PASTURE AND BEEF PRODUCTION POSSIBILITIES IN THE SUGAR BELT OF NATAL

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INTRODUCTION.

The question of what is to be done with our surplus land has repeatedly been brought up since the restriction of cane growing by quota. As far as the writer is aware, no satisfactory solution has yet been forthcoming, although several possibilities have been considered, such as the growing of leguminous crops, subtropical fruits, trees for mine timber and match-wood, etc., etc.

For some or other reason, however, the establishment of artificial pastures as a source of cheap feed for working animals, or for the production of beef and milk, has been either overlooked or discarded, in spite of the fact that during the past ten years pasture research in the Union has received tremendous impetus by both private and Government enterprise.

The reason for the impetus given to pasture research —not only the establishment of artificial pasture, but also the improvement of the natural pasturage or "veld"—is an economic one. As Leppan[1] points out, "the average yields per acre of the cereals are among the lowest to be found anywhere, and the total production of maize and wheat is a little more than one per cent. of the amount produced in the United States. Because of the liberal State assistance given to these two crops, the production of each meets the local effective demand, and, in the case of maize, roughly a sixth is exported. Sugar, which is highly protected, also produces surpluses for export."

In lieu of export of surplus maize, the marketing of this commodity in the form of beef or dairy products is often suggested. In this connection Van der Post[2] points out that the selling of expensively produced maize in the form of beef, milk, wool and mutton on cheap overseas markets appears to be no better than the direct sales of maize on the same markets. In view of these facts, cheaper feed would appear to be necessary to place the Union animal industry on a sound footing. In this connection, referring again to the sugar belt of Natal, it is rather paradoxical that an area which would seem to be most favourable for the production of such feed has been encouraged to sink vast sums of money in an uneconomic agricultural industry. There is also another aspect which up to the present appears to have been entirely ignored by those engaged in sugar cane culture, namely, the fact that in crop production entirely dissociated from the animal industry it has never been found possible to maintain soil productivity to the full extent.

PASTURE RESEARCH.

Pasture research at Umbogintwini was begun by the Agricultural Advisory Department of African Explosives & Industries, Limited, in 1931. The object was to investigate the economic possibility of providing pasturage for the factory working oxen and mules (maintenance cost of which was anything from 4½d. to 6d. per head per day), and, at the same time, to obtain information on the suitability of various grasses or pasture mixtures on the coast.

The first pasture experiment laid down compared Kikuyu grass, either alone or mixed with indigenous and exotic grasses, with Rhodes grass and *Paspalum dilatatum*. The results of this experiment were published by Moses,[3/4] who found that on a red sandy soil of recent origin Kikuyu was superior pasture grass to either Rhodes or *Paspalum*, and expressed the view "that it will provide pasture of a carrying capacity and feeding value to compare favourably with those of known good pasture areas in other parts of the world."

The initial success with Kikuyu was not repeated, however, when several acres of this grass were put down on a very poor, humus-deficient, sandy, alluvial plain along the south bank of the Umbogintwini River, and it soon became apparent that Kikuyu, however valuable under suitable conditions, became a most uneconomic producer where soil conditions were unfavourable; nor did heavy applications of artificial fertilisers alter the position appreciably.

It was therefore considered advisable, owing to the large range of soils found in this area, to investigate the possibilities of other grass species, both in small plots for close observation and study, and on a more extensive scale for grazing and palatability tests.

Although these investigations are still in progress, sufficient evidence has been obtained to indicate what at present may be considered the more promising grasses. These are as follows :—

Pennisetum clandestinum	(Kikuyu).
Pennisetum purpureum	(Napier grass).
Panicum maximum	(Ubabe).
Panicum repens.	
Panicum coloratum.	
Setaria sulcata.	
Brachiaria humidicola	(Creeping false Paspalum).

Paspalum notatum	(Creeping Paspalum).
Paspalum virgatum	(Upright Paspalum).
Paspalum dilatatum.	
Digitaria abyssinica.	
Chloris gayana	(Rhodes).
Stenotaphrum secundatum	(Buffels Kweek).
Dactyloctenium ægyptium	(Coast grass).

