NOTES ON THE PRESENT SUGARCANE VARIETY POSITION IN SOUTH AFRICA, 1941.

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This is intended to be a report of progress since the paper "The Revolution in Sugarcane Varieties in South Africa, read at the 1938 Congress of our Association. [1]

No new varieties have been released for commercial planting in this country since that time, but a good deal of progress is to be recorded both in the extension and development of the released varieties commercially and in the establishment and development of other new varieties and seedlings.

CENSUS RETURNS.

This is reflected in the special agricultural census of sugarcane published annually by the Office of Census.[2]

Unfortunately the most recent figures available refer to data collected as long ago as April, 1939, but at that date only 3 per cent. of the 95,000 acres under plant cane were planted with Uba. South of Durban there were only 139 acres of Uba plant cane and over 20,000 acres of plant cane of other varieties.

The proportion of all cane fields under cane varieties other than Uba had risen from 4 per cent. in 1934 to 68 per cent. in 1939; for Zululand districts only, the proportions were 5 per cent. and 80 per cent. respectively.

From 1935 to 1939 the statistics of yield of cane per acre for Uba compared with all other varieties are available.

TONS CANE PER ACRE.

Year.	Uba.	Per cent. of total area.	Non-Uba.	Per cent. of total area.
1935 ...	19.49	69.9	26.78	30.1
1936 ...	19.04	53.5	26.83	46.5
1937 ...	20.38	41.2	28.91	58.8
1938 ...	20.40	32.1	31.57	67.9
Mean	19.83		28.52	

It may be said that over the last year or two at least the comparison in yield per acre between Uba and the newer canes is hardly a fair one, since the Uba cane consists mainly of older ratoons.

However, the yield per acre of Uba has remained remarkably constant over a long period of years, whether it has comprised the whole of the crop or only a portion of it, consisting mainly of old ratoons, and notwithstanding the increasing ravages of streak disease.

The average yield per acre of Uba over the past 14 years is 20.14 tons, ranging only between 18.90 tons in the drought-stricken season of 1931 and 22.39 tons in 1930, when the crop had benefitted from the excellent rains of 1929.

The yield from the new varieties, on the other hand, has increased as their requirements have become better understood, and a wider range of varieties has become available.

Unfortunately, the census makes no distinction between the different non-Uba varieties, but groups them all together in the returns.

FIELD EXPERIMENTS.

Experiments go to show that there is not very much difference in potential yields between the three Co. varieties now in general cultivation, each showing about the same maxima in soils to which they are best suited, while in some medium soils they all give about the same yield of cane per acre, usually about 40 per cent. better than Uba. On the whole, however, the two most recently introduced, Co.281 and Co.301, may be said to have a wider range and to be more adaptable generally to the special conditions in this country than Co.290.

P.O.J.2725 is in a class by itself, giving plant cane and first ratoon crops in alluvial soils of 60 or 70 tons per acre or more, with which the Co. varieties cannot usually compare. Over a cycle of several ratoons, however, Co.290 has been shown in some instances at Umfolozi to be better than P.O.J.2725, and probably Co.301 will prove even more so. Co.281 has become a popular cane at Umfolozi, as elsewhere, but the indications from experiments are that it does not give such good results in the Umfolozi alluvial flats as the other three varieties just mentioned.

Co.281, however, appears to be more resistant than P.O.J.2725 to the cane-borer, *Eldana sacchari*, that has been reported at Umfolozi during the past two seasons. The borer is still there but is not spreading fast, and has been very destructive only in one or two fields of two-year-old P.O.J.2725.

Many variety trials have been laid down by the Experiment Station at different representative points in the sugar belt, and those harvested during the past two seasons number 18 plant cane experiments, 5 first ratoons and 4 second ratoons.

It is, of course, not proposed to quote more than a few of these in this paper, and many of them have

already been briefly reported in the "South African Sugar Journal." These results may be found in the January, 1939 number, and every number of that year from August to December inclusive, under "Experiment Station Notes." In the 1940 volume results are published in the January and February numbers, and in every number from June to December; also in the January and February numbers of 1941.

These experiments are usually combined fertilizer experiments and variety trials, generally only two varieties being compared—for example, Co.301 against whichever variety has hitherto been considered the best in the particular soils and conditions represented.

In other cases a wider range of four or five varieties is compared, in such experiments fertilizer treatment being uniform, so as to avoid the need for an inconveniently large number of plots.

To illustrate the method and results a few experiments are quoted whose results happen not yet to have been published in any detail, having been harvested during the rush of last June, when as many field experiments as possible were done before two out of the three agricultural assistants at the Experiment Station went on military service.

Eshowe—Estate of the late C. R. Butcher.

Plant cane crop of fertilizer experiment and variety trial, harvested in June, 1940, at 21 months.

Comparison of varieties Co.290 and Co.301.

	Co.290.	Co.301.
Tons cane per acre	62.05	53.43
Sucrose per cent. cane	14.97	15.27
Tons sucrose per acre	9.29	8.77
Per cent. of Co.290	100.0	94.4
Purity of juice	91.7	94.4
Fibre per cent. cane	11.51	11.79

Co.290 in this instance was very significantly better than Co.301 under the conditions of this experiment, an unusual result in the light of other comparisons between these two varieties in other types of soil. The soil here is a typical and very uniform Table Mountain sandstone soil.

Verulam—Central Factory, Grange Estate.

Plant cane crop of liming experiment and variety trial, harvested in May, 1940, at 26 months.

Comparison of varieties Co.281 and Co.301.

	Co.281.	Co.301.
Tons cane per acre	40.38	37.89
Sucrose per cent. cane	15.21	14.97
Tons sucrose per acre	6.14	5.67
Per cent. of Co.281	100.0	92.3
Purity of juice	92.4	91.5
Fibre per cent. cane	14.81	13.58

Co.281 is significantly better than Co.301. The soil is a heavy loam, in which type Co.281 has usually proved superior.

Ifafa—Reynolds Bros., Ltd.

Plant cane crop of fertilizer experiment and variety trial, harvested in June, 1940, at 19 months.

Comparison of varieties Co.281 and Co.301.

	Co.301.	Co.281.
Tons cane per acre	44.90	35.16
Sucrose per cent. cane	15.26	15.18
Tons sucrose per acre	6.85	5.48
Per cent. of Co.281	125.0	100.0
Purity of juice	92.7	93.7
Fibre per cent. cane	13.55	15.48

Co.301 is very significantly better than Co.281 here. The soil is a medium loam in a typical granitic soil.

Hibberdene—P. J. Farrell.

Plant cane crop of fertilizer experiment and variety trial, harvested in June, 1940, at 19 months.

Comparison of varieties Co.281 and Co.301.

	Co.301.	Co.281.
Tons cane per acre	36.71	33.77
Sucrose per cent. cane	14.99	15.55
Tons sucrose per acre	5.50	5.25
Per cent. of Co.281	104.8	100.0
Purity of juice	92.0	93.7
Fibre per cent. cane	13.77	14.51

Co.301 is somewhat superior, but not significantly so. The soil is a gritty loam in granitic soil.

Umzumbi—Mrs. M. G. Lomas.

Plant cane crop of fertilizer experiment and variety trial, harvested in June, 1940, at 20 months.

