

## DISCUSSION.

Capt. F. E. Greig, before commencing his paper, exhibited two bundles of Agaul cane, which he had brought down with him. They were both exactly twelve months old. At the time of planting he had put some superphosphates with it, and the cane was planted in a fairly heavy soil. One part of the field was shaley, and he wished to see whether that cane would be suitable for the heavy soil of which his farm was mostly composed, and whether it would do better or as well on the shaley portion. The one bundle, which was very tall and with good thick stalks, had been grown on the better part of the field and had had the same treatment as the shorter cane in the second bundle, which was grown on the shaley portion. During the cold months he put a fairly heavy dressing of kraal manure on to keep it warm. It did not come ahead much until September. In October, after he had put on a small dress-

ing of superphosphates and potash, it shot ahead. He thought this cane would be more suitable for the soft sandy soils than the hard black soil which most of the planters had in his district.

Mr. Piccione asked whether the cane Capt. Greig had shown them was not similar to Uba.

Capt. Greig replied that he knew nothing about the cane beyond the fact that one day he was passing through Mr. A. S. L. Hulett's farm and noticed a cane which had a very much greener appearance than the others. On asking Mr. Hulett what it was he was informed it was Agaul, and he had been presented with a wagon-load of it, from which he had grown the cane now exhibited. It was extraordinarily like Uba, but was much more brittle, and was more difficult to reap.

The Chairman thanked Capt. Greig for his interesting paper.

# Cultivation of Cane on Flats.

(Paper by Mr. F. PICCIONE, Umhlatuzi.)

I will endeavour to detail here some observations which I have made on sugar cane growing on the Umhlatuzi Flats of Zululand. In doing so I do not pretend to pose as an expert, or anything of the kind. I present this paper merely as the views of an interested observer.

**Soils.**—The soils are of an alluvial deposit of great depth and have been formed, and are continually renewed, by the overflow of the Umhlatuzi. They vary considerably in quality, owing apparently to the deposits of sand from the river. The lower level soils, especially those approaching indigenous forests and papyrus and kooke grasses, when drained are the richest and yield maximum crops.

**Floods.**—These alluvial lands have in many ways suffered tremendously from floods which have occurred with remarkable frequency. These devastating floods are the planter's greatest enemy, and a source of great anxiety. Harvesting of crops has been held up, crops destroyed, fields scoured out, especially where cultivation has been practised, huge unfertile sand deposits have been dumped all about, and in cases farms have been cut in twain by the river changing its course. Fear of its recurrence has resulted to a large extent in cases of little or no interest being taken in cultivation by imple-

ments, as stirred-up soils are usually washed away and the cane stools left standing on ridges out of the ground.

The ploughing out of old ratoons has been delayed largely on this account. The results of these river floods reflect on the tonnage returns to the mill. In the earlier days, the "flats" were producing approximately 100,000 tons of cane per annum. These figures gradually fell to 62,000 tons in 1920. Since these floods have given us a period of rest, confidence in the flats is being restored, and ploughing out and cultivation by implements is going on to a greater extent than ever before.

**Harvesting.**—The practice is to cut half the farms annually, exactly as is done on the hills. Earlier cuttings from favoured fields (which were previously cut in the best months) take place occasionally on some farms. I mention this because of the statements one often hears that twelve months' old canes are cut. The tonnages per farm average from 3,000 to 4,500 tons of cane per annum. All canes are trashed by burning in situ in the early mornings, and the mill gets delivery of the canes the same days as they are cut. Burning is carried on because it is considered economically sound practice, the

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soils being very rich in both humus and moisture, and the density of growth being so great that hand trashing is not considered a feasible proposition.

**Transport.**—The farms are all connected to the mill by light railway, and in the fields portable tram track is used. Canes are loaded into what are styled 4-ton bogie trucks, which are loaded by two boys. I would like to say here that it would, in my opinion, be a distinct advantage if a 2½-ton improved basket truck were introduced, as experience shows, that being lighter, they are easy to handle, and, when loaded, to pick up after derailment is an easy matter, whereas in such incidents the big bogies have usually to be off-loaded. This bogie is not suitable for the light track used in fields, and entails a lot of extra labour in packing, tram-lines, etc. Further, the charge of a flat rate by the mill should be continued, as it is unfair to planters to charge them on the actual costs of running the system, as they have no say in the management and have their own private system to maintain.

