

REPORT OF SUB-COMMITTEE ON FIBRE TESTING

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

During the past season a considerable amount of experimental work has been done in connection with fibre testing. The South African Cane Growers' Association inaugurated a series of experiments which were commenced at Empangeni with the co-operation of the Z.S.M. & P. Co. Further experiments were later carried on at Felixton, and as a result of these some factory scale tests were done at Gledhow. The objects of the Empangeni experiments were to confirm the results obtained by Mr. Bechard at Darnall last year as to the relationship between juice expressed and fibre, and also to investigate the possibility of establishing a satisfactory lixiviation method.

Extraction Tests.—For the extraction tests a press was constructed from a hydraulic jack, capable of giving pressure up to $2\frac{1}{2}$ tons per square inch. In most of the tests a pressure of 1 ton per square inch was employed. Samples of cane were shredded in a high speed shredder obtained from Queensland. Weighed portions of this shredded cane were placed in the press and the pressure applied, the volume of juice extracted being measured. Both the extracted juice and the residual bagasse were then analysed in the usual way. Fibre and Java Ratio were determined. In the latter calculation the first 100 c.c. of juice expressed were taken to represent the crusher juice. Fibre was simultaneously determined by lixiviation, and the standard indirect method and also by Prinsen Geerlig's formula:

Fibre=Dry Substance in Cane—

$$\frac{\text{Suc. \% Cane} \times 100}{\text{Purity of Expressed Juice}}$$

The results obtained showed very wide individual variations. However, when the results were grouped and averaged, a relationship between juice expressed and fibre became apparent. The results of the two experiments are given below:—

| C.C.S. Juice expressed per 1,000 G.M. Cane. | Fibre by Lixiviation. | No. of Tests. | Java Ratio |
|---|-----------------------|---------------|------------|
| First Experiment: | | | |
| 595—585 | 13.9 | 5 | 78.7 |
| 575—570 | 14.3 | 5 | 79.2 |
| 565—555 | 15.0 | 6 | 77.7 |
| 555—535 | 15.5 | 5 | 77.5 |
| 530—500 | 15.1 | 5 | 75.8 |
| Second Experiment: | | | |
| 615—605 | 13.2 | 7 | |
| 600—590 | 13.6 | 4 | |
| 585—580 | 13.8 | 8 | |
| 575—560 | 14.5 | 6 | |
| 555—525 | 14.4 | 6 | |

The results of fibre obtained by the other two methods were somewhat erratic. Although there is an apparent relationship between juice expressed and Java Ratio, the above figures should be regarded with caution.

These results confirmed the previous conclusions of Messrs. Dymond and Bechard. They show, however, that individual tests are of little value, and the best results to be expected are that the average of a number of samples will show the approximate fibre range.

Lixiviation Tests.—A modification of the apparatus proposed by Mr. Moberly last year was constructed and tried out. Cold lixiviation was tried first, but was abandoned owing to the very long time (36—48 hours) necessary to obtain results. Hot lixiviation was then tried, using water from the boiler feed tanks. It was found that the use of linen bags for holding the samples was impracticable as the water circulated round instead of through the bags. These were, therefore, abandoned and the shredded cane was placed directly in the cells. The results of these experiments showed that with hot lixiviation a steady solution of fibre apparently takes place. The solution products react to the

α naphthol test and it is practically impossible to determine the true fibre in this way. Tests were then carried out boiling the shredded cane in water and changing the water every hour. The same solution of fibre was apparent, but after three or four changes of water the decrease of weight became very much slower. A method of determination by boiling with four changes of water was therefore standardised, and used in all the experiments where juice expressed was compared with lixiviated fibre. Four parallel tests on the same sample of shredded cane by this method gave the following results:—

15.35
15.30
15.40
15.35

A parallel tests with alcohol gave 15.40. This method even if approximately accurate is too slow for general application.

Comparative results of different samples from the same consignment invariably showed such wide variations that the recognised difficulty of hand-sampling cane was amply confirmed.

A series of juice expression tests were carried out at Felixton on all consignments of cane crushed during a fortnight. The results, however, were extremely erratic, due undoubtedly to the above-mentioned sampling difficulties.

The experiments were then transferred to Gledhow and a further attempt was made to establish a lixiviation method which could be used with sufficient rapidity for testing all consignments of cane.