	Co.301.	Co.290.
Tons cane per acre	19.59	17.05
Sucrose per cent. cane	13.43	14.65
Tons sucrose per acre	2.63	2.50
Per cent. of Co.290	105.2	100.0
Purity of juice	88.5	90.3
Fibre per cent. cane	15.66	14.59

Co.301 is very significantly superior to Co.290 here. The soil is a wind-blown sand near the sea.

Braemar, Umzinto District—L. A. Cole, Glen Rosa.

Mean of plant cane and two ratoon crops of variety trial, harvested last in December, 1940.

	Co. 301.	Co. 281.	Co. 290.	P.O.J. 2725.	Uba.
Tons cane per acre ..	46.24	41.82	37.91	24.90	24.89
Sucrose per cent. cane..	15.66	16.04	15.48	17.03	15.23
Tons sucrose per acre ..	7.24	6.71	5.87	4.24	3.79
Per cent. of Uba.. ..	191.0	177.0	154.9	111.9	100.0
Purity of juice	91.8	93.9	90.5	92.9	89.2
Fibre per cent. cane ..	12.70	14.65	12.82	14.36	12.54

The soil is a fine sandy loam, apparently derived from Dwyka conglomerate and not from the prevailing granite of this area. The three crops averaged above were cut at intervals of 22, 24 and 17 months respectively. Co.301 took the lead throughout, followed by Co.281, both being significantly superior to Co.290 and the rest.

A similar experiment is in progress at Wilton Park, Empangeni, with comparable results for the plant cane and first ratoon crops.[3] In this case Co.301 and Co.281 are practically equal over the first two crops and significantly superior to the other varieties.

In a typical sandy soil overlying sandy loam at Umhlali (G. P. Ladlau), Co.301 and Co.290 were practically equal and both superior to Co.281 over plant cane and two ratoon crops.[4]

Summary of Results of Recent Experiments for both Plant Cane and Ratoon Crops over a wide range of Soils and Conditions.

A.—*Co.281 v. Co.301.*

In eight experiments Co.301 was significantly better than Co.281, in medium to sandy loams at Ifafa, Braemar, Mount Edgecombe (3), Umhlali, Gingindhlovu, and Kulu.

In six experiments there was no significant difference in sucrose per acre between Co.281 and Co.301. These were also in medium or sandy loams and not particularly impervious subsoils at Hibberdene, Mount Edgecombe (2), Verulam, Chakas Kraal, and Empangeni.

In four experiments Co.281 was significantly better than Co.301, all in heavy soils with stiff subsoils, at Braemar, Verulam, Mount Edgecombe, and Compensation.

B.—*Co.290 v. Co.301.*

In five experiments Co.301 was significantly better than Co.290 in various types of soil at Umzumbi, Braemar, Mount Edgecombe (2), and Empangeni.

In three experiments there was no significant difference between Co.290 and Co.301, once in heavy clay alluvial (Illovo), once in medium loam over Table Mountain sandstone (Upper Tongaat), and once in sandy soil (Umhlali).

In one experiment Co.290 was significantly better than Co.301, at Eshowe, in typical Table Mountain sandstone soil.

C.—*Co.281 v. Co.290.*

In four experiments Co.281 was significantly better than Co.290, three of which were in soils with stiff subsoils at Braemar, Mount Edgecombe (2), and Empangeni.

In three experiments there was no significant difference in yield of sucrose per acre between Co.281 and Co.290; these were in medium loams at Mount Edgecombe (2) and Darnall.

In one experiment Co.290 was significantly better than Co.281, in a sandy soil at Umhlali.

These comparisons do not include our experiments on the Umfolozi alluvial flats, whose results are in a class by themselves and not comparable with our other experiments. At Umfolozi, however, Co.290 has compared with other varieties much more favourably than is usual elsewhere. A separate report for Umfolozi conditions has been compiled by Mr. P. Fowlie.

Characteristics of Co.281.

These experiments show that Co.281 is an excellent cane in stiff or heavy soils, and that it ratoons well under suitable conditions.

A good example of the latter quality may be seen in an experiment here where Co.281 is growing in competition with Uba and Co.213 in a heavy loam overlying a stiff clay.[5]

This crop is now in fifth ratoons, having been planted as far back as 1929.

The average results of all five crops hitherto harvested is as follows:—

	Co.281.	Uba.	Co.213.
Tons cane per acre ...	38.32	28.32	29.22
Sucrose per cent. cane .	15.08	14.08	13.42
Tons sucrose per acre...	5.78	3.99	3.92
Per cent. of Uba	146.5	100.0	98.6
Purity of juice	92.5	89.1	90.1
Fibre per cent. cane ...	14.40	14.59	14.91

Following is the percentage superiority of Co.281 to Uba in yield of sucrose per acre at each successive cutting:—

Crop.	Year harvested.	Age in months at harvesting.	Co.281 yield per cent. of Uba.
Plant cane	1931	22	126.5
First ratoon	1933	22	150.2
Second ratoon	1935	25	137.7
Third ratoon	1937	23	151.8
Fourth ratoon	1939	23	166.5
Means		23	146.5

It will be seen that there is a progressive superiority showing that Co.281 is a better ratooner than Uba under the conditions of this experiment.

It is of interest to note that the large superiority shown in the first ratoon crop of over 50 per cent. arises out of the drought conditions of 1933, the latest year up to the present in which a really serious and prolonged drought was recorded.

The total rainfall for the year at the Experiment Station was 27.14 ins., of which only 15.63 ins. were recorded up to the end of October, and up to the end of June, when this experiment was harvested, only 10.16 ins. had been recorded for the year.

A comparison of the results from the two varieties at time of harvesting is instructive.

	Co.281.	Uba.
Tons millable cane per acre .	32.97	24.92
Tons dead cane per acre ...	0.70	5.90
Per cent. of dead cane ...	2.12	23.68
Sucrose per cent. cane	15.15	13.29
Tons sucrose per acre... ...	5.00	3.33
Per cent. of Uba	151.5	100.0
Purity of juice	92.6	88.6
Fibre per cent. cane	13.48	14.14

The Co.281 cane was therefore much better than the Uba in every respect during these severe drought conditions.

Besides a high degree of drought resistance, Co.281 has been found to be in other countries highly resistant to frost and cold. Fortunately we have had no serious ground frosts here for some years, but, like droughts, they may occur at any time.

It is this property of cold resistance that makes Co.281 of special value in Louisiana as a windrowing cane. That is to say, in severe frost it may be cut and laid in the rows and will keep for several days if necessary before being milled, or alternatively may be collected into heaps and lightly covered with earth, when it may be kept until the following spring for planting purposes. No other cane has been found hitherto in Louisiana that will do this satisfactorily, hence the continued cultivation there of Co.281 on a considerable scale, notwithstanding its relatively low yielding capacity and susceptibility to mosaic disease under Louisiana conditions.

Co.281 has proved very resistant hitherto to sugarcane diseases as now existing in this country. There has not been a single field case of streak disease or mosaic disease recorded here. It can be artificially infected with streak disease under laboratory conditions only with the greatest difficulty; it may be more readily infected artificially with the strain of mosaic disease existing in this country, but may be considered at present for all practical purposes to be immune from streak and mosaic diseases locally. Co.281 recovers more rapidly and completely from locust attack than Uba.

Another good quality claimed for Co.281 that, as far as I know, has not been adequately tested in this country is a high degree of tolerance to brak in the soil or irrigation water.

