find is most fortunate for the canegrowing sections of the North, for we now know that the flies can live and thrive in Queensland, and that they are able to hold the borer beetles in check. The unsuccessful attempt of the Colonial Sugar Refining Company to establish these parasites at Goondi in 1914 led us, naturally, to conclude that they could not live here ; presumably because they were preyed upon by many enemies, as we found to be the case in Fiji.

With the parasites well established in a nearby district, it will be a simple matter to introduce them into other centres of infestation, using care only to transfer them at a favourable season.

Moth Pests.—Both the army worm (*Cirphis unipuncta*) and the noctuid moth-borer (*Phragmatiphila truncata*) are rather troublesome this season in places along the Mulgrave River. Fortunately, both species are attacked freely by parasites which keep them from becoming serious pests.

Every grower is familiar with the work of the army worm on young cane plants, the leaves being chipped out at the edges, and the caterpillar is usually to be found during the day hiding between the top leaves. The work of the noctuid moth-borer, though less familiar, is easily recognised on young canes, for the central leaves are usually killed entirely, all the feeding being done inside the shoot. On old cane the caterpillars work behind the upper leaf-sheaths, boring into the stalks here and there ; but their work may be easily recognised by the abundant frass that they throw out.

The caterpillars do not remain long inside the stalk, for a single individual may make a number of tunnels—evidently only going into them to feed and to hide during the day. The principal damage to mature cane is that they cause it to shoot freely at the eyes, due to the injury of the terminal bud.

I would suggest as a possible control measure the application of a green crop of beans or peas before planting cane again. This, however, would be of little avail if there were other infested fields of cane nearby."

J. F. ILLINGWORTH.

10.—VARIETY PLOTS IN DIFFERENT DISTRICTS.

These plots have been established for the purpose of growing canes for distribution in different districts. Those already established are upon the farms of the following:—Mr. N. Jacobsen, Yerra; Messrs. R. Ruge and Sons, Proserpine; Messrs. Black Bros., Kalamia; Mr. Jas. Mackersie, Ayr.

11.—LIME AND FERTILISERS

Acidity in our canefields is still very marked, and lime is of the utmost importance. There appears to be an impression existing in some quarters that the Bureau does not favour the use of pulverised lime. This is altogether erroneous, as the extension of the use of lime in any form that will correct acidity and give the grower all the benefits that usually accrue from its use would be welcomed.

The purchase of fertilisers is becoming increasingly difficult. Potash and nitrate of soda are exceedingly hard to procure. The Federal Government has regulated the price per unit of the constituents of meatworks manure. The price of sulphate of ammonia is also fixed by the Commonwealth. What are known as green manures, such as Mauritius beans and cowpeas, are also extremely scarce at the present time.

12.—ECONOMICS.

It is unfortunate that climatic conditions often play so disastrous a part in the production of sugar in Queensland. With suitable weather there would be no difficulty in producing as much sugar every year in Queensland as would meet the Australian consumption, and so prevent the sending out of the country of large sums of money to purchase sugar to make up the deficiency. Of milling power we have plenty at the present time if all mills were only fully supplied. Last year's results show this only too clearly.

Taking last year's figures, for which this Bureau is indebted to the Government Statistician, it is found that the total area under cane in 1917 was 175,762 acres, the largest yet on record. Of this, the cane from 108,707 acres was crushed, practically the same figure as in 1914, but producing a much larger yield—viz., 2,704,211 tons of cane as against 1,922,633. This left a balance of 67,055 acres, which includes standover, cane cut for plants, and cane planted for 1918. The yield of sugar was 307,714 tons, the largest production ever seen in this State. The amount of cane taken to produce 1 ton of sugar was 8·79, slightly better than the preceding year, but not so good as 1913, 1914, and 1915. The average tons of cane produced per acre was 24·88, the finest yield secured for many years, due largely to the great amount of standover cane, particularly in the Southern sugar districts, the average for the Wide Bay district being 28·75, the highest in the State. The average tons of sugar per acre produced was 2·83, the largest yield being in Wide Bay—viz., 3·17 tons per acre.

New South Wales last year produced 16,546 tons of sugar, and the Victorian Beet Sugar Factory manufactured 1,650 tons.

The molasses made (as far as returns were furnished) was 11,514,636 gallons. Of this there were:—

	Gallons.
Sold to distilleries	1,513,047
Otherwise sold	45,360
Burnt	3,444,651
Used or sold for feed	1,464,084
In stock	878,332
Used for manures	627,000
Run to waste	3,542,162
Total	11,514,636

Steps should be taken to utilise the large quantity of molasses burnt and run to waste.

13.—GENERAL.

The older varieties of cane sent up to the Kairi State Farm on the Atherton Tableland were severely damaged by the March cyclone. It was hoped that the Bureau would have been able to have shipped them down to the lower levels this year, but, due to the state of the cane, replanting had to take place. The varieties planted out are Badila, Goru, Rose Bamboo, Striped Singapore, Meerah, and B 208. The thanks of the Bureau are due to Mr. Olive, the manager of the State Farm, for the care he has bestowed on this cane.

The Goodwood, Miara, and Palms Mills did not crush this season, and the first two are not likely to crush again. Invicta, Waterloo, and Nerang are closing at the end of this season. The Invicta Mill is stated to have been purchased by the Haughton River Canegrowers, near Townsville, and the plant and buildings are to be shifted to that locality.

Motor tractors are rapidly coming into use, especially in the Northern canefields. There are forty-seven tractors of one make between Proserpine and Cairns. This machine is stated to work on one tin of kerosene per acre and to plough on the average 3 acres per day. Messrs. Black Brothers, of Kalamia, use their tractor for the subsequent cultivation of the cane, and state they can cultivate 22 acres per day of 9 hours at a cost of £2 7s.

A good deal of interest is being taken in siloing cane and cane tops for feed. Excellent silage from chaffed cane and tops have been made at the Kairi State Farm, and cattle devour it with great relish. At Bundaberg a small silo has been put down at the Sugar Experiment Station for testing cane tops for silage purposes.

The thanks of the Bureau are due to the various Canefarmers' Associations, their presidents and secretaries ; also to the managers and officers of the various sugar mills, for their courtesy and attention and for their willingness to assist the work of the Bureau in every way possible.

The metropolitan and country Press are of great service to the Bureau in the dissemination of general information and reports, while the "Australian Sugar Journal" most kindly gives a great deal of space to reporting, and in many instances specially illustrating, the activities of the Sugar Experiment Stations.

The Bureau is also indebted to the Government Printer for the care taken in printing technical bulletins and reports.

HARRY T. EASTERBY,
General Superintendent.

Brisbane, 22nd October, 1918.

Price, 1*s*.]

By Authority: ANTHONY JAMES CUMMING, Government Printer, Brisbane.