The method eventually evolved was as follows:—

100 grams. of finely shredded cane is placed on a cylindrical container made of Peck strainer gauze which fits closely into a tin billy-can. A tube connected with the condensed water line is inserted directly into the sample in such a way that the issuing stream of hot water imparts a circular motion to the contents of the can. The water overflows through a hole a couple of inches below the top of the can. After extraction for two hours the sample is dried and weighed.

It was found that after two hours a moderately reliable result was obtained. Longer extraction continued to give progressively lower figures, but the rate of decrease was much slower, indicating that the change was due more to solution of fibre than removal of the soluble solids of juice.

A number of experiments indicated that the above was a useful and reasonably accurate method if all conditions were standardized. However, when an attempt was made to apply it to all consignments of cane crushed, the results were again entirely nullified by the sampling error.

The main conclusions of the above series of experiments were:—

1. A relationship exists between the juice expressed and the approximate fibre range and Java Ratio, but more information and study is necessary before this fact can be properly applied to fibre determination.
2. A practical method of determining fibre by lixiviation of a given sample has been evolved.
3. The present impossibility of taking accurate representative samples of cane renders impossible the immediate application of the fibre clauses of the Fahey Agreement.

Later on further experiments in connection with the juice expression method were made at Felixton using both the press and a hand-mill for expressing juice. The results together with certain other tests made at another mill, once again confirmed the relationship between juice expressed and fibre, and Java Ratio, but likewise indicated the difficulty of applying such a method to single individual samples.

The committee is of the opinion and hereby recommends that these experiments be continued on a factory scale during the coming season and suggests that the following should form the basis of the experiments:—

1. Definite weights of sampled cane be passed through a hand-mill.
2. A two-roller hand-mill should be used.
3. Samples should be taken of every 15 tons of cane.
4. Methods of sampling to form the subject of special investigation.
5. The average of all tests for each planter for a week be used for determining the individual Java Ratios for each week.

Further tests of lixiviation methods should likewise be tried.

Further it is pointed out that the real value of the fibre results will be to determine an individual Java Ratio and thus assure a fairer distribution of sucrose and encourage the growing and cutting of a better quality of cane. It is, therefore, considered that some consideration might be given to the idea of abandoning the provisional bonus and penalty scales for fibre, which in any case are seldom likely to affect sucrose percentages by more than 0.1 in either direction. The existence of these scales makes many people suspicious of their application. If they were abandoned there would be less reluctance to adopt fibre testing at the earliest possible moment. In the meanwhile the committee are of the opinion that the difficulties of sampling render the application of general tests impracticable for the present.

G. C. DYMOND.
P. L. DRAEGER.
R. M. BECHARD.
D. McRAE.
G. S. MOBERLY (Convenor).

CHAIRMAN: This report indicates, I think, that the Committee on Fibre Testing is continuing to do very good work on what is a very difficult subject. Reference to this report will show you how many snags and difficulties are met with at every turn, particularly the difficulty in sampling cane which we have already discussed at this meeting. I would like to ask Mr. Moberly whether they have been able to make any definite arrangements regarding these co-operative experiments which he regards as advisable?

Mr. MOBERLY: Nothing has been done. This recommendation was made at the last meeting of this Committee a few weeks ago and it was decided that it should be done next year. I think this is an example of one of those points which we wish to bring up definitely with the Millers, such as we discussed when dealing with the paper on Cane Trucks. If the Conference is of the opinion that this should be done I think the matter should be brought up to the Millers and the thing tried. Last year the experiments were done by the Cane Growers' Association with I think, useful results, but they would not be prepared to carry the whole cost of it for another year.

Mr. PALAIRET: I understand the real difficulty in sampling is the fact that any one sample contains considerable quantities of cane both of low and of high fibre, and it is just pot luck which sticks are taken. Your results have shown that if you take one lot, crush it, mix it up well together, and then distribute the sample, you get almost exactly the same results.

Mr. MOBERLY: Yes, if you divide out the shredded sample you can get comparable results from all of them.

Mr. BECHARD: It is not so much a question of fibre variations in individual sticks, but also the proportion of accompanying field refuse. This refuse, which is 50 to 60 per cent. fibre, creates our biggest problem.

Mr. MOBERLY: There is still a further problem, and that is the problem of water on the cane. It was hoped that if some way of applying fibre was reached that this would largely overcome our wet cane problem. Cane carrying a large quantity of water would show a lower fibre.