The disadvantages that may be attributed to Co.281 are very few. Its very upright habit of growth permits the growth of weeds that would be etiolated by a cane of more spreading habit, thus tending to increase cost of cultivation. It has a high fibre content, which hitherto has been regarded more leniently in the factory than might have been expected. Also the fact that it is a purple cane is a slight disadvantage, since this tends to furnish a darker coloured juice, needing more decolorization than would be necessary for a green cane, other things being equal.

It is to be noted that, in spite of its many good qualities, Co.281 has not become established in cane growing countries as widely as might have been supposed.

In its country of origin it seems to have found a footing only in the extreme south at Nellikupam in South Arcot. In certain parts of Cuba, where it was never expected that a thin cane could become established, Co.281 is now widely grown; but in most cane growing countries it is either unknown or has been tried and discarded.

Co.290.

Co.290 is by no means as hardy a cane as Co.281 and therefore has a more limited range of conditions to which it is suited. It soon shows signs of distress in drought, but it takes a lot of drought to kill it, and its recovery after watering is remarkable.

Unless it is grown in a sandy, well-drained soil it is apt to fail in the ratoon crops, but under suitable conditions it will ratoon indefinitely. Thus we have now at the Experiment Station some sixth ratoons

of Co.290 which has given an average yield over five ratoon crops of 27.93 tons cane per acre of an average sucrose content of 15.18 per cent., harvested at regular twelve months intervals—a record of sugar per acre per annum that has not been equalled by any other variety at the station. The soil is stony and appears rather heavy for Co.290, and of course has never been irrigated but has been adequately fertilized at each crop; but even the control plots that have never been fertilized average 25 tons cane per annum.[6]

The secret is, of course (if it is a secret), the regular harvesting of the crop when it is ready for the mill.

Co.290 has come under a cloud in recent years of surplus crops, since it has often been necessary to hold it over long after it has become mature.

Unfortunately Co.290 cannot tolerate well such conditions. It is then apt to lodge and break, or develop stem cracks through which harmful organisms of various kinds can enter and cause decay of the surrounding tissue.

Although Co.290, like Co.281, does not take mosaic disease in this country under field conditions, it is slightly susceptible to streak disease. The rate of infection is so slow, however, that the disease is very easily controlled by rejecting diseased canes for replanting.

In most other countries Co.290 is preferred to Co.281 because of its greater productiveness.

Co.301.

Co.301 is a comparative newcomer to this country, but is rapidly finding favour over a wide range of light to medium soils. It is a very vigorous grower of good sucrose content, though sometimes a little late in ripening, and in the fields is almost immune to streak and mosaic diseases.

We do not know much yet about its reaction to drought in this country, but the evidence so far is that it is fairly resistant in sandy soils but not so resistant in heavier soils. Co.301 has the reputation in India of standing drought well.[7]

One defect is its tendency to premature flowering, especially in sandy soils near the sea. Another is its liability to lodge and break in heavy rain accompanied by strong winds; we have had some extraordinary cases of apparently complete recovery in fields of Co.301 that had been laid flat.

We have practically no information about the performance of Co.301 in other countries; in most places it is quite unknown, but, like Co.281, has come into prominence here entirely on its merits exhibited locally.

SUCROSE RETURNS.

The following figures are supplied by the Central Board for the season recently ended. They show the sucrose content and crusher juice purity of the five varieties commercially grown for the 13 factories accepting the Central Board testing service. These factories represent 77.8 per cent. of the total output of the industry, or 3,325,440 tons of cane in all.

Variety.	Per cent. of total cane.	Per cent. of total sucrose.	Sucrose per cent. cane.	Purity of crusher juice.	Java ratio.
Uba ...	21.66	20.43	12.39	85.6	77.12
Co.281...	40.53	41.74	13.55	89.0	77.14
Co.290...	29.96	29.67	13.01	86.9	79.14
Co.301...	3.00	2.99	13.10	87.6	76.88
P.O.J.*.	4.85	5.12	13.87	88.0	80.88
Total	100.0	100.0	13.13	87.4	77.84

*Mainly P.O.J.2725, with a small undetermined proportion of P.O.J.2878.

The figures may be considered to be fairly representative of the crop as a whole. The proportion of Co.281 is rather higher than for the whole crop, and P.O.J. lower because of the omission of Umfolozi factory, which crushed a high proportion of P.O.J. canes (57 per cent.).

These returns show that the unusually low sucrose content of the last crop cannot be attributed to the non-Uba varieties showing less superiority over Uba than formerly; they are, in fact, still nearly a whole unit ahead of the Uba (13.34 per cent. cane against 12.39). The cause must be looked for in some other direction; probably the very unfavourable distribution of rainfall in 1940.

NEW VARIETIES.

Although no cane varieties have been released for commercial planting since Co.301 in 1935, much work has been done since in the introduction and study of new varieties from other countries, also the introduction of seed and the germination of seedlings and selection therefrom.

It was comparatively easy to improve upon Uba, but is not so easy to improve upon the new released varieties under conditions to which they are best suited. However, considerable progress has been made.

Varieties introduced from overseas since the 1938 Congress are Co. 349, 360, 385, 402, 407, 408, 433, 453, 455 and 464 direct from the Imperial Cane Breeding Station at Coimbatore, S. India; H.M. 89, 320, 607, 608, 617, 644, 647, 651, 654, 657, 659, 660 and 661 and Mys-ray 99 and 138 from the Department of Agriculture at Bangalore, Mysore State,

India; C.P. 29/291, F.C. 916 and 1017, 28 N.G.19, Creole, and Black Cheribon from the Bureau of Plant Industry, Washington, D.C., U.S.A.; Hok, Khakai, and Kham from Thailand; and E.16 from the Société Générale des Sucreries et de la Raffinerie d'Egypte in Cairo.

It is too early yet to say much about these, except that many of them failed to survive the journey and introduction into this country.

At present Co.453 and F.C.916 are showing most promise of those already transferred from our quarantine greenhouse in Durban to open field quarantine at the Experiment Station.

Co.453 is a cross between Black Cheribon (Louisiana Purple), a natural variety originally from Java that has proved of great value over many years in many different countries, and Co.285, a variety which made splendid growth when introduced here a few years ago, but developed very little sucrose.

F.C.916 is another Puerto Rican variety (Fajardo Central) of the favourite West Indian cross P.O.J. 2725 × S.C.12/4.

Among varieties introduced before 1938, Co.331, 421, 426 and 432 and M.P.R.28 and PR809 have shown most promise. Co.419 was of exceptional reputation and of good promise in its earlier stages, but later became infected with streak disease and an acute form of the fungus disease eye-spot, *Helminthosporium sacchari*.

Co.331 continues to grow well and must be considered as a serious candidate for release.

It is a hybrid of Co.213 × Co.214, both of which varieties exhibited certain excellent qualities here but were not good enough all round to be released. Co.331 resembles Co.301 somewhat in appearance and is a remarkably vigorous cane and has hitherto been very free from disease in the field and exhibited considerable resistance to drought.[7]

It is a late ripening cane and is apt to be very low in sucrose early in the season, but holds its sucrose well once it has matured.

