THE FERTILISATION OF RATOON CANES

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Introduction.

One of the major problems confronting agriculturists to-day is that of economic fertilisation. This paper, which touches a fringe of the problem, does not claim to be comprehensive or scientifically correct in detail. It is addressed not to the scientist, but to the practical sugar planter in an endeavour to increase his interest in the fertilisation of his crops. The points to be borne in mind when considering this question are, primarily, the best form of fertiliser to apply, the stage of the plant's life at which to do so, and lastly, but most important of all, the quantities of the various ingredients required in order to show a profitable return, and at the same time keep the land up to maximum producing capacity. The writer is chiefly concerned with the last two points, and gives the results of a recent experiment in the heavy fertilisation of a second ratoon crop, together with a few observations and deductions that were made.

History and Selection of Site and Material.

The field selected for the test was 40 acres of hillside a mile from the sea and approximately 250 ft. above sea level. The soil was of the usual reddish sandy type generally found near the coast. The chemical analysis of a series of samples taken from this area averaged approximately 0.02% available P_2O_5, 0.002% available K_2O, 0.04% nitrogen, being slightly acidic with a pH of 6.4.

The last crop of the previous planting, a second ratoon Uba, had been harvested in May, 1931, and the field was replanted in December of the same year, which means the land was ploughed and planted again within 7 months, that is to say, it received only a "short fallow." Filter press cake analysing approximately 3% available P_2O_5 0.5% N, 15% CaO, and 45% organic matter, was applied in the furrows immediately before planting at the rate of 15 tons per acre. The yield from the plant cane crop harvested in 1933 was 27.9 tons per acre. No fertiliser was applied to the first ratoon which gave a yield of 29.8 tons per acre in 1935, the increase being attributed to more favourable climatic conditions.

The decision to run a fertiliser experiment on the second ratoon was not made until January, 1936, when the cane was six months old. (The treatment should, in routine work, commence as soon as possible after reaping the previous crop). After careful investigation of any apparent soil and other variations within the field, a site of four acres was selected which was as uniform as could be obtained and on which there was a definitely even stand of cane. This area was divided into two two acre blocks, the first of which was subjected to the treatment outlined below in Table 1, while the second acted as a control.

Application of Treatment.

As shown in Table 1, the cane was first treated with 1,500lbs. of superphosphate per acre on February 1st, 1936. This was dressed by hand, as the size of the cane did not permit the use of any machine to apply the fertiliser under a covering of earth, as is the usual rule with superphosphate. A week later the first dressing of 250 lbs. sulphate of ammonia and 166.6 lbs. muriate of potash per acre was applied. These fertilisers were mixed before application and also side dressed by hand. After an interval of three months this was repeated, followed, at two further three monthly intervals, by side dressings of 250 lbs. of sulphate of ammonia only. In the application of all fertilisers the amount to be received by every individual row of cane was calculated, weighed and supplied separately to each row to insure an even distribution.

TABLE 1.

Date Applied	Superphosphate (20% P_2O_5) lbs. fert. p.a.	lbs. P_2O_5 p.a.	Sulphate of Ammonia (20% N) lbs. fert. p.a.	lbs. N p.a.	Muriate of Potash (60% K_2O) lbs. fert. p.a.	lbs. K_2O p.a.
1/ 2/36	1,500	300	—	—	—	—
7/ 2/36	—	—	250	50	166.6	100
1/ 5/36	—	—	250	50	166.6	100
1/ 8/36	—	—	250	50	—	—
1/11/36	—	—	250	50	—	—
Total	1,500	300	1,000	200	333.2	200

Response.

Let us now observe the effect of the treatment. Good rains were experienced immediatly after the first application, i.e. in February and March, 1936, when a total of 15.26 inches was registered. The cane showed almost immediate response to the fertiliser, which manifested itself by a broadening of the leaf and the development of a dark green colour, together with a general increase in growth. The main effect on growth appeared to take the form of a thickening of the stalks rather than in their elongation; this is clearly illustrated in the accompanying photograph, which shows average canes selected from the fertilised and control areas respectively. Both bundles were weighed, and one adjusted to the other, so as to represent the ratio

in yield in tons per acre harvested. Thus the picture actually represents the amount of cane obtained from each block. Another feature was a tendency to send out side shoots near the top portion of the stalk, giving the cane a fan-like appearance. A great number of these side shoots eventually died off, while those which survived had, at the time of reaping, grown into lengths of cane of anything up to 3 ft. which were trashed and loaded still adhering to the parent stalk. Under conditions of drought, such as experienced in June, July and August of 1936, when a total rainfall of only 1.19 inches was registered, the fertilised ratoon maintained its colour showing no sign of lack of moisture, while other cane in the field had the usual drought stricken appearance.