**Varieties of Cane.**—Uba is the only cane grown on these flats, except for a small plot of Port Mackay, which was cut and milled for the first time last season. It is a big, red, soft, self-trashing variety, a vigorous grower, and I believe yielded over 60 tons to the acre. It was grown on very wet land and cut in the best month. The mill returns were: Sucrose content, 9.5; purity, 79; and calculated fibre, about 12. Its ratooning qualities are unknown. It will be of interest to know how this variety will yield on drier land. Some years ago, three varieties were tried here, namely, Natal Green, Ribbon, and D.74. They were grown on dry alluvial land and yielded as follows:— Natal Green and D.74, 64 tons to acre plant, 25 tons to acre first ratoons; Ribbon, 35 tons to acre, and first ratoons a little over 20 tons to acre. All were ploughed out as poor ratooners. The Natal Green was cut at two-year-old, and was all lying matted on the land. Had it been cut, say, 18 months, it would have been standing up. It was thought this class of cane would do well on moister fields. The D.74 stood upright at 24 months; had a firmer hold in the land, and had as many as 35 stalks of cane to many of the stools, and was considered the best of the lot. The Ribbon was a cane a little stouter than Uba, but it was unsatisfactory. The Natal Green and a few other soft canes are being tried on the flats, but it is too early as yet to give any description of them.

I was greatly struck with the Argentine red and green, grown at the Tongaat Estates. They are remarkably vigorous, erect foliage, slightly stouter than Uba, and come away faster. Mr. Saunders considers them excellent drought resisters, and thinks them a good stand-by. Their ratooning

qualities are unknown however. Cheribon is being grown at Reunion Flats, and it will be interesting to hear further of it. It did not seem to do too well on the hill at Illovo.

The canes imported by the Natal Estates from Australia, which are growing at Mount Edgecombe under quarantine, will be worth watching.

Mr. Storey, the Government Mycologist at Durban, exploded a bombshell amongst us a few evenings ago by stating that most of the above-mentioned canes show signs of being infected with the mosaic disease. This announcement will be received with great regret by those who are eagerly looking forward for the results of the experimental plots of soft canes at present being grown by some planters.

Canes are planted practically at any time, but the best planting months are September to November. April to June plantings are very slow owing to coldness of the soil, and require many more weedings, consequently such months for planting should be avoided if possible.

When young plant canes are about 12 inches high, the furrows should be earthed in and slightly ridged with pony ploughs.

**Planting Methods.**—My experience has been that it is a mistake to plant cane in deep furrows on the flats, as, generally speaking, Uba cane develops a very shallow root system on these lands. I find the seed beds ought to be soft, shallow and wide.

In regard to seed cane, the method adopted is to use vigorous 12 months-old plant cane as seed, failing that, first ratoons. I think it is generally admitted that we should select only the very healthiest, vigorous canes, and to reject all thin, reedy, immature dull-eyed, and all those with nodes close together. This method would ensure excellent stands of cane, and tend to check the entry of any disease. I find it good practice to trash seed intended for misses, as the buds then germinate earlier. It follows that if we plant from selected seed, future seed requirements should be selected in the same way from fields planted by selection.

The width of rows varies from 4 to 6 feet. Experience tells one that the 6 feet rows, and in case of very rich lands 7 feet, and seed planted continuous 2 together in the furrows give the heaviest yields. Further, it is an advantage to have an even depth of planting, which ensures all eyes sprouting simultaneously. Tails appearing after planting owing to too much top should be cut down, as such end-growths draw from the other eyes. Canes should be cut into lengths of from 12 to 18 inches.