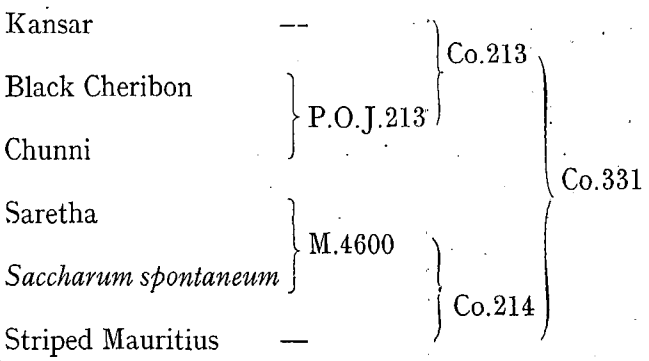
Results of Co.331 in comparison with released varieties have been published locally during the past year, [8, 9, 10]

In each case it yielded more cane per acre than any variety with which it was compared; but when harvested as 14 months old plant cane it contained only 12.26 per cent. sucrose compared with 15.30 in the Co.281, thus yielding 13 per cent. less sucrose per acre than Co.281, although it gave three tons more cane per acre.

In another instance where the experiment was harvested as 21 months old plant cane early in July, the Co.331 was still far from ripe, having a sucrose content of 13.91 per cent. compared with 14.95 in the Co.301, but there was no significant difference in the tons of sucrose per acre (7.53 for Co.331 against 7.72 for Co.301).

In the third experiment, 24 months old plant cane harvested in November last at Tongaat, the Co.331 was still considerably lower in sucrose content than the standard Co.281, 14.42 and 16.66 respectively, but the Co.331 yielded 73.21 tons of cane, or 10.56 tons of sucrose per acre, compared with 57.26 tons of cane and 9.54 tons of sucrose per acre from the Co.281. The differences, however, are not statistically significant.

The descent of Co.331 is as follows:—



It is widely grown in India, where it has gained a reputation as a very vigorous, late ripening variety.[11]

It may be said also that we have advanced a stage further towards selecting hybrids of P.O.J.2725, raised in Puerto Rico or elsewhere, or other canes that will successfully replace or supplement P.O.J. 2725 in this country, especially where the latter exhibits its principal fault of premature flowering.

SEEDLING VARIETIES.

Considerable progress may also be recorded in the development of seedling varieties in this country from imported seed.

The first batch of seed received here to give seedlings of real promise under our conditions was received from the Imperial Cane Breeding Station at Coimbatore in Southern India in 1936. This parcel contained seed of P.O.J.2725 crossed by Co.214, or by Co.281, or by Co.301.

These crosses were made at Coimbatore to our special request, by the kindness of Rao Bahadur T. S. Venkatraman, Government Sugar Expert, in charge of the cane-breeding station at Coimbatore.

Several hundred seedlings germinated from these, and eventually 252 of them—145 from Co.301, 82 from Co.281, and 25 from Co.214—were planted out in the field nurseries and systematic further selec-

tion begun. Several eventually reached the stage of replicated field trials against a standard variety, some of them comparing very favourably with Co.281, Co.290 and Co.301.[12]

Thus N.Co.147, a seedling derived from the P.O.J. 2725 × Co.301 cross, yielded as 19 months old plant cane last July at the Experiment Station 57.04 tons of cane per acre of 16.13 per cent. sucrose content. It thus surpassed in yield of sucrose per acre each of the three released Co. varieties grown for comparison in the same field.

Nine of these seedlings, N.Co.67, 79, 90, 117, 147, 151, 154, 170 and 211, have been selected for a further trial planted last September at the Experiment Station, in soil where Co.281 has hitherto given the best results. The two first named of these seedlings are derived from Co.281, the remainder from Co.301, with P.O.J.2725 as the female parent. Hitherto all of these nine have successfully resisted streak disease infection. All of them are capable of giving remarkably high sucrose contents; thus several have given tests of over 17 sucrose per cent. cane, one of them, N.Co.79, as early as April; another of them, N.Co.67, gave a test as high as 18.16 sucrose per cent. cane last September.

A further supply of seed was received from Coimbatore in May, 1938. This was all of the same cross, Co.421 × Co.312, selected for us by the Coimbatore breeders. It germinated extraordinarily well, as many as 3,268 seedlings surviving to be planted out in the field. The batch as a whole looked a better lot than the P.O.J.2725 progeny, and there was a remarkably low incidence of disease.

Only 24, or 0.7 per cent. in all, were diseased, and only 7, or 0.2 per cent., contracted streak disease.

This batch of seedlings is, of course, still under observation, and it is too early yet to decide whether any of them are of outstanding promise.

We have also received several lots of seed from the Sugarcane Research Station at Mauritius by the favour of Messrs. N. Craig, chemist in charge, and G. C. Stevenson, geneticist.

The first batch arrived in September, 1937, and consisted of seed from five different crosses, mainly from varieties raised in Mauritius. The seedlings from one cross failed to survive; two other crosses were discarded for susceptibility to mosaic disease; and the remaining two gave us respectively 345 and 178 vigorous seedlings.

They have been reduced in number by progressive selection and discard to 21, 14 of one cross and 7 of another, which are now competing with released varieties in replicated plot trials.

Some of these seedlings from Mauritian seed have shown remarkably high sucrose tests in the laboratory mill; thus six of them gave sucrose per cent. cane tests of over 16 last October.

The progeny of each cross in these Mauritian seedlings preserves a family likeness to a remarkable degree, but as a whole they do not appear so well suited to the somewhat severe soil and weather conditions at the Experiment Station as the Coimbatore seedlings; it is very possible, however, that they may be the Umfolozi or irrigation canes of the future.

A further supply of seed from Mauritius received in September, 1938, gave seedlings which all died; and of another batch arriving a year later only eight survived, of which only two are worth further attention.

Better success was attained with seed received from Mauritius last October. Four different crosses were represented and 825 seedlings survived to be planted out in the field.

Sugarcane seed was received from a new source of supply to us in July last, from Hawaii, by the kindness of the Experiment Station of the Hawaiian Sugar Planters' Association. Fourteen crosses were represented in the parcel and the seed bore the long journey very well. As many as 7,155 seedlings successfully germinated and were planted out in the fields. Many varied types of cane are represented and such well-known names to us as Co.281, Co.290, Badila, D.1135, and P.O.J.2878, figure in the list of canes from which the seed is derived. Many of them are showing very considerable early promise.

Although none of our seedling canes developed here from imported seed-fuzz have yet attained the stage of release for commercial purposes, I am convinced we are progressing on right lines that will eventually lead to success, and to the development of varieties peculiar to this country that will be better suited to our special conditions than we can reasonably expect from any imported established variety developed for other conditions.

We have had an instance, unique in recorded experience in this country, of a cane forming fertile flowers and seed at this experiment station. The cane is Amu Darya, a variety of *Saccharum spontaneum*, a wild cane originally from Central Asia that came to us via Washington, D.C.

It was observed to form complete flowers last year and again this year in January. There was no other cane in flower at the time with which we might have crossed it, so it was allowed to fertilize itself, which it did very successfully, a good crop of viable seed being obtained.

However, sugarcane in this country, as in nearly all extra-tropical countries, does not normally form fertile seed, so that we are dependent for supplies of seed on the goodwill of our friends in other countries, more fortunately situated from the point of view of cane breeding.

We are therefore much indebted to the institutions at Coimbatore, Mauritius and Honolulu already mentioned, as well as the Bureau of Plant Industry, Washington, D.C., U.S.A., especially Drs. E. W. Brandes and G. B. Sartoris, for having made our work along these lines possible.

I have pleasure in acknowledging the assistance of Dr. A. McMartin and Mr. G. S. Moberly in collecting the information used in this report.

SUMMARY.

