FIELD AND MANUFACTURING DATA ON VARIETY CANES
HARVESTED 1934/35 SEASON.

By W. O. CHRISTIANSON.

During the crushing season, 1934/35, about 75,000 tons of canes other than Uba were crushed. Of this total the bulk was P.O.J.2725, next in order being Co.290, and the remainder was made up of P.O.J.2878, 2727 and 2714. A considerably greater amount was actually cut, much being used for planting. This applies particularly to the Co. varieties.

A rapid survey of the sugar belt was recently carried out and information was obtained from fifty-two Planters and Estates in all districts. This information is summarised below. It is not as accurate as might be wished as most of the yield shown are estimated, but is at all events indicative of what might be expected from the new varieties in the field. (See Table I).

Briefly the above data shows P.O.J.2725 at an average age of 16.3 months as yielding nearly twice as much sucrose per acre as Uba, Co.290 at 13.5 months as 82 per cent more, and all the new varieties combined as 88 per cent more than Uba. The actual figures are:

<table>
<thead>
<tr>
<th>Variety</th>
<th>Age in months</th>
<th>Tons per acre</th>
<th>Uba Sucrose Tons per acre</th>
<th>% of Uba Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.O.J.2725</td>
<td>16.3</td>
<td>5.47</td>
<td>2.75</td>
<td>200</td>
</tr>
<tr>
<td>Co.290</td>
<td>13.5</td>
<td>3.93</td>
<td>2.16</td>
<td>182</td>
</tr>
<tr>
<td>All Varieties</td>
<td>—</td>
<td>5.27</td>
<td>2.80</td>
<td>188</td>
</tr>
</tbody>
</table>

In considering the above it must be borne in mind that the past season was phenomenal and Uba had an abnormally low sucrose per cent age. Uba suffered far more from the depredations of pests than any of the other varieties. The P.O.J. varieties are definitely not as attractive to the pest, either in the hopper or the flying stage. Co.290, although suffering defoliation perhaps to the same extent, does not show such tendency to side-shoots as does Uba. The insect has not been able to injure so much the heart of these new canes.

Some of the released P.O.J. varieties are not favoured by growers. P.O.J.2714, although it has given very good plant crops, does not usually ratoon very well and is being largely discarded. P.O.J.2727 and P.O.J.2878 have given excellent plant and ratoon crops, but the tendency is for them also to be discarded in favour of the higher sucrose yielder, P.O.J.2725.

Co.281 is very well reported on. It is the best germinating cane now in cultivation, has a very high sucrose content of high purity and gives particularly good yields under poor growing conditions. Almost every stick available was planted last season.

P.O.J.2725 is universally praised for heavy soils and moist conditions. Its chief virtues are drought, frost and streak resistance, very high sucrose, and extremely good germination and ratooning power. Its flowering has often been noted and it is disliked by some growers because of this. Some attempts at growing this cane in very sandy soils have given poor results, as was to be expected.

Co.290 is deservedly popular among both Factory-owned Estates and Planters. It has a very rapid growth and is particularly favoured for lighter soils. Enormous yields are reported where it is grown under irrigation and in moist land. This cane has been very successful in very wet, sour and brackish soils, and its frost resistance is very good. It has shown susceptibility to drought conditions very readily, but is generally reported to have a very good recovery. While resistant, it shows more streak than the other two varieties and it is pleasing to note that rogueing is being extensively carried out. Many cases of poor germination in dry or very wet soils were met with, and in this connection it was often stated that the lower portions of the stick do not germinate well and that six to nine months old canes make the best planting material. Three cases of poor ratooning were met with. This is probably due to lack of plant food. This cane is shallow rooting and responds well to fertiliser. Abortive attempts to flower were noted on two occasions.

Very large areas have been planted with P.O.J. 2725, Co.290 and Co.281 during the planting season now closed and we can expect well over 200,000 tons of these canes to be milled in the next campaign.

One large central mill will have at this time next year, two-thirds of the area supplying it planted with these new varieties. Only one of its numerous suppliers has planted any Uba at all this past season. This is an example of what is going on throughout the sugar belt and it is apparent that these new canes will in the very near future almost, if not quite, supplant Uba.

The reason for the enthusiastic adoption of these new varieties is of course their marked superiority to Uba. Uba, which the Industry has for so long depended absolutely upon, is universally stated to have deteriorated. It is apparently nearly 100% streak disexplained, all attempts at hindering the inroads of this disease having failed. Everywhere one hears the same tale of poorer yields, loss of germinating power and of vitality generally, so that Uba is no longer the cane it was. Indeed the manager of a big Estate expressed succinctly a generally-held opinion as, "If we don't leave Uba, it will leave us."
### TABLE I.