Cultivating plant canes with scarifiers is the usual method. I noticed recently an excellent idea in ox harness for cultivating implements. It is a one-ox bow-shaped yoke with two iron eyes on each

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end, to which two donkey chain traces are fastened, and the ox is driven by one umfaan. It works excellently with a single ox. I think the use of mules for cultivators instead of oxen would be more economical, as they are much faster and do much more work, and don't require the grazing an ox does—a consideration on these comparatively small farms.

Owing to the natural richness of these soils, fertilising does not appear necessary, but in cases of poor flat land a heavy application of filter press cake gives excellent results.

**Ratoon Cultivation.**—I think the cultivation of ratoons by pony ploughs should be undertaken as soon as possible after a field has been cut. The rows should be pulverised and the roots hoed over after each cutting. It is an advantage to pass a heavy triangular sharp tooth harrow over the ratoons. This operation lets in air and heat to the roots and brings on early germination. A fault one often notices on these flats is that canes are not cut down deep enough into the ground, and one sees a lot of flood-scoured stools sticking up all over fields. The result of this is that often thin reedy canes grow from eyes in the old mother stalks, which never develop properly.

A great fault with many farms is that the ratoons have been allowed to swell too far into the rows. In fact, in such cases cane rows almost cease to exist. This is obviously wrong. Ratoons should never be allowed to get into such a state. To check this, sharp cutting ploughs should be used to cut the ratoon roots back to their former position.

It is difficult to dogmatise on the question of the period of ratooning. One has to be guided largely by the quality of the soil and methods of cultivation adopted. But it seems to me that the limit should be on about the sixth ratoon. Another good practice on moister lands is to ridge up old ratoons with a heavy plough, the middles thus acting as drains. The crop yield is said to increase by this method. But it should not be attempted in dry parts. In ploughing out old ratoons, I think it is very advantageous to cross-plough and use large disc harrows. I believe a dressing of lime would be beneficial before harrowing.

A difficulty experienced on these flats with Uba is its very procumbent habit on the richer soils. The canes fall down at from 10 to 12 months, lying in a mass along the rows. The cane rapidly loses in weight, deteriorates, and a bull shoot crop takes its place. I think the only remedy for this is to cut such fields, early, if possible at the transition stage.

**Drainage.**—I think it most important that the flats should go in for a thorough system of drainage on each farm. Intensive drainage every 100 or 200 yards, according to the dry or moist nature of the field, with main ditches, would appear to be the right method. The Abney Level is an excellent handy little instrument for this work. It can be carried in the pocket, and is used merely by holding it in the hand. It gives the falls and rises and grades for drainage, tram routes, etc.

The fact will at once manifest itself that to carry out such an efficient drainage system, and to constantly clean and maintain it, will be a very costly item. It may be possible to get implements to perform some of the work, but if it has to be done by hand it will take time and money.

In the case of low-lying lands and hollows which become marshy in rainy weather, and whereon the cane will not grow in the ordinary way, I find that broad ridging of the seed bed well up and the middles made hollow, that the cane will usually take. This method is carried out at the Reunion Flats with success; every row becomes a sort of drain, and drains are placed, I think, every fourth row.

**Deterioration of Uba.**—A lot has been said on the question of the degeneracy of Uba cane. I have looked in vain for even the slightest signs of this on these alluvial lands. I find that Uba cane to-day is as healthy and vigorous and robust as ever it was.

**Quality of Alluvial Canes.**—We have heard a lot in recent times respecting this. We are told by experts and others that there is no ripening period, the growth is continuous, bull shoots are for ever springing out, and that after rains the sucrose falls.

The miller states that the average sucrose is only 10 per cent. In May and June it is 9½, and from July to November it is 11½. There are no separate records kept by the mill of flat canes, consequently the difficulty of getting at the true position is greatly accentuated and we are in the dark. The only time analysis has been made, was for a portion of the 1921 season, and that was for the Sugar Commission. If some of these canes do not actually ripen there is, as the mill shows at any rate, a period in the season when the canes are higher in sucrose content. This being so, it seems a pity that no effort is made by the mill to encourage a shorter season for the flats at least.