1. The annual censuses of sugarcane plantations for 1938/39 (the most recent available) and for preceding years are quoted to show the advancing proportions of the sugar crop in this country supplied by canes other than Uba.

2. The yield and performance of different varieties of cane now commercially grown, as shown by representative field experiments, are examined.

3. The main field characteristics of Co.281, Co.290 and Co.301 are outlined, also their quality performance as recorded by the Sugar Industry Central Board for last season's crop.

4. A brief summary is given of new variety canes imported in recent years into this country for experimental purposes, with special reference to Co.331.

5. An outline is given also of the successive introductions of sugarcane seed into this country from 1936, and of the stage of development of the resulting seedling canes now under experiment, and their general preliminary performance and promise.

Experiment Station,
South African Sugar Association,
Mount Edgecombe.
March, 1941.

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SUPPLEMENTARY NOTES TO "PRESENT SUGARCANE VARIETY POSITION."

The regular analyses by the Sugar Industry Central Board of sugarcane tabulated by months and varieties for each of the past five seasons are of very great interest and value.

When we compare the ratio of the sucrose content of any variety for any month with the general average sucrose content of all varieties for that month, we find a more or less constant ratio for each year. The means of these ratios indicate whether the particular variety is early or late ripening, and whether it will hold its sucrose late in the season.

In almost every instance the mean peak of sucrose content of each variety appears in September or October, so that other things being equal, that is the best time to harvest it. However, the whole of the crop manifestly cannot be harvested in these two months, and the question therefore occurs, which are the best varieties to cut earlier or later than this.

Co.281 demonstrates clearly that it can be cut with advantage either early or late, since in the months of May, June, July, November, December and January its superiority in sucrose content over the average run of all varieties is most marked.

Co.290 shows relatively little difference, and since it is most important that this variety should be cut

when conditions are most favourable for the ratoons to renew their strength, it follows that Co.290 should preferably be harvested during the latter half of the crushing season, although its sucrose content is slightly relatively superior during the first half. It is necessary to bear in mind also that this variety does not keep well after becoming mature and should not be allowed to stand more than 24 months before cutting.

P.O.J.2725 holds its sucrose remarkably well late in the season and therefore should be left if required to be harvested in November or later.

We have had very little evidence about Co.301 so far, comparatively little of this variety yet having come to the mills, but based on last season's evidence this cane is one which may with advantage be harvested fairly late in the season.

Uba has a comparatively restricted season of maturity and shows a marked tendency to deteriorate late in the season, as one would expect from such a vigorous grower. It is therefore best harvested within the months of July, August and September.

Ratio of sucrose content of each variety to that of general average over five seasons ending 1940.

	Uba.	Co.281.	Co.290.	Co.301.	P.O.J.
May	96.6	104.6	102.9	106.1	—
June	97.1	103.6	102.5	102.3	—
July	97.4	102.2	101.2	100.6	106.4
August	97.6	101.5	100.8	99.6	105.4
September	97.7	101.1	99.4	98.0	105.6
October	96.8	101.7	99.3	97.4	106.2
November	95.2	102.3	99.4	97.4	108.4
December	94.5	103.2	100.3	99.0	110.2
January	92.7	104.4	100.7	102.8	110.4
Season	95.3	103.0	101.1	99.8	107.5

The data for Co.281 is for the past three and a half seasons, and for Co.301 for the 1940/41 season only. There is insufficient data for P.O.J. for the first two months of each season.

It may be expected, of course, that the behaviour of different varieties will vary in different seasons, but the ratios so far extracted show a fair degree of uniformity over five years or less.

APPENDIX.

LIST OF SUGARCANE VARIETIES IN THE COLLECTION, AND SEEDLINGS RAISED LOCALLY, AT THE EXPERIMENT STATION, MOUNT EDGECOMBE, AND OF VARIETIES INTRODUCED INTO THE QUARANTINE GLASSHOUSE IN DURBAN.

Initials used to Designate the Origin of Varieties.

A. ... ... Antigua.
B. ... ... Barbados.
B.H. ... Barbados Hybrid (seedlings of proven parentage).
B. ... ... After a number, which is usually preceded by J, seedlings raised by Bouricius in Java.
C.H. ... Cuban Hybrid.
Co. ... ... Coimbatore, India.
C.P.... ... Canal Point, Florida, U.S.A.
D. ... ... Demerara (British Guiana).
Diamond . Diamond plantation, Demerara (British Guiana).
E.K. ... Seedlings raised by E. Karthaus, Java.
F.C.... ... Fajardo Central, Puerto Rico.
H.M. ... Hebbal, Mysore, India.
H.Q. ... Hambledon Sugar Co., Queensland.
J. ... ... Java (formerly used instead of P.O.J.).
M. ... ... Mauritius.
M.P. ... Seedlings raised by Perromat, Mauritius.
M.P.R. ... Federal Experiment Station, Mayaguez, Puerto Rico.
N.G. ... New Guinea.
P. ... ... Peru.
P.O.J. ... Proefstation Oost Java.
P.R. ... Puerto Rico (Rio Piedras Insular Experiment Station.
Q. ... ... Queensland.
R.P. ... Seedlings raised by a planter in Demerara.
S.C.... ... Saint Croix (Santa Cruz), Virgin Islands.
S.J.... ... South Johnstone, Queensland.
S.W. ... Sempal Wadak, Java.
Tjep. ... Tjepering, Java.
Tuc. ... Tucuman, Argentine.
U.D. ... Seedlings of Hawaiian Uba (= Zwinga) × D.1135, Hawaii.
U.S. ... U.S. Experiment Station, Canal Point (formerly used instead of C.P.).

VARIETIES GROWING AT THE EXPERIMENT STATION.

1.—General Collection.

Variety.	Parentage.	Country of origin.
Agaul	Natural variety	India.
B.726	——	Barbados.
Badila (N.G.15)	Natural variety	New Guinea.
B.H.10/12	B.6835 (B.1379 open cross) × B.4578	Barbados (1910).
Black Cheribon	Natural variety	Java.
Black Innes (M.189) ...	——	Mauritius.
Black Tanna	Natural variety	New Hebrides.
C.H.64/21	Uba × D.74 (Light Preanger open cross)	Cuba (1921).
Clarke's Seedling (H.Q. 409 ? 426 ?) ...	87 Couvé × ?	Australia.
Co.205	Vellai × *S. spontaneum*	India.
Co.210	P.O.J.213 × Madras 2	India.
Co.213	P.O.J.213 × Kansar	India.
Co.214	Striped Mauritius × M.4600 (Saretha × *S. spontaneum*) ...	India.
Co.223	Chittan × M.1515 (Naanal × *S. spontaneum*)...	India.
Co.237	P.O.J.213 × Red Fiji	India.
Co.243	A.2 × Co.206 (Ashy Mauritius × *S. spontaneum*)	India.
Co.244	P.O.J.213 × Co.205	India.
Co.270	B.3747 × Co.206	India.
Co.281	P.O.J.213 × Co.206	India.
Co.284	P.O.J.213 × Co.206	India.
Co.285	Green sport of Striped Mauritius × ? (Co.205 or Co.206 ?) .	India.
Co.290	Co.221 (P.O.J.213 × Co.291) × D.74	India.
Co.299	Co.213 × P.O.J.1410 (Cheribon × Chunni)	India.
Co.300	Co.213 × P.O.J.1410 (Cheribon × Chunni)	India.
Co.301	Co.213 × P.O.J.1499 (P.O.J.385 × P.O.J.181)	India.
Co.303	Co.221 × P.O.J.1507 (P.O.J.213 × P.O.J.369)	India.
Co.312	Co.213 × Co.244	India.
Co.313	Co.213 × Co.244	India
Co.317	Selfed Co.229 (Selfed Co.205)	India.