**AVERAGES OF FIELD DATA ON VARIETY CANES HARVESTED 1934/35 SEASON.**

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Number of fields represented</td>
<td>19 17 15 8 10 18</td>
<td>12 7</td>
<td>4 3</td>
<td>7 1 8 3 8 2</td>
</tr>
<tr>
<td>Weight of Cane in tons</td>
<td>2.98 2.39 2.39 2.75 5.39 3.89</td>
<td>1.35 1.17</td>
<td>1.06 6.64</td>
<td>330 165</td>
</tr>
<tr>
<td>Age</td>
<td>16½ mths. 16½ mths. 16½ mths. 16½ mths. 16½ mths.</td>
<td>21 mths. 17½ mths. 23 mths. 23 mths. 22 mths. 15½ mths.</td>
<td>3 plant 1 plant 3 plant 1 plant 1 plant 1 plant</td>
<td></td>
</tr>
<tr>
<td>Plant or Ratoon fields</td>
<td>12 plant 14 plant 6 plant 12 plant 1 plant</td>
<td>Plant Plant Plant Plant</td>
<td>Plant Plant</td>
<td></td>
</tr>
<tr>
<td>Purity of Juice</td>
<td>92.60 90.50 89.70 89.70</td>
<td>89.70 89.70</td>
<td>89.50 87.90</td>
<td>89.20 81.90</td>
</tr>
<tr>
<td>Purity of Juice</td>
<td>92.60 90.50 89.70 89.70</td>
<td>89.70 89.70</td>
<td>89.50 87.90</td>
<td>89.20 81.90</td>
</tr>
<tr>
<td>Number of irrigated fields</td>
<td>2 2 2 2 2</td>
<td>3 plant 1 plant 1 plant 1 plant 1 plant</td>
<td>3 plant 1 plant 1 plant</td>
<td></td>
</tr>
<tr>
<td>Type of soil</td>
<td>Light Medium Heavy Light Medium Heavy</td>
<td>Light Medium Heavy Light Medium Heavy</td>
<td>Light Medium Heavy Light Medium Heavy</td>
<td></td>
</tr>
<tr>
<td>Resistance to drought</td>
<td>V. good Good Good No test No test</td>
<td>Slight Good Good Good</td>
<td>Slight Good Good Good</td>
<td></td>
</tr>
<tr>
<td>Locust damage</td>
<td>Moderate Slight Slight V. slight Slight</td>
<td>Slight V. slight Slight</td>
<td>Moderate Moderate Moderate Moderate Moderate Slight</td>
<td></td>
</tr>
<tr>
<td>Yield of Cane in tons per acre</td>
<td>32.80 31.50 35.10 35.60 45.00</td>
<td>30.00 44.50 37.50 42.20</td>
<td>27.60 22.00 33.50 31.60 29.00 36.50</td>
<td></td>
</tr>
<tr>
<td>Yield of nearest comparative Uba</td>
<td>29.80 27.50 21.80 21.80 28.50</td>
<td>25.30 31.70 27.80 31.10</td>
<td>16.00 12.00 19.70 24.30 18.60 22.50</td>
<td></td>
</tr>
<tr>
<td>Sucrose % Cane in Uba</td>
<td>11.99 12.10 11.98 10.03 11.22</td>
<td>11.67 11.40 11.86 11.17</td>
<td>12.30 11.10 12.75 11.70 11.68 11.00</td>
<td></td>
</tr>
<tr>
<td>Tons Sucrose per acre—VARIETY CANES</td>
<td>4.95 4.57 6.99 5.26 4.95 6.07</td>
<td>5.54 7.29 5.10 6.23 5.10 5.96</td>
<td>3.58 2.90 4.60 3.78 3.69 4.27</td>
<td>1.33 1.33 2.51 2.84 1.87 2.48</td>
</tr>
<tr>
<td>Sucrose yield of varieties % of Uba</td>
<td>198.30 191.90 291.20 201.50 226.00 189.70</td>
<td>187.80 201.90</td>
<td>127.70 125.10</td>
<td>155.50 160.20</td>
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</table>
VARIETY CANES HARVESTED.
Milling Tests on 4,038 Tons Cane.