Mr. BOOTH: Is it not a logical sequence that if you can get a representative hand sample the whole question of Java ratio falls to the ground? It is much easier to get a true representation of sucrose if you get a decent sample than to get fibre.

Mr. MOBERLY: The value of fibre testing is to get a real Java ratio for each consignment of cane instead of at present applying the general Java ratio to everybody, which we know to be inaccurate, but

the best that can be done. All the Committee feel that the real value of fibre testing lies in the possibility of getting a good ratio.

Mr. BOOTH: But you misunderstand my point. We don't want any Java ratio. If your fibre figure is accurate it is a logical sequence that your sucrose must be accurate.

SECRETARY: It says in the paper (last paragraph): "It is therefore considered that some consideration might be given to the idea of abandoning the provisional bonus and penalty scales for fibre, which in any case are seldom likely to affect sucrose percentages by more than 0.1 in either direction." But the fibre clause in the Fahey Agreement has never been put into effect so that for practical purposes it is abandoned now.

Mr. MOBERLY: The idea of that was that if the general fibre clause becomes operative, when the methods of doing so are evolved, the suggestion is raised that the Millers might be prepared, and Planters also, to decide to apply it without those clauses. It is known naturally that it is a difficult thing, and the clauses are laid down, but our recommendation was put in in a general way so that some consideration might be given to the idea that there should be no penalties for fibre. The general idea in the minds of most laymen is that the fibre is to be applied for the purpose of either getting a little bit of bonus for the planter or applying a penalty to his cane, but it is not the main value of fibre testing; the existence and possible threat of these penalties and bonus makes the general layman reluctant to have them made operative, and nothing gets done about fibre, but if that misapprehension were removed and it was realised that the thing was done in order to find the true distribution of sucrose, then that reluctance might disappear.

Mr. BOOTH: Personally I think in the light of what is to happen to questions of penalties for fibre, taken in conjunction with the by-products business, it is going to rather twist things into a knot, and I think if you are steering clear of the question you are to be congratulated on the move—it is a very fine tactical proposition. But you can tell me what the result of 1% fibre would be—presuming your standard to be 16—that is nett.—if that fibre was raised to 17 what the value of 1% fibre means in allocation of sucrose content; without reference to the Fahey scale in this matter?

Mr. MOBERLY: If I follow the idea properly, the question is what effect would a change in fibre have on the determined sucrose in cane for a definite sucrose in juice? That is to say it boils down to what effect does fibre have on Java ratio?

Mr. BOOTH: In many ways it comes to that. But if your fibre is 16 and sucrose 13, and fibre was increased to 17, or you take two sticks 16 and 17,

what decreased value would be the equivalent of 1% fibre; in other words, what does 1% fibre mean in the cane?

Mr. MOBERLY: That simply boils down to the effect on Java ratio, which is in the neighbourhood of between 1.3 and 1.5 for every degree of fibre. If 16 fibre had a Java ratio of 77.0, then 17 fibre would have a Java ratio of somewhere between 75.5 and 75.7, and your sucrose would be diminished in proportion.

Mr. BIJOUX: Is it not a fact that if you can determine the fibre in question there will be no need to have a Java ratio?

Mr. WATSON stated that they should consider the determination of fibre from both points of view. The Millers' side had more to think about than the Planters. The little difference of 1% in cane would make very little difference to the planter, but it made a big difference to the miller.

Mr. BECHARD: I have here actual factory figures, and have come to the conclusion that one degree increase in fibre lowers the Java ratio by approximately .905. (Gives details of figures.) What Mr. Booth says is that if you can get a sample of the cane for fibre determination, there is no need for any ratio; do the whole analysis on that sample.

Mr. PALAIRET: It is considered that by taking samples out of the first mill of bagasse there is any likelihood that they would vary less. Would it be more desirable to take a larger number of samples and mix the lot?

Mr. BECHARD: I would not like to say you would get a perfectly good sample. But this is the only possibility.

Mr. PALAIRET: With regard to the question of dirty trashed cane, a great deal of cane comes in with a lot of trash. That penalises both the miller and all other planters. It seems the most important thing in this fibre business. At present you have a very unsatisfactory arrangement. It has worked but it is not sound, whereby if the two chemists agree that there is too much trash it is sent back. Is there any hope that testing from the bagasse is going to cure that at all?