Growth measurements were taken over a period of six months (Table 11). The first, on March 20th, 1936, after only the initial application of fertiliser, showed that the average length of cane in the fertilised block was 42 inches, and that in the control 34.7 inches, giving a difference in growth in a period of 7 weeks, since the first application of fertiliser, of 7.3 inches. (Unfortunately the canes were not measured before commencing the treatment, but it is reasonable to suppose that the cane in the two blocks selected was originally of the same average length). The last measurements taken on August 20th, before the final application of nitrogen and ten months before harvesting, showed a difference of 11 inches, the average for the fertilised area being 65.6 and that for the control 54.6. It must be remembered that this big difference was evident before all the treatment had

been applied, also that the cane had nearly a year left in which to grow before being cut, and that the months over which these measurements were taken are those during which cane grows very slowly compared with the fast growing period of September to March.

A few days before harvesting, readings for apparent sucrose per cent cane were taken with a field refractometer. The result was 13.33% for the control while the fertilised portion showed 12.73%. (The conversion factor, i.e. brix to sucrose, was taken as 0.67. Further experience showed this figure to be rather low).

TABLE II.

Dates Measured	20/3/36	20/4/36	20/5/36	20/6/36	20/7/36	20/8/36
Fertilised.						
Average Height ..	42	53	59	62.3	64.6	65.6
Increase		11	6	3.3	2.3	1.0
Control.						
Average Height ..	34.7	44	49.7	52.3	53.6	54.6
Increase		9.3	5.7	2.6	1.3	1.0

Results.

The cane was harvested on June 29th and 30th, 1937, exactly 24 months after it had been cut as first ratoon. The fertilised area yielded 49.145 tons per acre containing 6.143 tons of sucrose, and the control 24.17 tons of cane per acre and 3.385 tons of sucrose. When crushed at the factory the laboratory returned the following figures; fertilised area, sucrose per cent cane 12.5, purity 87.7; control, sucrose uer cent cane 14.0, purity 89.9. Except for keeping the cane separate the cutting of the experimental block followed ordinary field routine, in view of which the following figures are of interest. From the fertilised two acres 29 trucks were cut with an average weight of 3.39 tons and a cutting and loading task of 4,520 lbs. per man. The control took 18 trucks averaging 2.69 tons giving a task of 3,587 lbs. per man.

Let us now consider these results from an economic point of view and endeavour to ascertain whether any direct profit has resulted apart from the incidental benefits which will be discussed later.

Table III. is a statement of the total costs incurred from applying the treatment. It should be noted that the cost of the fertilisers was calculated on the ruling prices at that time.

TABLE III.

1,500 lbs. superphosphate at £3/2/6 per ton	2	6	9
1,000 lbs. sulphate of ammonia at £7/10/0 per ton	3	15	0
333 lbs. muriate of potash at £8 per ton	1	6	9
Railage and transport charges on above at 3/9 per ton		5	3
Cost per acre of applying fertiliser in 5 applications at 1/3 per application ..		6	3
Cost per acre of hire of 11 extra trucks at 6d. per truck		5	6
Cutting and transport to siding of 24.97 extra tons per acre at 2/- per ton ..	2	10	0
Railage from Siding to factory of 24.97 extra tons per acre at 1/- per ton ..	1	5	0
Total cost per acre	£12	0	6

As previously stated the tons sucrose per acre from the respective blocks was 6.143 and 3.383. a difference of 2.76. Taking the price of sucrose at £5/10/0 per ton, an increase of 2.76 tons sucrose per acre means an additional gross profit of £15/3/7 per acre. Table III. shows a cost incurred of £12/0/6 giving a nett profit of £3/2/1 per acre, or, on a crop of 50 tons per acre, as was the case in this instance, an increased nett profit of 1/2.9d. per ton of cane.

Incidental Benefits.