<table>
<thead>
<tr>
<th>Milling Tests on 4,038 Tons Cane</th>
<th>All new varieties (mainly)</th>
<th>% ratio per hour new varieties</th>
<th>P.O.J.2725</th>
<th>Uba.</th>
<th>% ratio per hour of new varieties to Uba.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tons per hour</td>
<td>81.10</td>
<td>66.78</td>
<td>121.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imbibition % Cane</td>
<td>27.57</td>
<td>31.83</td>
<td>105.2</td>
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<tr>
<td>Mixed juice % Cane</td>
<td>99.96</td>
<td>97.52</td>
<td>160.9</td>
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<tr>
<td>Bagasse % Cane</td>
<td>27.61</td>
<td>34.31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture % Cane</td>
<td>52.04</td>
<td>51.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose % Bagasse</td>
<td>3.28</td>
<td>3.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre % Bagasse</td>
<td>43.40</td>
<td>44.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose extraction</td>
<td>93.50</td>
<td>91.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre % Cane</td>
<td>11.98</td>
<td>10.10</td>
<td>96.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sucrose % Cane</td>
<td>14.66</td>
<td>12.44</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Java ratio</td>
<td>80.90</td>
<td>78.30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Crusher juice purity</td>
<td>91.20</td>
<td>86.50</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Last mill purity</td>
<td>79.40</td>
<td>78.30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mixed juice purity</td>
<td>88.80</td>
<td>84.80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glucose ratio</td>
<td>2.55</td>
<td>3.73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ash % Juice</td>
<td>0.392</td>
<td>0.433</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.B.—The above summary is the arithmetical average of results from ten factories and represents seventeen mill tests. Only six factories reported glucose ratios; the ash figure shown is from only one factory.

The new canes included in the summary of mill tests consist of Co.290 and all released P.O.J. varieties, but P.O.J.2725 is the chief one represented.

Outstanding features of this summary are the increased extraction and crushing rate, the greatly increased quantity of juice to be handled in a given time and the lower amount of fibre available as fuel. These figures would all have been increased, but most factories could not cope with the extra juice.

The quantities of new varieties crushed at any one time at the factories were in some cases too small to give much information, and the canes were milled without any adjustment whatsoever, no study being made of anything but mill tests. In those cases where more information was collected, we find the following deviations from the Uba normal.

**Mill Settings.**

In one factory only was a mill reset. This was necessary because the last mill could not be slowed down sufficiently and the poor feed from the low-fibred cane resulted in bagasse too wet to burn properly. In another factory it was a general practise to slacken off the crusher for any considerable amount of P.O.J. canes and tighten it for Co.290.

**Mill Speeds.**

In one case the crusher speed was increased to get information of the mill crushing capacity. In another six cases the speed was reduced owing to the extra juice overtaxing other equipment. In all cases the subsequent mills were slowed up to enable them to be properly fed with the smaller quantity of bagasse.

**Power.**

This was found in one factory to be 21% less with P.O.J. canes and 10% less with Co.290 in spite of nearly 30% more cane crushed per hour.

**Volume of Juice.**

This was too much for the juice equipment, in every case the pressure being most felt on some weak part of the plant. In order to overcome this difficulty the mills were slowed down and the imbibition reduced in many cases.

**Fuel.**

Very few factories crushed enough to study this question, but one definitely had to burn extra fuel to make up the shortage when crushing low-fibred P.O.J.2725, while several had to reduce imbibition to maintain a steam balance. Some definite opinions were expressed that it will be possible to increase sufficiently the efficiency of the boiler house and to economise heat sufficient to meet the shortage, thus avoiding any extra fuel cost.

**Cush-Cush.**

A few cases were reported of excessive amounts of cush-cush and the fouling of screens by the high proportion of soft pithy particles from P.O.J.2725.

**Juice Treatment.**

The amount of chemicals used was reduced in six cases. One factory reduced the chemicals by one half, two by 25 to 40 per cent and three only slightly. The proportions were not altered.

In one factory a test was made on P.O.J.2725 without sulphur dioxide and with apparently excellent results. This factory experienced no difficulty in clarification, filtration, or in any part of the process. The clarified juice is reported as “Sparkling,” the filtration “excellent,” the cake “Good” and the filtrate “brilliant.”

The factory that reduced the chemicals by 50 per cent reports that its clarification process handled 20 per cent more juice from P.O.J.2725, P.O.J.2878 and Co.290. This increased quantity of juice gave a much better clarification and filtration and less mud than the Uba juice under normal treatment.

Where the chemicals were reduced to 60 to 75 per cent of normal the results again were superior to those with Uba. In one case the Kopke clarity is reported as 51 as against 30 for Uba. In another case the clarification rate increased 15 per cent.

In two of the factories which only slightly reduced the proportion of chemicals added the results are similarly superior. In one case (and this is the only exception), a report was made that although the clarification with the usual amount
of chemicals was superior to Uba, the attempt to reduce chemicals was unsuccessful.