Variety.	Parentage.	Country of origin.
Co.331	Co.213 × Co.214	India.
Co.351	P.O.J.2725 × Sorghum durra Stapf.	India.
Co.354	P.O.J.2725 × Sorghum durra Stapf.	India.
Co.355	P.O.J.2725 × Sorghum durra Stapf.	India.
Co.356	P.O.J.2725 × Sorghum durra Stapf.	India.
Co.385	Co.213 × Co.281	India.
Co.407	P.O.J.2725 × B.3412	India.
Co.408	P.O.J.2725 × Co.243	India.
Co.413	Co.290 × J.247 B	India.
Co.419	P.O.J.2878 × Co.290	India.
Co.421	P.O.J.2878 × B.3412 (D.74 open cross)	India.
Co.426	P.519 [Vellai × P.O.J.1410 (Cheribon × Chunni)] × Co. 360 (P.O.J.2725 × Q.116)	India.
Co.432	P.O.J.2727 × Co.285	India.
Co.434	P.O.J.2878 × (probably) E.K.28	India.
Co.453	Black Cheribon × Co.285	India.
Co.455	P.O.J.2725 × *Saccharum spontaneum*	India.
Co.508	Selfed Co.214	India.
C.P.177	——	U.S.A.
C.P.807	Selfed U.S.1643 (probably selfed P.O.J.213)	U.S.A.
C.P.28/11	Co.281 × U.S.1694 (P.O.J.213 × ?)	U.S.A.
C.P.28/19	Co.281 × U.S.1694 (P.O.J.213 × ?)	U.S.A.
C.P.29/103	P.O.J.2725 × C.P.1165	U.S.A.
C.P.29/116	P.O.J.2725 × C.P.1165	U.S.A.
C.P.29/291	Co.281 × U.S.1694	U.S.A.
C.P.29/320	Co.281 × C.P.27/34 (D.74 × U.S.1694)	U.S.A.
Cuban Selection	Probably identical with C.H.64/21	Cuba.
D.1135	D.103 open cross	British Guiana.
D.207/20	D.145 open cross	British Guiana.
D.666/13	D.625 [open cross of Dyer (open cross of Meligeli)] open cross	British Guiana.
Diamond 10	Diamond 185 (unknown) × D.145 (open cross of Striped Preanger)	British Guiana.
E.K.28	P.O.J.100 (Black Borneo × Loethers) × E.K.2 (Lahaina × Red Fiji)	Java.
F.C.915	P.O.J.2725 × S.C.12/4	Puerto Rico.
F.C.916	P.O.J.2725 × S.C.12/4	Puerto Rico.
Gingor	Reputed graft hybrid between Mauritius Gingham and Goru: is either one or other of these canes	Australia.
Glagah (*Saccharum spontaneum*)	Natural species	Java.
H.M.609	P.O.J.213 × H.M.544 (natural cross)	India.
H.M.619	P.O.J.213 × H.M.544 (natural cross)	India.
Hind's Special	Natural hybrid ?	Philippine Islands.
Horne	Striped sport of Louisier (Otaheite)	Mauritius.
J.247 B	Black Cheribon × Red Fiji	Java.
Kavangire	Natural variety	India.
Kassoer	Natural hybrid : Black Cheribon × Glagah	Java.
Kham	——	N. Thailand (Siam).
M.1900	Unknown	Mauritius.
M.P.55	Selangor × ?	Mauritius.
M.P.R.3	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.7	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.28	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.42	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.49	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.61	P.O.J.2725 × S.C.12/4	Puerto Rico.

Variety.	Parentage.	Country of origin.
M.P.R.63	P.O.J.2725 × S.C.12/4	Puerto Rico.
M.P.R.151	P.O.J.2364 × M.P.R.9 (Selfed S.C.12/4)	Puerto Rico.
Merthi	Natural variety	India.
Oshima	Natural variety	China.
Otaheite	Natural variety	Society Islands.
P.O.J.36 M	Bud selection of P.O.J.36 (P.O.J.105 ?)	Japan (Formosa).
P.O.J.36	Striped Preanger × Chunni	Java.
P.O.J.100	Black Borneo × Loethers	Java.
P.O.J.213	Black Cheribon × Chunni	Java.
P.O.J.234	Black Cheribon × Chunni	Java.
P.O.J.2714	P.O.J.2364 (P.O.J.100 × Kassoer) × E.K.28 (P.O.J.100 × E.K.2)	
P.O.J.2722	P.O.J.2364 (P.O.J.100 × Kassoer) × E.K.28 (P.O.J.100 × E.K.2)	Java. Java.
P.O.J.2725	P.O.J.2364 (P.O.J.100 × Kassoer) × E.K.28 (P.O.J.100 × E.K.2)	Java.
P.O.J.2727	P.O.J.2364 × Batjan	Java.
P.O.J.2753	P.O.J.2364 × P.O.J.1507	Java.
P.O.J.2803	P.O.J.2703 [P.O.J.2354 (P.O.J.100 × Kassoer) × E.K.28] × P.O.J.2713 [P.O.J.2364 × P.O.J.2571 (Cheribon × Fiji)]	Java.
P.O.J.2822	P.O.J.2526 (Cheribon × Kassoer) × Tjoekir 154	Java.
P.O.J.2878	P.O.J.2364 × E.K.28	Java.
P.O.J.2883	P.O.J.2364 × E.K.28	Java.
P.O.J.2946	P.O.J.2875 × S.W.111	Java.
P.O.J.2947	P.O.J.2875 × S.W.3	Java.
P.O.J.2952	P.O.J.2722 × S.W.499	Java.
P.R.803	P.O.J.2725 × S.C.12/4	Puerto Rico.
P.R.809	P.O.J.2725 × S.C.12/4	Puerto Rico.
Pompey (7R.428)	——	Fiji.
Light Preanger	Natural variety	Java.
Q.813	Badila open cross	Australia.
R.P.8	B.208 × D.145	Demerara.
S.C.12/4	B.6835 (B.1379 open cross) × B.4578	Barbados.
Sin Nombre (probably Saretha)	Natural variety	India.
S.J.4	Badila open cross	Australia.
S.J.7	Badila open cross	Australia.
S.W.499	J.247B × Batjan	Java.
Tjep.24	Kassoer × Cheribon	Java.
Toledo	Natural hybrid (*S. officinarum* × *S. spontaneum*)	Philippine Islands.
Tuc.451	——	Argentine.
Tuc.454	——	Argentine.
Tuc.472	——	Argentine.
Tuc.544	——	Argentine.
Tuc.1406	Co.243 × Co.244	Argentine.
Uba	Natural variety	India.
Uba	A reintroduction of this variety from East Africa	India.
Uba Marot	Natural hybrid ?	Mauritius.
U.D.1	Zwinga × D.1135	Hawaii.
Yellow Caledonia	Natural variety	New Hebrides.
Yon-tan-san	Bud sport of Oshima	Japan (Formosa).
Zwinga	Natural variety	China.
U.S.663	——	U.S.A.

2.—Varieties, whose Identity is not now known, Introduced into Natal previous to the Experiment Station Introductions.