It has not yet been possible to subject all of the above grasses to thorough grazing tests under varying conditions, but some information regarding comparative dry matter yields and chemical composition is available and will be given at a later stage.

GRAZING RETURNS.

The method adopted for gauging the value of different pasture grasses is one which has been used extensively by Hall[5] in his pasture-fertiliser work, and consists in recording the total number of mature animals equivalent carried by a unit area of pasture for a given length of time and expressing the results as grazing day units.

The following returns have been obtained from acre units of different pasture grasses during the period January to December, 1937 :—

Name of grass.	Soil type.	No. of grazing days per acre.
Brachiaria humidicola .	Grey sand	263
Setaria sulcata	Grey sand	325
Napier grass	Red sand	602
Napier grass	Windblown sand	342
Kikuyu	Red sand	552
Digitaria abyssinica ...	Windblown sand	175

On the poor, humus-deficient, alluvial sand on the banks of the Umbogintwini River the following returns were recorded (average for four years) :—

Name of grass.	No. of grazing days per acre per annum.
Kikuyu...	110
Self-sown sward consisting primarily of *Panicum maximum* and *Dactyloctenium ægyptium*	276
Kikuyu and *Panicum maximum*	230
Kikuyu and *Stenotaphrum secundatum* ...	264

On a heavy and moist soil (average for four years) :—

Name of grass.	No. of grazing days per acre per annum.
Paspalum dialatatum	503

The returns from Kikuyu on red sandy soil compare very closely with those obtained by Moses[4] under similar conditions. Napier grass on the same soil type also had a high carrying capacity, while, as anticipated, *Paspalum dilatatum* answered well on a heavy moist soil.

Both *Brachiaria humidicola* and *Setaria sulcata* responded reasonably well to good treatment on the grey sandy soil, while the returns from Napier grass on windblown sand can be considered very satisfactory. It is clearly indicated that Kikuyu should be avoided on poor, humus-deficient sandy soils. In fact, under these conditions it would seem that returns obtained from the natural sward are as good as, if not better than, those from artificial pasture.

PLANT-FOOD REQUIREMENTS.

The chemical composition of numerous grass samples taken at Umbogintwini has been obtained. This information is most complete for Kikuyu, though two of the principal ingredients, namely, nitrogen and phosphoric oxide, have been determined on seasonal cuts of several other grasses grown in small plots under identical conditions. The data thus obtained are summarised in the following table on page 23.

From the table on p. 23, it would appear that with the complete removal of a grass crop large quantities of both phosphoric acid and nitrogen are lost to the soil. This loss in the case of phosphoric acid per acre per annum, as a general average, amounts to approximately 100 lbs., equivalent to 500 lbs. 20% superphosphate; while the corresponding loss of nitrogen to the soil is about 240 lbs., equal to 1,200 lbs. sulphate of ammonia.

Response to a balanced fertiliser treatment has been very marked, particularly in the case of Kikuyu, *Digitaria abyssinica*, *Stenotaphrum secundatum* and *Dactyloctenium ægyptium*, while the uptake of both phosphoric acid and nitrogen has also been consistently influenced by the fertiliser.

Available potash figures indicate that large quantities of this plant-food are also removed from the soil. Young Kikuyu grass was found to contain anything up to 5% potash (K_2O), with a general average of 4.5%. On a 10,000 lb. dry matter production basis 450 lbs. potash are involved, i.e. a muriate of potash equivalent of 750 lbs. *Brachiaria humidicola* was found to contain about 2.5% potash and Napier grass 3.2%, both representing large quantities of the above potash salt.