Clarification.
This was in all cases superior to the Uba normal, anything up to 25 per cent increase in settling rate being reported. The mud was definitely less and the clarified juice good, being reported as "brilliant," "sparkling," or the like.

Filtration.
The filtration was excellent where studied, and in no factory was it thought that the filter capacity would be overloaded, even with the increased crushing rate expected.

Evaporators.
This part of the equipment together with juice pumps, juice heaters, etc., are generally stated to be too small to cope with any increased crushing rate and will have to be improved. In many cases the rate of crushing and the imbibition had to be reduced because of this weakness.

Vacuum Pans.
Where studied, faster boiling (up to 10 per cent) and much easier graining is reported.

Recovery.
No factory has, as yet, carried out a long enough test to pronounce judgement under this heading. It is confidently believed, however, at all but one factory, that factory work and efficiency will be very appreciably improved by the handling of the varieties crushed last season.

Conclusions.
From the above it is obvious that the new canes crushed gave a valuable increase in extraction, and mill capacity. When equipment is improved and increased (where necessary) the full advantages such as higher crushing rate, less wear and tear on mills, economy in chemicals, increased capacity of filtration plant and improved boiling house work will be gained.

In conclusion, I wish to thank all the planters, mill managers and their field and factory staffs, that were visited, for the ready way in which the above information was given, often at considerable trouble to themselves.

Experiment Station,
South African Sugar Association,
Mount Edgecombe,
Natal.
March, 1935.

CHAIRMAN: This paper is a short record, naturally very incomplete, as has been pointed out by the compiler, owing to the quantities of these new variety canes which were crushed being so small, and the data being collected from various areas scattered up and down the sugar belt. However, we have sufficient information in this paper to confirm some of our hopes and also some of our fears of what we are to expect from the adoption of these new variety canes, both as regards their growing in the field, and subsequent treatment of the cane in the factory. Of course, with regard to the manufacturing side of the question, these notes more or less confirm what we would be led to expect. There is one point I would like to make mention of in the growing of these canes. I am not a cane-grower myself, but I have seen canes growing for the greater part of my life. It is this—unless these new variety canes are carefully cultivated and selected in planting, is there not a general tendency for them to revert to type? If nature is allowed to have its way, as has been the case with Uba cane, will it not revert to type—of the Uba variety, will most of them not revert to that? I consider the matter of cultivation and careful selection will have to be very carefully looked after. I know under the old happy-go-lucky means of growing Uba cane, the planter was the one man in the world without any worries. I am afraid his life is going to undergo a change. The paper is now open for discussion.

Mr. BECHARD: On one point I would like perhaps a little further information. When the meeting about soft canes took place, unfortunately I was away on leave on that particular occasion. On the question of fuel, I am referring to P.O.J. 2725, the bulk of what we crushed. At the time we were crushing that cane, we were suffering from a general shortage of cane. I reduced the speed of our mill deliberately. At that time we were suffering from a shortage of fuel. Also at that time, we were stopping very frequently. I made it my own practice generally to keep soft cane last, so that we would have some fuel to carry over.

Another point is one that just raised—the question of species. I do not know if you gentlemen have followed the argument which has been going on for some time, but it is summarised in a paper by Mr. Martin, who has reported on certain deterioration of the cane as propagated by cutting, and he has come to the rather surprising conclusion that cane deteriorates very rapidly. Deterioration of the species is due to the planting of immature cuttings. It is a very interesting point, because, generally speaking, everybody will plant immature cane. Some will go so far as to plant only tops. I do not know if that article has come to the notice of Mr. Dodds. It is in the last bulletin of the Association of Agronomists of France. It is rather revolutionary and very interesting.

Mr. BOOTH: With regard to Mr. Bechard's remarks on immature cane, can I ask him to elaborate that point?
Mr. BECHARD: I am only quoting another's opinion. I would like to let you have a translation of that report.

Mr. BIJOUX: With regard to clarification. In the results obtained, generally, I take it that all these canes were hand crushed, apparently with very good results. When we come to a big group, would planters hand crush the cane?