Apart from the actual increased profit which has been shown to result from heavy fertilisation, with the additional rise in yield of over 100%, there are many other advantages which occur. First there is the extra output per man in cutting and loading and the consequent reduction in the number of labourers required to deliver the daily quota. It was observed further, that although the yield was just on 50 tons per acre, there was no twisted and

recumbent cane, as is usually the case with any crop of Uba approaching this figure, nor did the trash cling to the stalk as in the control, thus the cane as supplied to the factory was clean, free from any ground rot, and therefore superior from a milling point of view. Owing to the quicker growth and "covering in" of the foliage due to the fertilisation, weeds did not grow to as great an extent, enabling a decrease in cultivation costs. Perhaps the greatest advantage is that of the reduction in the annual planting programme, which entails expenditure in ploughing, harrowing, furrowing, etc. and also the prospect of land lying idle for some considerable time, to say nothing of the labour required to replant, which in these times of shortage, is another important factor. The improved supply of plant food appears to have had some influence on the spread of streak disease, as will be seen from the figures in the following paragraph.

Four months before reaping, in February, 1937, the whole field of 40 acres, in which the experiment was situated, was inspected for streak disease by Mr. R. Halse of the Government Department of Agriculture. The 38 acres, consisting of the remainder of the field apart from the fertilised portion, gave a figure of 14% streak infection, while the experimental block showed 12%. The existing crop, i.e. the 3rd ratoon, was inspected again at the age of six months by the same official, the streak figures on this occasion having risen to 24% and 14.8% respectively, that is a rise of 10% over the field in general and a rise of only 2.8% for the fertilised block.

Discussion.

Table I. shows that the total amount of nitrogen and potash received by the crop was divided, the former into four, and the latter into two equal parts, these being applied at regular intervals. Although this is no doubt a more costly and laborious method than applying the whole amount in one operation it is in no way prohibitive, and is considered advisable for the following reasons. In the first place, to apply a dressing exceeding 250 lbs. sulphate of ammonia per acre in one operation, is to risk burning the cane, when the leaves will turn brown as when affected by frost. This burning is more likely to occur during spells of dry weather. Secondly, both the sulphate of ammonia and muriate of potash are materials which are readily soluble in water and on account of this are easily lost to the crop by leaching, which would be accelerated by any heavy falls of rain, by drainage or by irrigtion. There is, therefore, much less chance of losing valuable plant food, before it has been absorbed by the crop, when these fertilisers are applied in smaller quantities at regular intervals. As far as the superphosphate is concerned it is not generally considered necessary to split up the application, nor has this been done in any of our work to date.

At first sight the quantities of fertilisers used for this experiment, appear very large compared with the applications which are customary. The writer has endeavoured to show that they were not necessarily excessive; perhaps they were not even sufficient. It is the ratoons that pull down our average yield per acre in this country, this being partly due to a lack of plant food, and yet the quantity of fertiliser applied to ratoons is usually very small. In some cases fertiliser is applied to plant cane only, which, in spite of having the benefit of newly cultivated soil, with probably a green manure crop ploughed in, and with all the other obvious advantages is still given the majority of plant food, which might much more profitably be supplied to the ratoon.

The 40 acre field in which this test was made would normally have been ploughed out after the second ratoon. Encouraged, however, by the results described in this paper, the whole field is now running as an experimental third ratoon, and has been dressed with 1,000 lbs. superphosphate, 600 lbs. sulphate of ammonia and 400 lbs. of muriate of potash per acre. At the time of writing the field is looking exceptionally well and has the appearance of plant cane. It is early to estimate the return from this third ratoon, not due to be cut for another 15 months, but the indications are that the yield will exceed 35 tons per acre.

Perhaps this experiment would be more correctly called a demonstration, because the layout did not conform to the agricultural concept of a scientifically arranged plan. However, it was a demonstration that produced such emphatic results that they could not be ignored. It has shown also that there may be a lot of changes in the present method of sugar cane fertilisation that could be profitably adopted. It has also definitely opened up the prospect of further work on this subject and suggested new angles from which the problem may be tackled.

In conclusion the writer would like to express his thanks to Mr. R. G. T. Watson, who originated the experiment in the interests of the Tongaat Sugar Co., Ltd., without whose advice and encouragement this paper would not have been written.

Tongaat Sugar Co., Ltd.,
Tongaat.
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The PRESIDENT: Thanked Mr. Lintner for reading the paper in the absence of the author, and said the value of the paper lay in its coming from practical experience.

Mr. LINTNER: In appreciating the paper remarked that it showed the growing interest of

estate workers in experimental work and hoped that it would be encouraged. He also stressed the need of publishing photographs to illuminate various points, the present paper supplying a good example of what he meant.

Mr. DODDS: Regretted Mr. Steward's absence as he would have liked to have congratulated him personally. The paper though concise, opened up possibilities for study and showed us that there was more in the fertilisation of ratoons than most of us thought possible. Several of us had seen this experiment at various stages of growth and knew what a striking object lesson it had made in the field.