It is essential, therefore, that in pasture establishment adequate attention should be paid to the plant-food replacements. It is realised, of course, that under grazing conditions a certain proportion of the plant-food ingredients are returned to the soil in the manure. In this connection Henry and Morrison[6] give the following list representing the annual yield of fertilising constituents per 1,000 lbs. live weight :—

Name of grass.	% P_2O_5		% Crude Protein = N × 6.25		Lbs. Dry Matter per acre per annum	
	Fertilised	Unfertilised	Fertilised	Unfertilised	Fertilised	Unfertilised
Kikuyu	0.45	0.36	11.6	9.4	10,174	4,782
Paspalum virgatum	0.45	0.40	12.2	11.0	9,408	5,354
Setaria sulcata	0.59	0.50	16.3	14.0	11,979	8,268
Panicum maximum	0.54	0.42	12.7	10.6	12,783	9,951
Rhodes	0.46	0.37	10.8	8.8	13,300	11,620
Paspalum notatum	0.52	0.47	12.9	12.4	2,964	1,634
Napier	0.56	0.47	14.1	12.1	29,396	22,124
Paspalum dilatatum	0.48	0.46	13.5	13.0	3,959	4,551
Panicum repens	0.48	0.39	11.4	9.9	9,009	6,171
Panicum coloratum	0.47	0.39	12.2	9.4	15,296	10,304
Digitaria abyssinica	0.47	0.37	11.9	9.2	6,936	3,352
Stenotaphrum secundatum	0.41	0.28	10.8	8.0	5,643	2,497
Dactyloctenium ægyptium	0.42	0.28	9.6	6.8	6,636	2,884

(N.B. The P_2O_5 and Crude Protein figures are averages of all season cuts).

Type of animal.	N lbs.	P_2O_5 lbs.	K_2O. lbs.
Cow	156	38	127
Sheep	119	44	126
Pig	150	104	128
Horse	128	143	103

Thus a cow weighing 1,000 lbs., consuming annually 7,000 lbs. dry matter (approximately 20 lbs. per day), will return to the soil plant-food equivalent to 700 to 800 lbs. sulphate of ammonia, 200 lbs. 20% superphosphate, and 200 lbs. muriate of potash. Should she obtain this dry matter from one acre of pasture producing 10,000 lbs. dry matter, it would still be necessary on an average to apply at least 300 lbs. superphosphate, 500 lbs. sulphate of ammonia and 100 lbs. muriate of potash (or plant-food equivalent).

In these calculations amounts of plant nutrient becoming available due to natural influences have been taken into consideration.

It will be noticed from the foregoing table that nitrogen and not phosphate is the chief plant-food requirement for pastures. Unless these ingredients, potash included, are applied in the correct balance, the optimum response will not be obtained. This was illustrated in a *Paspalum* pasture which had received a preponderance of phosphatic fertilisers, the result being a large seed crop with very little leaf development. This condition was rectified, however, by nitrogenous top-dressings. In another instance supplies of potash were accidentally withheld from a Kikuyu pasture with almost complete cessation of growth, as indicated below :—

Paddock.	Treatment.	Grazing period.	No. of grazing days per acre.
A	NPK	Oct.-Feb.	222
		March-June	246
B	NP (potash accidentally omitted)	Oct.-Feb.	83
	NP + K (100 lbs. KCl added)	March-June	296

Whereas paddock A shows only a small difference of 24 grazing days, paddock B shows up the marked results of potash omission.

Regarding the application of nitrogen, grasses are capable of taking up this plant-food in the ammonia form, and quick responses are therefore obtained when ammonium sulphate is used. On account of the fact that the salt is readily leached, particularly when applied to the sandier soils, frequent dressings of small quantities are preferable to occasional large applications.

PASTURE MANAGEMENT.

The influence of defoliation on the plant and its root system has been very thoroughly investigated by

Jones[7] at Jealott's Hill. He shows that pasture plants under conditions of light grazing have considerably greater root development than those under heavy grazing, and he lays emphasis on the importance of the root and leaf base as storage organs for the building up and conservation of plant-foods. He points out that restriction in the development of the root system and the succulent leaf base influences adversely the production of green leaf during subsequent growth. In another experiment Jones[8] shows that "the time and intensity of grazing markedly affected the botanical composition in relation both to the proportion of grass to clover and to the inroad of weed-grasses and thistles."