Mr. MOBERLY: There is a lot of very useful information in this paper and there is one point I would like to point out. In these figures given in the first column we have got a comparison with Uba, I take it, is based on the figures “Uba Sucrose tons per acre.” But a true comparison is tons of sucrose per acre per year, or per unit time. If we consider that the average time, P.O.J.2725 is mostly plant cane for 16 months, Co.290, only 13½ months, the comparison with Uba becomes very much more marked. That last column would probably be nearer the neighbourhood of 300. It is that factor which is going to be a very large one when it comes to the expansion of our total output. I think it would be of interest to members here to note that this question of the treatment of new variety canes in the factory is one which is being followed up by the Committee of this Association, and steps have already been taken. The matter is in hand now to arrange for one factory, during the cutting season, to work for a period of a few weeks with nothing but these new variety canes, so that the various technical committees will have an opportunity of watching the progress of crushing, and they will be in a position to advise as to the methods of clarification and other treatment to be followed, and also capacities. Planters will undoubtedly have to alter their capacities to meet these increased quantities of juice. At the present moment we can only make guesses at the capacities. It is intended to carry out these experiments during the coming crop. For at least two weeks, we will have at one mill nothing else but these canes.

Dr. HEDLEY: I am amazed to hear a remark from Mr. Bechard to the effect that they could make fuel with soft varieties. It is the first time I have heard it, and I cannot understand it. When Uba has a figure of 15% fibre and taken as 100, Mr. Christianson shows that with the 12% fibre you have 160 per cent of mixed juice % cane to be evaporated in a given time. Now you have more juice to evaporate; you have less fibre to do it. How on earth can one make fuel? That is one thing I have been concerned about in the last two or three years. It is a thing that the Boiler Committee has pushed—that we will not be in a position, when we get these new varieties, to boil off, evaporate, crystallise and so on, the juice which we get from these new varieties unless we have greatly improved methods of conservation of heat by insulating pans, insulating crystallisers, insulating juice tanks and conserving of heat in all directions.

Mr. BECHARD: I thought that this would happen. The fact is it can still be substantiated by Mr. Rae. Does not Dr. Hedley consider that the biggest expense of steam that we have is in the milling? (Dr. Hedley: Certainly not, juice heating and evaporation use the most steam). Certainly the fact that I have stated—that we did make bagasse while crushing soft cane—can be well substantiated.

Mr. BIJOUX: There is a point brought up by Dr. Hedley with reference to Mr. Christianson’s figures. There is a mistake in the third line.

Mr. CHRISTIANSON: Actually there is a slight misprint at the per cent ratio new varieties Uba in a given time.

Mr. MOBERLY: I would like to explain on behalf of Mr. Christianson that I am responsible for a little fault there, because the manuscript he put in, I did not follow exactly what he meant and in correcting the proofs I struck out “per hour.” He was right and I was wrong.

Mr. DYMOND: Although I did not observe this condition at Amatikulu last year about getting more bagasse with these new varieties, I had information from Mr. Olivier at Xinavane, that the previous year, in the second half of the season, when they crushed only new varieties of cane, they definitely made more fuel—had easier working at the factory. That was the point—that they made more fuel.

Dr. HEDLEY: Made more fuel as compared with what variety?

Mr. DYMOND: Uba.

CHAIRMAN: With these softer canes you crush so much more per hour. The actual tons of bagasse passed into the boiler house is very much greater, and the work of clarification is very much quicker. Therefore, the losses in radiation, which are far greater than some people realise, are considerably cut down. If your tons of cane per hour crushed, or what I prefer as the more scientific figure, the tons of bagasse passed out of the last mill, is considered, and the time taken in the process, you will find that radiation loss, plus, to a small extent that used in the engines and so forth, is very much reduced. So that in totalling up your steam balance, one may find that the shortage of fuel is not so marked. But still, personally, I only hope it is true that we shall be able to make bagasse, but I very much doubt if we shall be as well off in the boiler house as we have been with Uba. I very much doubt whether there will be a definite improvement. I do not know how this run was at Amatikulu.
Mr. RAE: It was rather short, only about one hour. You may jump to wrong conclusions by taking only short tests. I think the time was too short to make satisfactory conclusions.

Mr. DODDS: Of all the papers we have had at this Congress dealing wholly or partially with the agricultural side of the Industry, I think this paper is of the most immediate practical interest and value. I am therefore sorry to note that circumstances prevented it appearing in the programme earlier, and that it has been read to such a scanty audience, and especially to so few planters and field men, as we have this morning. This paper, although necessarily giving us much of the information somewhat scantily, is, at all events, very useful in giving some indication of what we may expect from the new varieties. It also sounds some notes of warning, which I think should be emphasised at this Conference, on the agricultural side. The writer refers, amongst other things, to the drought resistance of Co.290 cane. Co.290 is a cane which soon shows signs of distress in drought to a rather alarming extent, but we certainly find that the cane is not so bad as it looks and it is a long time before any of it is killed. As Mr. Christianson notes, the rapid recovery and response to watering is remarkable. Nevertheless, the fact remains that Co.290 has much less drought resistance than Co.281, and probably even less than Uba. The tendency has been, during the last two seasons, for very large areas of Co.290 to be planted. In all probability, in some cases, if more Co.281 had been available, that would have been planted by preference. That means, possibly, that Co.290 has been planted in conditions somewhat subject to drought. During these last two seasons, we have been very fortunate in having no serious drought conditions, and this needs to be kept in mind with regard to the extension of this otherwise most valuable cane. Another thing we have found, and it has been confirmed by the experience of planters growing Co.290 for any length of time, that it must be cut at the right time, within a period of a month or two. It is not a particularly early ripening cane, but is capable of giving, as you saw from the graphs given by Mr. Colepeper in his paper, a high sucrose content comparatively late in the season. But, on the other hand, it does not hold over very well, so that it is a cane that needs careful watching. If properly treated, however, it gives excellent results.

