REPORT OF FIBRE COMMITTEE.

The following paper was read by Mr. G. S. Moberly.

The Committee this year has had the advantage of certain practical experiments which were carried out in connection with investigations of the qualities of new Variety Canes, and of alternative methods of cane valuation.

A series of tests of chip samples and cane samples from complete truck loads was made and compared for sucrose and purity with the mill crusher juice tests and the planters' crusher juice tests, these being the only standards of comparison available. The following results were obtained:

This series showed that the chip samples corresponded a little more closely with the ordinary crusher juice tests for sucrose and purity than did the cane samples. The fibre figures were somewhat higher for chips.

It may be noticed that the purity of the juice from the cane samples was nearly 1 degree higher than that from the chip samples, and higher than the purity of the factory or planters' juices. This is not necessarily due to faulty sampling, since the preliminary preparation by the knives enables the crusher to extract more juice of a lower purity. This has already been observed in factory practice.

A further series of tests was made on four trucks of cane; from each of which six samples of sticks of about 250 lbs. were taken. Any of these six samples might represent the sample to be taken in each case. The degree of concordance, therefore, throws some light on the efficiency of the sampling. The results of these tests are tabulated below:

<table>
<thead>
<tr>
<th>Truck</th>
<th>Average Variation from the Mean</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Fibre % Cane</td>
</tr>
<tr>
<td>A</td>
<td>0.28</td>
</tr>
<tr>
<td>B</td>
<td>0.12</td>
</tr>
<tr>
<td>C</td>
<td>0.14</td>
</tr>
<tr>
<td>D</td>
<td>0.35</td>
</tr>
</tbody>
</table>

The minimum view of the members of the Committee as to allowable limits of error for fibre is 0.5, so that so far as fibre is concerned the above would show that a 250 lb. sample of cane might be adequate, but further experiments of this type are required before such a sample can be finally recommended.

LARGE SCALE EXPERIMENTS.

A large scale experimental run was made, testing all cane crushed by one tandem at Darnall.
Samples of 250 lbs. of chips were collected in a special sampling apparatus devised by Mr. Dymond.

This experiment was discontinued after five days, as the fibre results obtained were far too high. This may have been due to several causes.

(1) Evaporation from the chips.
(2) Tendency of the knives to tear off particles containing too large a proportion of the rind.
(3) The fact that rind particles were probably more readily deflected into the receiver than pith particles.

A second run was then made using samples of about 250 lbs. of sticks. In order to avoid selection, the sample collectors were instructed to grab three sticks at a time. This may tend to limit the representativeness of the sample, but lessens the likelihood of unconscious selection on the part of the sample collectors.

In using the indirect method of determination it was assumed that the purity of the residual juice was equal to that of the expressed juice, whereas it is certainly somewhat lower. The difference appears to depend on the fibre % cane.

In order to test this the residual juice from 25 samples was expressed by means of a hydraulic press. For these 25 samples an average difference of purity of 2.9 was found. In five cases the purity of the residual juice was higher than that of the expressed juice.

Unless the bagasse from the auxiliary mill is sampled very rapidly there is a great danger of evaporation, and this will increase the apparent fibre % cane.

Errors of weighing and analysis of juice and bagasse will also affect the results. The degree of accuracy of the method can be shown roughly as follows:

**TABLE III.**

<table>
<thead>
<tr>
<th>Weight of Sample 250 lbs.</th>
<th>Weight of Expressed Juice 150 lbs.</th>
<th>Brix of Juice 20.0</th>
<th>Pol. of Juice 16.0</th>
<th>Pol. of Bagasse 8.0</th>
<th>Moisture % Bagasse 55.0</th>
</tr>
</thead>
</table>

The above gives Fibre % Cane = 14.0. (Assuming purity of residual juice = purity of Expressed Juice).

An error of 1 lb. in weight of sample makes an error of ± .044 in Fibre % Cane

| " " " 1 " " " " juice " " " " + .140 " " " " |
| " " " 0.1 " " Brix " " " " + .020 " " " " |
| " " " 0.1 " " Pol. " " " " + .025 " " " " |
| " " " 0.1 " " Bagasse " " " " + .050 " " " " |
| " " " 0.1 " " Moisture % " " " " + .040 " " " " |
| " " " 1.0 " " pur. of resid. juice " " " " + .050 " " " " |

The figures for fibre % cane from this run, which lasted seven days, were more reasonable than those for chips, but it is difficult to judge of their true value, since only the cane from one mill was thus tested, and the only available figure for fibre % cane in the factory was cane from both tandems.