In this connection, changes in botanical composition and effect on vigour of a coastal *Panicum maximum* and *Dactyloctenium ægyptium* sward were observed under different intensities of grazing. In a heavily grazed area *Panicum maximum* was almost entirely replaced by *Dactyloctenium ægyptium*. Where light grazing was practised *Panicum maximum* was not only able to compete successfully with this grass but was actually beating it. Moreover, the effect on grazing returns during the following spring was particularly marked, the carrying capacity per acre for the heavily grazed sward being only 22 grazing days, while that for the lightly grazed one was 61 days.

In an experiment designed to throw light on the critical growth period of different grasses, some interesting facts are coming to light. Unfortunately, the experiment has not been down long enough for the treatments to have had their full effect, but present indications are that all stooling grasses require a definite rest period for optimum yields of nutritive matter. In the *Panicum* group, for example, *Panicum maximum*, *Panicum coloratum* and *Panicum repens* responded favourably to a rest during the summer months, while Napier grass appeared to derive a greater benefit from a rest in spring. The latter remark also applies to Rhodes grass and *Paspalum virgatum*. Kikuyu and, to some extent, *Digitaria abyssinica* appear to be most productive when utilised to the full during the growing periods. The following table gives comparative yields in pounds and ounces per plot of different grasses which were uniformly fertilised, but were allowed to rest at the seasons of the year indicated. (The most successful rest periods are given in bold figures.)

Name of grass.	Resting Period. Spring lbs. ozs.	Summer lbs. ozs.	Autumn lbs. ozs.	Winter, lbs. ozs.
Rhodes grass... ...	**20 11**	17 11	13 2	11 5
Napier grass	**136 13**	101 9	89 11	72 9
Paspalum virgatum	**60 5**	45 8	38 11	36 2
Panicum maximum	25 2	**37 15**	21 9	26 11
Panicum repens ...	37 11	**54 10**	35 14	35 3
Panicum coloratum	32 5	**62 4**	35 14	30 11
Kikuyu	15 10	17 14½	25 11	**28 6**
Paspalum notatum .	**14 11**	10 8	12 7	10 7½
Digitaria abyssinica	9 15	7 12	8 5½	**13 5**
Setaria sulcata ...	44 15	**63 15**	34 1	45 13

UTILISATION OF PASTURES.

As has already been stated, the primary object of pasture establishment at Umbogintwini was to provide cheap feed for the factory working oxen, and it was only when surplus grass was available that attention was directed towards beef production. For this purpose steers of a recognised beef breed were purchased as required, and grazed as a first line on the Umbogintwini pastures. Working oxen were generally used as followers after the steers had had the pick of the grazing, and a few mules were finally put into the paddocks to finish off any rank growth. Complete utilisation of the herbage was thus obtained, and this system of grazing can be strongly recommended.

The first experiment (probably the first of its kind on the sugar belt of Natal) was conducted by Moses in 1933. He shows, after grazing six twenty-month-old Aberdeen Angus grade steers as a first line on approximately 28 acres of pasture consisting chiefly of Kikuyu for a period of 166 days, that good quality beef can be produced on improved pastures on the coastal belt. From a financial aspect, however, this experiment indicated that these animals were too small and too young for the local market (the average weight of the carcases was only 455 lbs.) and that carcases weighing 600 lbs. (dressed weight) would meet with a far bigger demand and obtain an enhanced price.

A subsequent experiment established that returns were overwhelmingly in favour of finishing off mature animals rather than carrying young stock for a period of two years or more before they could be ready for the market. Evidence was also obtained that a good quality trek ox, 6 to 7 years old, could be finished off for the market on good pasturage within a comparatively short period.

The necessity for selection of the right type of animal for fattening and avoidance of any check in its progress during the perparation period was also very clearly illustrated in all these experiments. Grain and/or oilcake feeding, therefore, is necessary during the short dormant season or during drought periods.