Variety.	Country of origin.
Booth's Selection (Striped Preanger ?)	—
La Mercy Red	Mauritius (?).
La Mercy Yellow	Mauritius (?).
Ogle's Selection	—
Rapson's Selection (P.O.J.213 ?)	Mauritius (?).
Rouillard's Selection (P.O.J.213 ?)	Mauritius (?).
Townsend's Selection (China cane)	—
Transkei Selection	—
H.Q.694 (?). Probably a wrong number for some other H.Q. variety	Australia.
Unidentified variety from a Native kraal	—

3.—Bud Sports of Varieties.

Variety.		Country of origin of sport.
Co.281	Striped (various forms)	South Africa.
Co.281	Green	South Africa.
Co.281	With drooping leaves	South Africa.
Co.290	Striped	South Africa.
P.O.J.2725	Striped	South Africa.
Uba	Striped	South Africa.
Gilbert's Selection	Sport of Uba	South Africa.

4.—Seedlings Raised at the Experiment Station.

A.—*Original Plants.*

No. of Seedlings.	Parentage.	Country of origin of seed.
25	32-1063 × 31-1389	Hawaii.
1425	32-8688 × ?	Hawaii.
150	P.O.J.2878 × ?	Hawaii.
275	31-2510 × ?	Hawaii.
75	32-9394 × ?	Hawaii.
825	31-2540 × ?	Hawaii.
275	32-4144 × ?	Hawaii.
1100	34-2719 × ?	Hawaii.
1555	34-2514 × ?	Hawaii.
825	32-6705 × ?	Hawaii.
125	33-9099 × ?	Hawaii.
25	Co.290 × ?	Hawaii.
50	31-1389 × ?	Hawaii.
425	33-7675 × ?	Hawaii.
175	M.188/33 × M.99/34	Mauritius.
525	M.134/32 × M.99/34	Mauritius.
100	M.134/32 × Co.290	Mauritius.
25	Co.301 × M.99/34	Mauritius.
6	Amu Darya 59, self-fertilized	Natal.
58	Amu Darya 59, self-fertilized	U.S.A.
7	(*Saccharum officinarum, S. spontaneum, S. barberi*)	Mauritius.

B.—*Replanted from Original Plants.*

11	Selangor Seedling × M.108/30 (P.O.J.2878 × Uba Marot)	Mauritius.
43	Selangor Seedling × M.196/31 (P.O.J.2878 × Uba Marot)	Mauritius.
414	Co.421 × Co.312	India.

C.—*Planted into Propagation Plants.*

67	Co.421 × Co.312	India.

4.—Seedlings Raised at the Experiment Station.—*Continued.*

D.—*Undergoing Replicated Plot Trials.*

No. of Seedlings.	Parentage.	Country of origin of seed.
5	P.O.J.2878 × Uba Marot	Mauritius.
7	Selangor Seedling × M.108/30	Mauritius.
14	Selangor Seedling × M.196/31	Mauritius.
9	P.O.J.2725 × Co.281	India.
27	P.O.J.2725 × Co.301	India.

E.—*Discarded after Trial, but Retained in Collection.*

2 (N.F.35 and N.F.42)	P.O.J.213 open cross	U.S.A.

5.—Varieties in the Quarantine Glasshouse in Durban.

Variety.	Parentage.	Country of origin.
Co.349	P.O.J.2725 × Co.243	India.
Co.464	Co.361 × Co.285	India.
Creole	Natural variety (hybrid ?)	India.
E.16	P.O.J.2878 × Uba Marot	Egypt.
Khakai	——	North Thailand.
F.C.1017	P.O.J.2725 × S.C.12/4	Puerto Rico.

6.—Variety Destroyed in the Quarantine Glasshouse.

No. of Seedlings.	Parentage.	Country of origin of seed.
H.M.606		India.

7.—Varieties Introduced into the Quarantine Glasshouse, but which have Failed to become Established.

Variety.	Country of origin.
H.M.89 (striped)	India.
H.M.320	India.
H.M.607	India.
H.M.608	India.
H.M.644	India.
H.M.647	Ihdia.
H.M.651	India.
H.M.654	India.
H.M.657	India.
H.M.659	India.
H.M.660	India.
H.M.661	India.
Mys-ray 99. Derived from a local variety by irradiation with X-rays	India.
Mys-ray 138. Derived from a local variety by irradiation with X-rays	India.

GENERAL NOTES OF SOME OF THE NEWER VARIETIES UNDER TRIAL.

Varieties Introduced from other Countries.

Five Co. varieties have been transferred from the quarantine glasshouse to the open at Mount Edgecombe during the year, as well as one Canal Point variety, one from Puerto Rico and one from Thailand; a reintroduction of Uba from East Africa has also been made.

Introductions into the glasshouse have been numerous and include a large number of Indian varieties from Hebbal, Mysore none of these, however, have survived.

No further extension of quarantine plots outside the Experiment Station has occurred during the year; on the other hand, eradication of some varieties has been carried out. The varieties now growing in outside stations are as follows:—

Indian Varieties.

Co.331	Co.419	Co.426	H.M.609
Co.355	Co.421	Co.432	H.M.619
Co.413			

Javan Varieties.

P.O.J.2753 P.O.J.2883

Puerto Rican Varieties.

M.P.R. 3	M.P.R.42	M.P.R. 63	P.R.803
M.P.R. 7	M.P.R.49	M.P.R.151	P.R.809
M.P.R.28	M.P.R.61		

The following have been eradicated :—

Co.270	C.P.29/320	S.J.4
C.P.28/11	F.C.915	B.H.10/12

Seedlings Raised at the Experiment Station.

During the year some viable seed, from which seedlings were raised, was collected here from the wild sugarcane of Turkestan, Amu Darya 59. Although of no direct commercial value, it is interesting to record such a fact, as it is probably the first case here of a Saccharum producing seed.

Of seedlings of commercial interest, a large number has been raised this year; over 7,000 have been derived from seed from Hawaii. A batch has also been obtained from Mauritius seed.

Further propagation has also been effected of a selected number of the Indian seedlings of the cross Co.421×Co.312; and of the previous ones from India, nine have been selected for further field trial against Co.281; of these eight are of the cross P.O.J.2725×Co.301, and one is of the cross P.O.J.2725×Co.281.

Summary of the Variety position during 1940.

Introduced into the quarantine glasshouse	19 varieties
Destroyed while under quarantine ...	1 variety
Failed to become established under quarantine	14 varieties
Transferred from the quarantine glasshouse to Experiment Station... ...	9 varieties
Eradicated from outside quarantine station	6 varieties
In outside quarantine stations	21 varieties
Total number of varieties at the Experiment Station	145
Total number of seedling plants at the Experiment Station...	7,582
Total number of seedlings in propagation lines or plots	468
Total number of seedlings in replicated plot trials	62

Botanical Laboratory,
South African Sugar Association,
Mount Edgecombe.
March, 1941.

The PRESIDENT welcomed everyone to the first session of the Technologists' Conference held at the Experiment Station, Mount Edgecombe. It was also the first meeting of any kind ever to have been held in the hall. Although he doubted whether the whole Conference could ever be held here, he nevertheless expressed the hope that many more interesting meetings and Conference sessions would be held here.

Mr. Dodds associated himself with these remarks.