The susceptibility of this cane to streak disease has also been commented on. It is certainly susceptible, though very slightly, under field conditions. We have had many more cases of streak in Co.290 than in any of the other released varieties. The susceptibility, however, is not to be compared with that of Uba or CH64/21, and can easily be controlled by rogueing. We have begun experiments at the Experiment Station on the tolerance of the varieties, Co.290 and P.O.J.2825—that is the measure of the extent to which the yield is affected by streak disease. The experiments have only been planted a few months, but up to the present there is no appreciable difference in growth between the streak diseased plots and the healthy plots alongside. Nor has there been any appreciable spread of the disease into the healthy canes. This is encouraging, as far as it goes. Whether the resistance of these new canes to streak disease can eventually break down is perhaps a matter for the botanists to discuss, but up to the present their resistance and tolerance are very satisfactory. As Mr. Christianson has noted, and confirms our ideas as expressed in the annual summary of laboratory reports, streak disease is undoubtedly proving a very serious factor in the deterioration of Uba cane.

Another matter which must be recognised with new varieties is the need for cultivation. I had a letter a few days ago from a large estate in Zululand, which commented on the wonderful results obtained from P.O.J.2725 and Co.290 cane on our experiment on Mr. Murphy's estate at Umfolosi, and they asked why such results had not been obtained by them, in a somewhat similar alluvial soil. The obvious answer was that the excellent cultivation that was given by Mr. Murphy to these variety canes, gave them a chance of doing their best. If that thorough cultivation is not carried out, these canes cannot be expected to fulfil our hopes. That is another point to be kept carefully in mind.

I have not yet noticed the paper by Martin which Mr. Bechard refers to, but, concerning your remark, Mr. Chairman, about the possible reversion of the new canes, although it is more a matter for a botanist than for me, I do not think there is any possibility of these canes changing their essential character on a considerable scale. With change of environment any cane will show temporary changes, for example with neglect of cultivation. But their essential character, and, above all, their capabilities, will not be permanently affected. Let me draw a parallel from the findings of the Carnegie Institute Commission on the poor whites in this country. Although they found serious deterioration amongst the poor whites, yet their offspring, if taken out of their unfavourable environment, were found to be quite up to the normal in general capability. If they were given proper nutrition and education, their possibilities were quite as good as the original stock from which they came and which had deteriorated in unfavourable surroundings. There is no case on record, as far as I know, of any poor white having changed so far as to become an aboriginal. They have, at all events, preserved their original colour and general racial characteristics. That, I think, applies equally to sugar cane, and I would like to hear the remarks of some of our botanists present on this aspect.

Mr. PALAIRET: Mr. Dodds has given us one or two very interesting points. He has raised one
particular thing which I think we shall have to watch very closely. He has pointed out the question of the limited period of the maximum sucrose content of Co.290 cane. But there is another thing that has cropped up. I know of two or three cases of planting failures. There is reason to believe that the age at which Co.290 can be planted successfully is very restricted. I have heard one or two say it will not come up if it is older than 14 months. That is a thing that we shall have to watch very closely. I hope we shall get some more information to help us on that question. It happened with some of my canes I supplied to a neighbour, in which he had some bad failures. Mr. Bechard raised this question of deterioration. While agreeing with the likelihood of these canes deteriorating if under-nourished, one thought that occurred to me was if you starve a high-caste Indian, he might, in time, revert in some respects to a coolie, but he would not revert to a negro.

Mr. McCLEAN: At some future conference, I hope to give a paper on the behaviour of these new varieties to streak disease. According to the readiness with which they acquire infection, the varieties may be roughly classified as follows:—(a) very susceptible—Uba, CH64/21 and related varieties; (b) resistant—Co.290 and P.O.J.2725; (c) very resistant—Co.281, P.O.J.2878, P.O.J.2714 and P.O.J.2727.