In conclusion, I would like to add that if we are to progress as we should as an important industry, an experimental station run on sound practical lines is essential. The need and necessity of this has been very strongly emphasised by the Government experts who lectured to us so ably during this Congress.

## DISCUSSION.

Mr. Townsend asked what system of drainage was employed on the flats.

Mr. Piccione replied there was no system really, at any rate it was by no means a perfect one. There were many drains about the flats placed very promiscuously. Most of them had large drains but no small field drains.

Mr. R. W. Anderson referred to the question of deterioration of the Uba cane, and stated that he had not noticed any deterioration. A good many planters were of opinion that the Uba to-day is as vigorous as it ever was, and it would be interesting to know whether any planters had noticed any deterioration and if so to state their views.

Capt. Greig stated that in some fields he had noticed deterioration in the Uba, but it had been his experience that such deterioration had taken place through planting from other than the very best selected plant cane. He had a field that was planted with second ratoons on a very good piece of land, and he obtained three crops from it. The first was not a good crop at all; it was a fairly decent season. The second crop was better, and the third was most disappointing, and he had ploughed it out. He had noticed a continual improvement in all the fields he had, and he put that down to the fact that he used only the very best selected plant cane that he could get, and, as he had said before, he hoped the day would come when it would be looked upon as a crime to plant anything but the very best selected cane. If they all set themselves to do that there would be an enormous improvement in the vitality of the Uba cane.

Mr. Rapson asked if Mr. Piccione had noticed any difference in the sucrose content of cane which had been planted on the top of ridges as compared with cane planted in the ordinary drills in Zululand.

Mr. Piccione replied that they had not had any tests. It had only been carried on very recently, and the cane was at such a stage that it was not possible to take a test. On being asked if it was the intention to take a test, he replied that although it would be advisable to do so, they had no facilities for doing so. It was only by the courtesy of the mill that it was done.

Mr. A. Townsend stated that Mr. Piccione had raised an important point in drainage. They all knew that if cane was planted on a poor soil, badly drained, no return was obtained. A little plant cane may be obtained, but as a rule, due to want of drainage, the cane dies out while the cane on the surrounding hill thrives. He spoke from his experiences at Sea Cow Lake, which was a very heavy alluvial flat with unlimited depth of soil and moisture. Cane was planted there and open drains

put in, but no attempt was made at systematic draining. In handling these canes it was found that the hill canes were more suitable than the others, which were of low density and an abomination in working in the mill. They adopted a system of drainage which unfortunately they did not carry on long enough. Their first attempt, however, was sufficient to convince them that they were working on the right lines.

Before starting this they had their canes planted in any position. Afterwards they had their drains at 20 feet intervals, and went down the valley. The soil taken from the drains helped to raise the surface of the surrounding land. They were able to cultivate a heavy growth of upright cane, and the results justified the cost of those drains. It was possible to ratoon up to ten ratoons without difficulty. In his opinion the Uba had increased by leaps and bounds from the time it was first planted. It was hard to recognise the Uba of to-day as that of twenty years ago. He agreed with Capt. Greig as to the necessity for exercising care in the selection of plant cane. A lot of the so-called deterioration was due to inexperienced men planting cane without proper tillage and the necessary care in fertilising and draining.

Mr. Ladlau stated that eleven years ago he planted cane on the farm which he owned at that time, and some of that cane is still ratooning, but of course was nothing like the first few crops. That was not due to any fault of the cane itself but to the length of time it had been ratooning. It should have been ploughed out before to-day and replanted with selected cane. To-day he had a new farm, and the canes on it were really tip-top and vigorous, as they were on his first farm at the commencement. The two farms are in the same district, and if anyone were to go and compare them the difference would be noticed at once.

Mr. Booth stated that from the millers' point of view no cane under 10 per cent. sucrose was worthy of milling, and asked if Mr. Piccione would explain why he came to the conclusion that there was no deterioration of cane when the Umhlatuzi Valley average for June came to less than 10 per cent. In May it was about 7½ per cent. Viewing it as a commercial proposition he had come to the conclusion that there must be deterioration of some sort in the Umhlatuzi Valley when the first cropping month's average had not come to 10 per cent.