Some evidence was also obtained in connection with the necessity for feeding grain ration during the final stages of the finishing off period on good pasturage. In one experiment half the number of animals were given daily, for the seven weeks before slaughter, 6 lbs. of crushed yellow maize. No increase in weight over the group fed on grass alone was recorded, although the maize-fed animals did realise a slightly better price.

As the cost of the maize consumed amounted to 3s. per 100 lbs. of dressed carcase, and the increase in price per 100 lbs. was only 1s. 3d., there was no financial advantage in this instance. However, on the whole, the prices for these animals were unsatisfactory and too much reliance, therefore, cannot be placed on the results.

TABLE I.—STEERS RECORDS.

Group	1	2	3	4	5
Breed and number of animals ...	6 Sussex Cross	4 Shorthorn Cross	6 Sussex Cross	5 Mixed Beef	13 Mixed Beef
Age	3—3½ years	2—3½ years	1½—2½ years	3—5 years	2 years upwards
Origin	Western Transvaal	Natal Midlands	Western Transvaal	Northern Transvaal	Bechuanaland
Date of arrival	12/7/36	11/6/35	12/7/36	7/5/37	8/1/37
Date of sale	9/11/36	22/12/36	22/6/37	30/9/37	29-30/12/37
Average weight on arrival ...	1,137 lbs.	683 lbs.	876 lbs.	917 lbs.	827 lbs.
Average weight at sale	1,317 lbs.	1,170 lbs.	1,190 lbs.	1,196 lbs.	1,190 lbs.
Average daily gain	1.714 lbs.	0.837 lbs.	0.910 lbs.	1.911 lbs.	1.008 lbs.
Average dressing-out percentage	50.5%	52.6%	51.3%	49.0%	50.1%
Average nett return	£12 9 5	£11 9 3	£10 3 8	£10 14 1	£11 15 0
Initial cost (purchase price) ...	£4 10 0	£5 0 0	£4 10 0	£6 14 4½	£6 5 0
Railage to coast	£1 0 3½	£0 6 0½	£1 0 3½	£0 19 1	£0 19 0
Cost of concentrates and licks ...	£0 16 0½	£0 10 0½	£1 1 7½	£1 7 9½	£0 10 9
Cost of grazing	£0 14 3	£3 9 9	£2 3 1	£0 18 3	£2 4 7
Total cost	£7 0 7	£9 5 9	£8 15 0	£9 19 6	£9 19 4
Profit per animal	£5 8 10	£2 3 6	£1 8 9	£0 14 7	£1 15 8

For average figures per animal, see overleaf.

ECONOMICS OF STEER FATTENING ON IMPROVED PASTURES.

Some impressions on the economic aspect of conditioning cattle on improved pastures for slaughter purposes can be formed from figures obtained from experiments carried out at Umbogintwini. The details and results of these experiments are given in the accompanying "Steers Record" (Table 1). Regarding grazing cost, this is considered to be 1½d. per grazing day, on the basis of an annual cost of pasture maintenance on the coast of £3 10s. 0d. per acre. One acre should provide from 500 to 600 grazing days per annum, as has repeatedly been obtained at Umbogintwini for Kikuyu, *Paspalum dilatatum* and Napier grass on the better soils.

The average daily gain of 1.228 lbs. is low, as is also the dressing-out percentage. With regard to the former, it is found that rapid gains are usually made when the stock first come down, and if sold after the first 4 to 5 months the average daily increase in weight is usually much higher (see groups 1 and 4). The dressing-out percentage is based on live weights before despatch, and not immediately before killing, which probably accounts to some extent for the high wastage. It also shows (as was the case) that many of the steers were somewhat leggy and weak over the loins—a breeding and not a feeding fault.

The cost of production of each of the five groups is principally governed by the purchase price and the duration of the fattening period. Actually only two of the five groups were in the required condition for fattening at the time of their arrival, namely, Nos. 1 and 4, and the remaining groups had to be retained considerably longer than considered ideal.