Fibre % Cane

Average of 255 special tests (1 tandem) 16.81
" Factory tests (2 " ) 15.62

These figures are not as close as one might wish. There is reason to believe that cane crushed in the tandem from which the tests were made was of somewhat higher fibre than cane crushed in the other tandem. It is also probable that the method of testing (particularly the sampling of bagasse) does not yet eliminate all chance of evaporation. Further refinements in the methods of working may eliminate this.

**ACCURACY OF THE METHOD.**

Apart from sampling there are a few other possible sources of error.

It will be noticed that the purity difference between expressed and residual juice does not greatly affect the result.

Suppose that in the above instance the purity of the residual juice were 77.0 instead of 80.0, then the Fibre % Cane should be 13.84. With the maximum probable errors in weighing and analysis we might get:


Assuming that residual juice purity equals expressed juice purity, the above would give: Fibre % Cane = 14.8, which is the maximum probable error due to weight and analysis errors.

If, due to evaporation of the bagasse sample, the pol. of the bagasse rose to 8.2 and the moisture % bagasse fell to 52.0, the other figures remaining unchanged and correct, we should get Fibre % Cane = 15.1 which is a possible error of 1.1 due to evaporation in the bagasse sample.
CONCLUSIONS.

The Committee is of the opinion that, if a satisfactory method of sampling cane can be devised, the determination of Fibre % Cane by the method of crushing the sample in a power-driven auxiliary mill and estimating the fibre by the indirect method, is a promising line for further investigation.

The Committee is of the opinion that the question of an adequate sample of cane is one requiring further investigation, bearing in mind the possibility of applying the tests made on such samples to the average of consignments over a period of a week or more.

Mr. BECHARD: Would Mr. Moberly be able to tell us what is the total error in weight. In working with small mills you add up the juice expressed and the quantity of bagasse resulting and it never totals up to the quantity of cane treated. He has not given us the weight of bagasse. It would be interesting to know if there was a loss during the experiment.

Mr. MOBERLY: I am sorry that I cannot give that figure now. I believe that some tests were made at Darnall during the run, but I have not got them with me. As far as I can remember the loss was not very considerable. There was a clear run-off of the juice which was run directly into a receiving tank and weighed immediately, and when we did weigh bagasse, which we did not do normally, the bagasse was weighed immediately after it fell from the bagasse plate, and we did not find very much loss. I am sorry that I cannot give the figures actually as they were.

Mr. BECHARD: I only mentioned this point because I noticed the difference of 1 lb. in weight of juice is a big individual error.

Mr. BIJOUX: There were two main differences in that direction. The air and weight of cushion. The weight was not exactly the weight of the cane originally. The weight of the juice and the bagasse would not exactly give you the weight of the cane. There is the cushion in the strainer and there is also the weight of the air.

Mr. DYMÔND: Regarding the question raised by Mr. Bechard as to the weight of the bagasse, it is a very difficult point to establish on account of the effect of weather. On a very hot day bagasse will lose weight quickly, and on a cold, damp day it will lose nothing at all. The principal point is the quick sampling of the bagasse and not so much the weight.

Mr. MOBERLY: It was pointed out to me yesterday by someone who is not able to come this morning, that Table II. did not show the degree of accuracy fully enough. It only showed the average variation from the mean, and not the extreme of variation. He pointed out that the extremes of variation are important as considered in any individual sample. I have the actual figures here. In A the fibre % cane ranged from 15.08 to 17.62. In the case of B it ranged from 15.48 to 16.25, a difference of 0.77. In the case of C it ranged from 13.52 to 14.8, a difference of 0.48, and in the case of D it ranged from 15.67 to 17.13, a difference of 1.46. In view of this variation the Committee is not satisfied that the sampling of cane for fibre has been solved yet, but they feel that they have opened up a line of investigation which has some promise in it, and further investigations are to be carried out next year. The first stage in that is going to be to establish definitely whether a sample can be taken from cane sufficiently representative of the whole consignment to make it worthwhile going on doing further tests.

Mr. FOSTER: I notice you say samples of chips were tried by Mr. Dymond and discontinued after five days. I tried the sampling of chips for some time, and to my mind it is a very fair method of getting hold of a sample of cane. I rather think that Mr. Dymond might be able to get over to some extent the question of evaporation from the chips. All my samples came from the second knives and therefore should have been very good. Do you think there is a possibility of drying out the samples of chips?

Mr. DYMÔND: I am perfectly satisfied and have made up my mind on that point, that is quite impracticable so far as representative sampling is concerned. The results of the chip method were so wide of the mark in some cases that we had to discard the method. The evaporation depends very largely on weather conditions. We had an enclosed sampling device in which the chips were deviated straight into canvas bags, and even these bags when placed in a room lost weight continuously for an extended period, even out of the line of the sun. The result of our tests was about two degrees higher than one would normally expect.