Mr. Piccione replied that none of the planters knew what their sucrose content was in the past. The only people who were competent to do that were the millers, and they had not done so. The millers had told them that the sucrose content was higher in the early days. That was no doubt due to the fact that the ratoons were not so old. Everyone

knew that when they got older, generally speaking, they had less vigour, but it did not follow that the canes were deteriorating. It was the ratooning system that was at fault. When the cane was ploughed out and replanted the same vigour was gained as when originally planted.

Mr. Mortifee stated that in his experience there was no deterioration. There was a plant cane on his land to-day as vigorous as he ever hoped to find cane. Where it was found to be languishing there must be something wrong with the planting or the soil. The cane had the same vigour in his experience as when he started, some nine years ago. As regards the planting of cane on the flats, the whole trouble was drainage. If you have a vigorous plant and it has wet feet, it lacks proper percolation of air through the soil and leads to deterioration. He had practically cut such portions up into squares at his farm. He had cut a drain about three feet, and they are all connected with each other. During the winter the whole of these drains are bone dry, with the result that the cane has a tendency to mature more rapidly than otherwise. With regard to the sucrose percentage, so far as his own figures were concerned they were something over 13 per cent.;

last year they were just under 13 per cent. With proper cultivation and drainage he saw no reason why they could not produce good cane.

Mr. Piccione stated that the elevation of Sea Cow Lake, referred to by Mr. Townsend, was much lower than the flats he spoke of; the Umfolosi flats also were much higher than Sea Cow Lake. All the land at Umhlatuzi was not marshy; there was only a small proportion of the flats that were marshy, and cane had hardly been tried there.

Mr. Anderson stated that it was rather important that their views on deterioration should be made clear. Arising out of the remarks of the Commission there was an article in the "International Sugar Journal" on the question, which might give the impression that cane growing in Natal and Zululand was almost a decaying industry. He considered it should be made clear that in the opinion of the planters present there is no sign of deterioration where the cane is properly cultivated.

The Chairman, in thanking Mr. Piccione, stated that it was very necessary that the question of growing cane on the different soils should be thoroughly discussed, and he hoped that next year they would have more papers by planters giving their experiences than they had had this year.

## Economical Aspects of Lubrication.

(Paper by Mr. M. McMASTER, Director, Sir J. L. Hulett & Sons, Ltd.)

Some time ago I was requested to raise the question of the purchase of lubricants at this Conference. Since then the Organising Secretary has arranged that I should read a paper on the Economical Aspects of Lubrication, and kindly informed me of this when arrangements had been made.

I hope the following notes will lead to some discussion and be of some help to a more careful study of economical lubrication in the sugar factories.

The question of economical lubrication is a very big question. There are very many diverse opinions on lubrication, and I think I am safe in saying that most of the knowledge of lubricants lies in the hands of the big oil companies, and for that reason we are rather in their hands.

From information gathered, lubrication throughout the sugar industry is a very big item of expense, probably reaching £40,000; it is also an extraordinarily variable one, I am informed, ranging from as much as 5d. per ton of cane crushed at some mills

to 1d. per ton cane crushed at other mills. It is obvious, with such variable costs of lubrication and unknown costs of repairs, caused by inefficient lubrication, that the expenses can be, in most cases, reduced by careful attention and a common sense study of the problem.

The whole economic aspect of lubrication comes down to this: the minimum amount of money spent on lubricants consistent with the minimum amount of repairs to machinery necessitated by that lubrication.

Let us now consider lubricants themselves for the moment. Lubrication is to interpose a film between two metallic surfaces to keep them from actual contact, thereby reducing friction and consequent ill-effects to a minimum. Although many substances are lubricants, a special class of substance called oil is found to be the best in practice. These oils are divided into three classes, animal, vegetable and mineral, but for our purposes the mineral oil class