Average Figures per Animal for period June 1935 to December 1937.

Average weight at arrival	890 lbs.
Average weight at sale	1,211 lbs.
Average daily gain	1.228 lbs.
Average dressing percentage	50.2 %
Average dressed weight	607.9 lbs.
Average return for animal	£11 8 3
Therefore average price per 100 lbs. dressed weight	£1 17 6
Average nett profit per animal	£2 5 2

The average return of £11 8s. 3d. is, as shown, equivalent to 37s. 6d. per 100 lbs. dressed weight, which places these steers in the export B grade. Except for very well bred animals, it would seem advisable to limit the purchase price, including railage, to 140 to 150 shillings for the average two-year-three-year-old bullock.

In all instances it was found advisable to feed certain concentrates, the amount of which was governed to a large extent by the nature of the season. The animals in groups 1 and 2 were provided with concentrates—the former during the winter and dry spring of 1936 and the latter during the winter only—and were finished off on grass alone. Groups 3 and 4 were fattened and sold immediately after the drought of the summer and autumn of 1937, and required the largest quantity of supplementary feed. Group 5, on the other hand, was sold in December, after the October and November rains had had their effect on the pastures, and these animals were finished off on grass alone, a minimum of concentrates having been given during the previous winter. The use of concentrates is resorted to in order to tide over a thin period, it being essential to avoid loss in condition during either the growing or the fattening periods.

Regarding the average nett profit per steer of £2 5s. 2d., this was obtained over an average grazing period of 321 days. Translated into nett profit per acre this amount will naturally depend on the average carrying capacity of the pasture providing the grazing.

As reported elsewhere, the carrying capacity per acre of good pasture was found to be approximately as follows:—

Napier grass	600 grazing days per annum.
Kikuyu	550 grazing days per annum.
Paspalum dilatatum	500 grazing days per annum.
Average	550 grazing days per annum.

On this basis the profit per acre in respect of the beef trials under discussion is $\frac{550}{321} \times 45$s. 2d. or £3 17s. 5d per acre. This figure will, of course, be considerably less for the poorer soils such as windblown sands, but, in any event, the economy of pasture establishment on such soils is doubted.

SUMMARY AND CONCLUSION.

The establishment of artificial pastures to supply cheap feed for working animals and the production of beef is suggested as an outlet for surplus cane land.

A brief resume is given of the pasture work in progress at Umbogintwini.

Evidence is produced to show the necessity for maintaining soil fertility. Intensively grazed pastures have been found to require added plant-food to the extent of 100 lbs. nitrogen, 60 lbs. phosphoric oxide and 60 lbs. potassium oxide per acre per annum.

Carrying capacity per acre per annum for different pasture grasses on the better soils was shown to be between 500 and 600 grazing days, the cost of which is approximately 1½d. per day.

The importance of correct pasture management is stressed and data produced to show the necessity for a seasonal rest, particularly for pasture grasses with stooling habits.

The financial returns from five groups of animals finished off on coastal pastures with a minimum of concentrates over a period of 2½ years are given. Profits of nearly £4 per acre per annum were obtained from good pasture land.

As can be seen, these investigations cover a comparatively short period only, and many of the experiments are still in the initial stages. Although it is too early to draw any decisive conclusions, the results obtained up to the present (especially when the adverse conditions of 1937 are taken into consideration) are of sufficient promise to justify the subject being brought to the notice of the Sugar Industry, particularly in view of the urgent need of alternate crops in the sugar belt of Natal.

REFERENCES.

[1] H. D. Leppan, "The Organisation of Agriculture," 1936, p. 46.

[2] A. P. van der Post, "Economics of Agriculture." 1937, p. 215.

[3] D. Moses, S. Afr. J. Sc., 1932, **29**, 376.

[4] D. Moses, S. Afr. J. Sc., 1934, **31**, 299.

[5] T. D. Hall, S. Afr. J. Sc., 1932, **29**, 389.

[6] W. A. Henry and F. B. Morrison, "Feeds and Feeding," 1927, p. 281.