The PRESIDENT opened the discussion and suggested to those interested to read a similar paper by Mr. Dodds in the 1938 Proceedings, and then to re-read this one. The two were supplementary to each other. He pointed out that Co.290 had a reputation which it did not quite deserve, as was shown by some excellent results given in this paper. Co.301 too was judged too hastily. It was very necessary to plant these canes in the correct soil types and to cut them at the right time.

Mr. BOOTH congratulated Mr. Dodds on his paper and said that it too will form a very valuable record, and it would certainly be of great assistance to him personally. He was particularly interested in Co.331 and N.Co.67, and asked Mr. Dodds when these canes would be available to planters. A cane that would mature early and enable the mills to start in April and May would be very useful. By the end of October the Natal rivers were generally running hot and dry and manufacturing conditions were then becoming strenuous.

With regard to the figures dealing with the sucrose content, it should be pointed out that, being based on a differential Java ratio, they did not reflect the true sucrose, and to people outside this country they were definitely misleading. He deprecated the basing of these figures upon the arbitrary standards adopted in this country for the assessing of sucrose in cane.

Mr. DODDS, replying to Mr. Booth, said he had already tentatively applied for the release of Co.331, but did not expect its release just yet. The Government Mycologist must first be quite assured of the immunity of the cane to mosaic disease under field conditions. Mr. Dodds was confident that Co.331 would stand this test, as it resembled Co.290 and Co.281 in this respect. It was thus possible to infect it with mosaic disease under artificial conditions, but not one case of mosaic in the field had been noted hitherto with any of these varieties. The position with the seedling canes was that they were under the same Government restrictions, and the final results of field experiments now in progress would determine whether or not their release would be applied for.

As regards the sucrose content figures of the Central Board, Mr. Dodds said that they represented 77 per cent. of the total crop, and he considered them fairly representative of the actual sucrose content of the whole crop, although based on the rather unsatisfactory Java ratio.

Mr. RAULT, after thanking Mr. Dodds for his able report and the amount of valuable information that was included, said that if Uba were lower in sucrose than the new varieties, one would have expected a rise in sucrose with the progressive increase in these varieties. Records of thirty years at his factory, however, did not show it; in fact, the sucrose content of 100 per cent. Uba in the old days compared very favourably with the present figure, in which was included 60 to 70 per cent. new varieties. How would Mr. Dodds explain this?

Mr. DODDS explained that the low sucrose for the past season was due to abnormal weather conditions. From the April sucrose figure he had expected a record year; but the heavy rains in May and June caused a permanent set-back. The relative difference between the sucrose figures for Uba and the new varieties, however, still persisted. The results from Natal Estates could not be applied to the industry and inferences drawn. Most of the cane here was grown under irrigation and that might also account in some measure for the relatively poorer sucrose returns of recent years. Mr. Dodds regretted that the Experiment Station had not hitherto been able to carry out irrigation experiments, but he would very much like to see them done.

In reply to Mr. Rault, Mr. Dodds said that N.Co. stood for a cane seedling raised in Natal from Coimbatore seed.

Mr. BIJOUX pointed out that although the sucrose content as reported by the Central Board was based on a differential Java ratio, it could be calculated back and adjusted to the normal Java ratio.

Mr. DODDS said that to have the same Java ratio for all varieties would be even less correct.

Major MUNGLE said the industry had to thank Mr. Dodds and his staff for their enterprise in having discovered and obtained the release of the new varieties, so that fortunately the industry was not dependent on Uba to-day.

The industry was trying to get a suitable variety for each soil type. Co.290 originally filled a gap, but had disappointed many since. Co.301 was a good cane, but had the following disadvantages : it lodged, flowered, was a late ripener, and gave trouble in loading. Co.281 was a very reliable cane, but it did not fit in everywhere. For these reasons he was very anxious that Co.331 should be released as soon as possible.

Mr. DODDS thanked Major Mungle for his encouraging remarks. We had not yet arrived at any stage of finality with the release of new varieties, and it was perhaps too much to expect a new variety that would be superior in all respects to the established varieties. Co.331 had the disadvantage of being a very late ripener and it would show a poor sucrose in comparison with other varieties. In Hawaii they were now planting varieties which gave vastly improved yields in the field but were at the same time the cause of inferior mill returns; yet they considered that it paid them to use these canes.

Mr. GARLAND said that the reputation of Co.290 had been upset as a result of surplus cane and leaving it over too long, as well as planting it on soil for which it was not suitable. Co.290, unlike Co.281, did not carry over very well. He thought Co.290 was going to come back to favour.

In his opinion, the Sugar Association should grant the Experiment Station facilities for carrying out irrigation experiments on Natal Estates.

Mr. VERNON CROOKES said that if land adjacent to the Experiment Station could be set aside by Natal Estates, the industry and the Experiment Station would welcome the opportunity to conduct experiments on irrigated canes. As regards the Central Board's method of arriving at the sucrose content of the cane, he pointed out that there was no alternative method and it was the nearest to correct values they could get. Co.290, at the time of its release, saved the sugar industry as far as the South Coast was concerned, but after the release of Co.281 it was gradually eliminated. It was found that Co.290 did not ratoon well on the South Coast hills, and the red rot that attacked this variety caused a lot of trouble in the factories. Co.290 had served its purpose already, whatever its future might be.

Mr. DODDS appreciated the remarks by Mr. Garland and Mr. Crookes. He thought Co.290 would still be of good service, provided it was planted on the right type of soil and harvested at the proper time. It should not be left so late as to become overripe, also it had the disadvantage of not ratooning well if cut too early in the dry season. What was commonly called red rot in Co.290 was not red rot in the scientific sense of the word as applied to a certain specific disease, but simply general decay of the cane after cracking and injuries to the cane.

Dr. McMARTIN said that apart from disease entering through the cracks in Co.290, inoculation

experiments showed that there was a certain inherent weakness in the stem of that variety. It was found, for instance, that after inoculation of healthy cane stems that the organisms only spread within the actual joint in Co.281. In Co.301 they spread to the neighbouring joint, whereas in Co.290 the whole stalk was affected. Co.290 was attacked by a group of diseases, which were generally considered minor in other varieties, rather than by a specific disease.

Dr. VAN ZYL again pleaded for more experimental work. The necessity for this was illustrated by the divergence of opinion as regards the suitability and future of Co.290. Investigational work should be carried out on all the main soil types if we wished to find the answers to all the different questions. Experimental work on cane varieties, fertilizer applications and irrigation practice should always be closely linked with the soil type. If the soil aspect were neglected the results were liable to be confusing or even contradictory. Therefore it seemed necessary that experimental sites on representative soils should be carefully selected throughout the cane area for future investigations on varieties.

Mr. DYMOND sent the following written comments on the paper:—

"With regard to Mr. Rault's comments, an analysis of the optimum figures as published by the Experiment Station is interesting. From 1928 to 1936 (excluding 1934) the sucrose per cent. cane for the optimum period was 13.87 per cent., and that for the last three years (1937 taken as a transition year) was 13.85 per cent. With regard to the balance of the crop the figures were 12.72 per cent. and 12.40 per cent., but these figures were not comparative owing to the increased length of the crushing season during the last three years.

"Since the rainfall for the two periods were approximately the same, it would appear that the comparative results obtained from experimental plots did not reflect the conditions of the crop as recorded at the mills. From these figures there appears no evidence that we have obtained a higher sucrose per cent. cane from the new varieties."

The PRESIDENT called for a very hearty vote of thanks to Mr. Dodds. This was accorded with applause.