Mr. BECHARD: About 50 per cent. of that dirty matter is fibre. If you sample the bagasse the trash portion is still there, and the planter would only receive a reduced quantity of juice.

Mr. POUQUET: Any foreign matter introduced takes away part of the sugar in the cane.

Mr. MOBERLY: I don't see any way in which we can hope to deal with field trash quantitatively apart from fibre. You can have arbitrary deductions

for field trash or it can be done quantitatively along with the fibre when you evolve a method. This year at Felixton a method was tried out for removing field trash automatically, but unfortunately that proved a failure and has been abandoned. It seems the only hope is to deal merely with the fibre in the field trash.

Mr. BOOTH: I take the opportunity, if I am in order, to make a proposal to the effect that the last paragraph of the Committee's report reading from: "It is therefore considered that some consideration might be given . . .," be the considered opinion of this meeting assembled, and such report should go forward to the Association. I am inspired by the fact that I personally have done a lot of work on fibre and appreciate what has been done. I think the work and discussion has more or less taken the form of going round in circles, and it would clarify the position if this last paragraph of the report were adopted as the considered opinion of this meeting.

Mr. MOBERLY: I hope there is no misunderstanding on that. When we talk about abandoning bonus and penalties scales it is not intended that there should be an abandonment of fibre tests as allowed for provisionally in the Fahey Agreement. It was contemplated that if satisfactory means were obtained those tests would still be applied, but their value would be applied to distribution and not to bonuses and penalties.

Mr. BOOTH: That is more or less what I am after.

SECRETARY: Might I suggest you are taking a pretty long step to do that. If you are going to interfere with this Agreement as it stands at the present moment you are going to raise questions outside of this particular question of fibre altogether. One can understand, if the Association was satisfied that there was no hope of individual sampling of fibre, saying to the Association, "Abandon this penalty scale and bonus"; but that is not, I understand, Mr. Moberly's idea when he suggests this. All he says is that the atmosphere surrounding the research in this particular matter will be improved. That is all I understand.

Mr. MOBERLY: Not so much the atmosphere surrounding the research as the atmosphere of both sides of the Industry in approaching this question of applying the results of the research.

Mr. BOOTH: The last sentence says: "In the meanwhile the Committee are of the opinion that the difficulties of sampling render the application of general tests impracticable for the present."

SECRETARY: I agree, but your motion abandons the whole thing.

Mr. BOOTH: No, my motion is in the light of the last paragraph.

SECRETARY: As to whether the Association should take a step like that, which alters an important document like the Fahey Agreement, my opinion is that you had better leave it alone.

CHAIRMAN: The question that has been discussed seems to be the general opinion of the meeting here; of course it can only be a recommendation.

SECRETARY: I am only mentioning that, not with any idea of influencing the minds of the meeting on the technical side, but merely as it affects the political side of this question. Whether the Association, purely as a technical matter, passes a resolution of this kind, of course it is quite within its rights to do so, but it has a significance a good stage beyond that.

Mr. BOOTH: The whole of the technical aspect of the Fahey Agreement is built up on the recommendations and resolutions more or less of this Association, and I do not think anybody would force the terms of the Fahey Agreement if this Association had not arrived at a settled mind with regard to testing. My idea is to show those people who may be anxious to know what is to become of the fibre, that it has not been dropped, but it is only to give them breathing space.

Mr. WATSON: There is no doubt the question will be asked by a good number: "Are we going to apply the fibre clauses to analysis of cane?" Do you think this report is a sufficient reply to the question?

Mr. MOBERLY: As regards giving sufficient reply, there is a very definite reply in the negative, that at present we are not in a position to apply it.

Mr. BECHARD: This report goes further, and says that before the Committee can pass any opinion it wants tests on a mill scale. The idea is to have the whole thing carried out at the mill, but no payments to be based on those figures while investigations are proceeding.

Mr. PALAIRET: I think that the Fahey Agreement says at the expiry of three years or any year thereafter this matter may be considered by the Millers and Planters combined. I am rather inclined to think that that three years having expired, and the mills being on the point of opening, the time to take that up this season has passed.

SECRETARY pointed out that the three years expired in September next.