Several cases of natural infection have been reported in Co.290 and P.O.J.2725. The disease, however, does not spread so rapidly in these varieties as in Uba, and the incidence of the disease is usually well under one per cent, even in localities where almost every plant of Uba is infected. One plant of P.O.J.2878 was found recently with streak. Otherwise the varieties in the very resistant group have remained free from the disease under field conditions. Both Co.281 and P.O.J.2878 have been infected artificially, but only with difficulty, and infected plants have always recovered.

I am not in agreement with the statement that Uba is nearly 100% streak diseased. A survey is in progress to determine the amount of infection in this variety throughout Natal and Zululand. From the preliminary figures I would estimate the percentage to be nearer fifty.

I do not agree with the Chairman that the new varieties will revert to some wild type. The mere fact that cane is propagated vegetatively insures that the genetical constitution of a variety will remain unaltered in successive vegetative generations.

Mr. BECHARD: Would Mr. McClean consider, though, that cane as propagated in this country could more or less have a breakdown of resistance to disease. It is not so much the prospect of reverting to another type. Given unfavourable conditions, is there a possibility of the breakdown of the natural resistance to disease?

Mr. McCLEAN: It is rather difficult to answer that question. It would be merely speculative. I cannot quote any parallel cases of plants which are propagated vegetatively. Of course, plants propagated by seed, that is a different matter. There might be a tendency in "sports" to increase the susceptibility or resistance.

Mr. PALAIRET: Are there on record any genetical changes?

Dr. McMartin: Yes, there are one or two cases. It has been done experimentally, I know, with the tomato. They have altered the genetical constitution. But such cases are very rare.

Mr. BOOTH: I am surprised at Mr. Palaireset, a gentlemen of his education and integrity, selling to a neighbouring planter seed of 14 months and not telling him how to plant it. I planted Co.290, P.O.J.2725 and Co.281, all 24 months old, but having carefully selected it, I did not have any misses.

Despite the evidence of scientific friends, I give great weight to a statement made to me last year at the Show, by a gentleman who, I think, has been in sugar, with few exceptions, since before any of us were in Africa. Whilst wonderfully open-minded, he expressed great doubts as to whether all these new varieties would not, in course of time, revert to the characteristics of one. I would sound a note of warning that, with all these virtues, all the new canes must be regarded, with respect to staying power, with a certain amount of suspicion, and will leave it at that.

This same gentleman told me that 50 years ago, sugar centrifugals, with all their antique methods of construction, as soon as the machine stopped, the sugar fell right out. It did not require any handling to clear it out. I think myself that is not a bad test of the efficacy of juice preparation.

Then on another subject, which, to my mind, is also of great importance. This is the first record we have of the new varieties. I see, in reading the first page of Mr. Christianson's article—on which I congratulate him—it refers to tons of sugar per acre, and he includes the Fahey bonus. Now the Fahey bonus may or may not exist a year or two hence. I do not think it is a proper basis of comparison. We are constantly told that our records are going abroad. I do know that they are being studied. I think it is somewhat misleading to technologists overseas if they are to be told figures which will not be included, possibly, in the future. May I suggest, since this is a first paper, that these figures be altered, excluding the bonus?

Mr. RAULT: I second that. I objected strongly to these figures being put in, because they were only something local; they mean nothing to people outside. These figures ought not to be published outside.
Mr. HAYES: With all respect to grey hairs, and to Mr. Booth's remarks as to the effects of cane-working in the dim, murky past, we have to realise that we have no information at what cost the sugar he mentions was obtained. Another line one can take is as regards the behaviour of Uba after a long period under certain conditions. The fact that the canes that were grown previous to the introduction of Uba were nothing like Uba in characteristics, although they were subject to the same environmental conditions as Uba, should be kept in mind. They deteriorated, certainly, but even before they were eradicated their milling properties were quite unlike Uba.

Mr. DODDS: While not wishing to prolong this somewhat academic discussion, I should like to call your attention to two varieties of cane still in existence here and in other parts of the world—Otaheite and Preanger. When grown under favourable conditions, they are some of the best canes that have ever been known. The reason they have largely gone out of cultivation is that they have not sufficient degree of resistance to new diseases, or old diseases that have become widespread. It is on record that these varieties have been under cultivation, and have been propagated vegetatively during that time for a period of 150 to 200 years. There is no sign of any systematic deterioration in these varieties, and their properties, colouring and appearance closely resemble those that were recorded over 100 years ago. There are some beautiful water-colour drawings of them that were done early in the 19th century by Tussac in the "Flora Antillarum." These illustrations are perfectly applicable to-day. Mr. Booth's remark brings me to another point regarding the planting of these canes. He commented on Mr. Palairet's having sold cane without explaining how it was to be planted. We have found Co.290 this season has been rather subject to failure to germinate, due to minor diseases, which, as far as we know, have always existed in the soil and to which Co.290 happens to be rather more susceptible than most of the other varieties. If conditions favour the development of these diseases, as our recent rainy season has done, lack of germination is liable to result. There is a good deal to be said in favour of Mr. Christianson's suggestion of planting only the upper parts of the cane, because we find that it is the lower portions that are most liable to fail.