Mr. FOSTER: I have found very rapid evaporation from chips but I think that could be overcome.

RECOMMENDATION.

The Committee recommends that further investigation of cane sampling and the indirect method of determination of fibre in samples crushed in a power-driven auxiliary mill should be carried out this season at some suitable factory. Steps to this end are already being taken by the South African Sugar Association in conjunction with the Experiment Station.

G. C. Dymond
F. W. Hayes
G. S. Moberly (Convener)
Mr. MOBERLY: I think I should point out that there is a very marked difference in the circumstances of chip sampling at Maidstone and most other mills. At Darnall we had to take these samples from the knives which were placed at the lower part of the carrier, and the chips were thrown up the carrier and were caught in mid-flight, so that we had that difficulty about selectiveness of the sample apparatus. From what I remember of the Maidstone lay-out they have some very high speed knives at the top of the carrier, and after the cane is passed through the knives it then passes downwards in a continuous downstream of churned up cane, so that all you have to do is to insert a deflector into the carrier and the cane flows out, and in that way you get a much more representative sample, pith and rind and everything else is coming down together, and is equally selected, but if you have to rely on the energy of the chips as we had to do in our sampling device, you get a selectiveness which you do not get under the Maidstone conditions.

Mr. BIJOUX: In any case you will find you are bound to have more chips than pith because the knives are revolving parallel to the sticks of cane.

Mr. RAULT: I see a note comparing the purity of juice extracted by the small laboratory mill and the one obtained from the Krajewski in the factory. You seem to explain the lower purity of the Krajewski juice as being due to the knives. I may have read your paper too quickly, but from our tests on the efficiency of crushers and other mills my experience is that the crusher takes much less than any laboratory mill, and therefore your laboratory test should give you a purity of the cane appearing to give a very much higher purity from mills where the cane is not prepared before going into the crusher. He might even have added further that with bad feeding you may have high purity, giving planters very high bonuses, whereas the same cane going through in a heavy feed may not have any bonus at all. It all points to the fact that cane not being fed properly on to the carrier affects the results of the purities at the crusher.

Mr. MOBERLY: We certainly found that very marked in comparing different mills, and it has been my experience that we always look for the highest purities at the little baby mills with no knives. For instance at Delville the cane is mostly from one place, and is not normally of a high sucrose, but it gets purity bonuses out of all proportion to that in any other mill in the country, due to this point we are making here. We have noticed it at all these smaller mills.

Mr. MOBERLY: I am sorry, I read it as a Krajewski sample you were taking. The crusher extracts much less than you have been getting in your laboratory mill. A laboratory mill will give you 45% or more, and sometimes 60%; a crusher will only give you 25 to 35%, and this juice extracted by the crusher should be purer.

Mr. BIJOUX: In any case you will find you are bound to have more chips than pith because the knives are revolving parallel to the sticks of cane.

Mr. RAULT: I think it is due to dissimilar samples, a different sample having passed at the crusher.

Mr. DYMOND: I do not think Mr. Rault quite follows the figures. They represent a very large number of averages and it was definitely established that there is a relationship between the cane sample and the crusher juice sample. But if you take cane off the knives then you get a drop of purity of about one degree—definitely the effect of the knives breaking up some of the lower purity cane cells and expressing it lower.

Mr. RAULT: I am sorry, I read it as a Krajewski sample you were taking. The crusher extracts much less than you have been getting in your laboratory mill. A laboratory mill will give you 45% or more, and sometimes 60%; a crusher will only give you 25 to 35%, and this juice extracted by the crusher should be purer.

Mr. MOBERLY: Samples of whole cane will show one degree higher purity than samples of chips from the knives, when expressed by the crusher.

Mr. MOBERLY: We certainly found that very marked in comparing different mills, and it has been my experience that we always look for the highest purities at the little baby mills with no knives. For instance at Delville the cane is mostly from one place, and is not normally of a high sucrose, but it gets purity bonuses out of all proportion to that in any other mill in the country, due to this point we are making here. We have noticed it at all these smaller mills.

Mr. ELYSEE: Mr. Moberly has remarked about the cane appearing to give a very much higher purity from mills where the cane is not prepared before going into the crusher. He might even have added further that with bad feeding you may have high purity, giving planters very high bonuses, whereas the same cane going through in a heavy feed may not have any bonus at all. It all points to the fact that cane not being fed properly on to the carrier affects the results of the purities at the crusher.