Mr. PALAIRET: Therefore this question of fibre testing for this season can hardly be taken up by either side. The position will not arise again until probably eight to nine months ahead, and then it is a matter that if either the Natal Sugar Millers' Association or the South African Cane Growers'

Association formally notifies the other that they wish the matter of fibre testing to be discussed then, and then only, will this question come up. In connection with the alteration of that clause I think this Association has a very big responsibility. Under that agreement it is the duty of this Association to draw up arrangements for the methods by which the various tests and things are to be carried out, so that that proposal, which goes rather beyond that, can only be a recommendation to the parent body—the Millers' Association. If it is regarded as that, then presumably there is no harm in it; it can't go further unless they take it up, in which case it is purely a matter for negotiation between Millers and Planters. But the essential responsibility of this body is as regards methods.

Mr. MOBERLY: I think that should be borne in mind. This Association has not the power to amend that agreement, but we are competent to express an opinion as to what we consider would be a good line to approach in considering this question, and that is what Mr. Booth's proposal embodies.

SECRETARY: May I point out that the clause quoted by Mr. Palairt is this:

"At the expiry of three years, or any year thereafter, the Fibre question shall be determined by mutual agreement, failing which by a Chemist Board of seven, three appointed by millers and three by planters, these six to appoint the Chairman."

So that to pass a resolution like this seems to be somewhat premature.

Mr. BOOTH: I would suggest that the motion takes the form of a reply to the last speaker. If the combined meeting of Millers and Planters comes forward and says: "How far have you gone forward?" here is the reply.

SECRETARY: But you don't need to ask for it; it exists in this agreement.

CHAIRMAN: Is the argument likely to arise this season?

Mr. MOBERLY: The point is that a large portion of the Industry would be only too glad if the matter is never brought up at all, because those clauses frighten them and blind them to the real value of fibre testing. None of them sees where it is going to be of any value. They say: "How is it going to affect us on that penalty scale?" and this idea was to hasten not retard a settlement by removing from its path a bogey which is frightening those people who ought to be considering the question in the near future.

SECRETARY: I can't see that there is any substance in that argument. After all this is mandatory (indicating clause in Fahey Agreement), so that it does not matter what the opinion of miller and

THIRD DAY

The Conference resumed on Thursday, April 17th, 1930, at 10 a.m.

planter may be as to what may happen to him under the scale; he has to put up with it if a medium of determining fibre can be found. Meantime no method has been found, and this Committee points out the extreme difficulty in the way of finding it. They may say throw out this fibre determination business altogether, and if that is done the penalty disappears as well. So that by keeping on investigating as you are doing now appears to be all that is necessary.

Mr. BECHARD: Would it be competent for this Congress to pass a resolution approving of the report on fibre testing?

CHAIRMAN: Would you care to put it in that form, Mr. Booth, that this general Conference approves of the recommendations of the Committee?

Mr. BECHARD: I suggest that for various reasons, chiefly so as to have the methods tested on a mill scale. A recommendation from this Association, I am sure, would go a long way towards securing that point. The Planters have done their bit last year and it cost them quite a lot. I don't say the Millers have not done anything; they have. But now that we have reached a certain point we want things tried out on a larger scale.

Mr. BOOTH: I make the proposal on the lines suggested: "That this meeting approves of the recommendations of the Committee on Fibre Testing."

Seconded by Mr. Foster, and agreed unanimously.

At 5.30 p.m. Conference adjourned to next day.

Mr. DODDS, in opening the proceedings, said: We are still one paper behind with our agenda, and I have here an interesting paper from Mr. Blacklock on a subject which is of great importance, and on which he has made some observations during the last week or so. The subject has only recently cropped up. The paper deals with the Losses due to Polarisation in Raw Sugars in Store, and in view of the importance of this matter, with your permission, I will ask Mr. Blacklock to read this to you.

Mr. BLACKLOCK, in introducing his paper, said: I should perhaps apologise for introducing an extra subject without due notice, for in spite of the fact that the Committee were rather deploring the paucity in the number of papers submitted this year, the length of discussion has so far resulted in a rather crowded three days' session. The remarks I have to make on Polarisation in Raw Sugars are brief and cannot be dignified by the name of a Paper. They were inspired by a bad case of deterioration in Natal sugars that came to my notice during the past few weeks, and it was felt that our principals, and those upon whom the onus of disposing of the sugar falls, would wish that this matter should be brought up at the Conference.