[7] M. G. Jones, Empire J. Exp. Agr., 1, 43.

[8] M. G. Jones, Empire J. Exp. Agr. 2, 122.

The PRESIDENT: Opening the paper for discussion remarked on the amount of technique involved in grass production and the wide field in which the technologist had to work.

Mr. LINTNER: Expressed his appreciation of the paper. He reminded the audience that we are continually making rediscoveries and due credit should go to those who refreshed our memory. The African Explosives & Industries, Ltd., were convinced, through many valuable experiments, that large areas of this country were suited to grassland cultivation with a view to raising beef and milk profitably. Mr. Lintner made passing reference to the history of cattle breeding, dating back several centuries. Outstanding in Mr. Deenik's paper were the remarks on periodicity of growth of different species and types of grass, to which too little attention had been paid. Furthermore we have to bear in mind that we cannot successfully turn over our poorest areas to grass and expect them to thrive. Mr. Lintner then raised the point of feeding as against breeding. The Government policy was to improve beef by breeding an improved strain of cattle. But can we at the same time overlook the pastures on which they have to feed? Improved stock were worse scrub as such if they were under-fed, than animals which were the product of the environment and adapted to that environment. Another point raised was that ecological studies should be carried out also on grass to find grass suitable for certain varieties. He said he recently found an instance where *Paspalum dilatatum* was being recommended on a very large scale in an area where there were hundreds of acres on indigenous swards of Rhodes an obvious error. Mr. Lintner then asked the possibility of *Setaria sulcata* spreading mosaic. Lastly he drew attention to the success of Kikuyu in soils plentiful in humus.

Mr. COIGNET: Asked if sufficient attention had been paid to the value of cane top silage and molasses concentrate as stock feed.

Mr. FOWLIE: In thanking Mr. Deenik expressed himself on the economic aspect of cattle feeding. He said that fattening cattle was firstly a business proposition, which depended on the markets as much as on correct feeding. As high veld farmers had to sell cattle in the autumn to save their lives, we had every prospect of obtaining them cheaply up-country. Secondly the market required most beef a month or two before Christmas, say October and November and perhaps December. Another point was that on the coast we should purchase fully grown or nearly fully grown animals. As Mr. Deenik showed it did not pay to keep cattle twelve months and grow them out a bit and then fatten them off. The best profits would be got from animals that were about three years old or even much older if they were of good type. Our market really wanted weight, and quality did not always pay. In conclusion, then, to fatten cattle for the market, buy as well as possible, keep as short a time as possible, and sell when the markets were good.

Mr. MOBERLY: Appreciated the fact that attention had been drawn to the vicious grazing-burning rotation noted in some parts of the thorn country.

Dr. McCLEAN: In replying to Mr. Lintner's question on *Setaria sulcata* said that this indigenous grass was quite common on the coast particularly near bush. As a mosaic carrier it would not exert a very great influence, though the variety grown of course would have much influence on the possibility of infection.

Mr. DEENIK: Referring to the question of Kikuyu said that this grass was a failure in nearly every case on humus-deficient soils. In such cases large quantities of organic matter were necessary, making this grass a crop of perhaps doubtful economy. Experiments were being carried out at present on this subject.

Replying to Mr. Coignet he said he had never tried fattening animals on cane tops since it was believed that cane tops gave an undesirable oily fat, which would not recommend our beef for export. Furthermore mature cane tops must have

a low feed value, and therefore at the most could only be expected to furnish bulk under which circumstances they must be supplemented with either good pasturage of high feed value, good hay or silage.

Referring to Mr. Moberly's remark he said that by paddocking (controlled grazing) the difficulty of bush menace can largely be overcome. Mr. Deenik finally thanked the various speakers for the appreciation they expressed.

The PRESIDENT: In concluding and thanking Mr. Deenik pointed out that a great deal of new ground had been covered in this paper. The African Explosives & Industries, Ltd., represented here by Mr. Deenik had done a great deal in their own way to help our sugar technologists.