CHAIRMAN: I think this discussion will go on till evening if it is allowed. We are to understand, of course, that this is only a preliminary canter in this respect. The discussion of these new varieties and the subject will come up every year at future conferences.

With regard to the next two papers, is it your wish that these be read now? We have asked the contributors, and they both say that they do not mind if these two papers are left out, so far as the reading is concerned. Is it your wish that we proceed with these two? I see the audience quietly dwindling away.

Mr. MOBERLY: I propose that these papers be taken as read, but an opportunity be given to raise any particular points.

CHAIRMAN: We will consider this paper now closed, and I ask you to give Mr. Christianson a hearty vote of thanks for the work he has done in collecting the data. Carried.

CHAIRMAN: We will take the next two papers now as having been read, and leave them open for discussion till one o'clock. Has anyone any observations to make on the locust paper and the experiments?

Mr. VIGER: With regard to the paper Dr. McMartin read yesterday—the few instances in which Dr. McMartin said the effects had been negatived by inoculating locusts with this fungus—is not there a possibility that previous poisoning might have been responsible for that effect?

Dr. McMartin: All the locusts which were used for this infection experiment were carefully picked, as not having been near arsenic. They were kept in cages. We did not try any inoculation experiments on them until we were perfectly satisfied that they could live in cages for weeks.

The question as to the effect of spreading arsenate in the cane fields and destroying the natural enemies of the fungus disease is a question which must be considered. There is a possibility that in spraying with arsenic we destroyed, to a certain extent, the insects and fungus diseases which naturally destroy locusts. It was shown in one instance—I think in America somewhere—that some orchard pests that they were spraying with arsenic, were actually increasing in numbers in the orchards instead of decreasing; and they attributed this to the fact that they were destroying, by the arsenic spray, such a large number of the natural enemies of the pest. But as far as locusts are concerned, we may sum up the position by saying that if we are spraying with arsenic we are able to kill the locusts; if we do not spray with arsenic, and leave it to Nature, we are taking too big a chance.

Mr. LINTNER: In connection with Dr. McMartin's papers, I should just like to say that I think that everybody who has had anything to do with scientific work in this country at all ought to thoroughly appreciate the really magnificent way in which Dr. McMartin has carried out his research on locusts. He is a botanist and he has done the work of an entomologist. I know how little I should like it if I had to turn my mind to botany without much preparation. I really do think that his work demands the highest appreciation.

(Applause).
CHAIRMAN: We will simply pass a vote of thanks to the contributors of the two last papers, Dr. McMartin and Mr. Fowlie, in closing this conference.

Carried.

CHAIRMAN: I would like to say how gratified I have been at the very excellent attendances we have had. I had fully expected that to-day we would have just a few enthusiasts left, but even to-day, at the tail end of the conference, I must say the attendance has been comparatively good, as compared with previous years. This is the longest conference we have ever had. I think in future years it will become absolutely necessary again to split it up into sections. I know that Monday's proceedings were of very little interest to the majority of chemists and cane growers, and it is quite evident that the last two days have been of very little interest to engineers—I do not think any of them have been here. I put that as a suggestion to the new Committee—that arrangements be made next year to subdivide the conference a little more and have it meeting in separate sections. It will be the only practical way of getting through the work, because, as years go on, it is certain that the amount of work to be got through in the course of these conferences will increase, and the conference will have to be subdivided. I thank you very much for your attendance, and I trust the conference next year will be as successful as this one has been.

Mr. MOBERLY: I think we certainly ought to pass a vote of thanks to the Chairman, or, as I prefer to say, the President, of this Association, for the way in which he has conducted this Congress. I know from experience that it is no easy job, and great credit is due to Mr. Camden Smith for the smooth way the conference has gone and also for the way in which he has managed to get through the whole of the very large agenda which has been before us. At the same time I would like to bring in the name of Dr. Hedley for his work, which is not merely work during the last four days, but steady work during the last twelve months, and to both of them I think a hearty vote of thanks is due.

Carried with acclamation.

The Chairman briefly replied on behalf of himself and Dr. Hedley, thanking the members for their appreciation.