THE VALUE OF CANE TOPS, CANE TOPS SILAGE AND MOLASSES IN BEEF PRODUCTION.

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Preliminary investigations on beef produuction possibilities on the Coastal Belt of Natal formed the subject of a paper read before this Association in 1938.[1] Studies of this nature have been continued, and much valuable data on pasture and beef production are being obtained. The present paper, however, as its title signifies, will deal almost solely with the value of the cane tops, cane tops silage and molasses in beef production.

The value of molasses as a ration for feeding beef cattle is already well known. According to Henry and Morrison,[3] molasses, provided it replaces not more than about one half of the concentrates fed, supplies 70% of the nutrients ordinarily given with the same weight of grain. Snell,[7] reporting on feeding trials with fattening steers, shows that the substitution of 2.38 lbs. molasses for an equivalent amount of grain in a ration containing 9.26 lbs. of this feed resulted in an increased rate of gain as well as of hay consumption. In addition, this ration comprised maize-soybean silage, and cottonseed meal.

Comparisons made at the Everglades Experiment Station, Belle Glade, Florida[8] with freshly cut sugar cane, sugar cane silage and pasture with and without molasses, indicated that the most economical gains were obtained from rations in which half the grain had been replaced by molasses, the cost of the molasses being 60% of that of the grain.

Literature regarding the use of cane tops as a stock feed appears to be particularly scarce. In this connection Morrison[4] remarks: that much feed is wasted when this by-product is not utilised by being fed to stock, as the amount of leaves and tops ranges from four to eight tons per acre. Cane tops silage has, however, received more attention. Dodson and Staples,[2] feeding this material to stock, state that cattle ate it very well, but they were not as fond of it as of maize silage, and would not eat as much per day. However, it seemed quite as palatable as sorghum silage. They found that one ton of cane tops ensilage carried the equivalent of more feed units than 320lbs. of maize, and that 18 tons of cane hauled to the mill from an acre gave about six tons of tops and leaves, of which four tons or more were suitable for silage. In the 1937-1938 feeding trial by the Everglades Experiment Station[8] sugar cane silage supplemented with maize and molasses in equal proportions produced average daily gains of 2.05 lbs. as against 2.18 lbs. for animals on full grain and pasturage. In the 1938-1939 season the daily gains were 1.70 and 1.98 lbs. respectively. It must be pointed out, however, that in these trials the entire stool including tops and stems was ensiled.

Finally, Quesenberry[6] reports from results obtained from feeding experiments in which different silages were compared, that silage made from cane tops can be utilised advantageously as a feed for cattle, although it is not as palatable as that made from maize, soybeans, sorgo or cowpeas. His results indicated that in making 100 lbs. gain, steers fed on cane top silage required 28% more silage and 40% more cotton seed meal than those fed on maize silage.

Feeds Used in the Experiments.

The object of the experiments carried out at Umbogintwini was to determine the efficiency of cane tops, cane top silage and molasses fed to beef animals with or without pasture or grain. The protein supplement fed when considered necessary consisted of cottonseed (whole) up to 2½ lbs. per head daily. The cane tops used in these trials were obtained from an adjoining area about 200 acres in extent, supporting a well-grown crop of two year old first ratoon Co.290 well fertilised both as plant and ratoon cane. The crop averaged approximately 41 tons per acre yielding about nine tons of tops. Whenever maize was fed it was in the form of coarsely ground yellow meal, and the molasses, when given, was administered diluted with its own volume of water, and mixed with the tops. As far as possible fresh cane tops were gathered after each day's harvest and passed through a chaff cutter. For the making of ensilage the fresh material was also chaffed.

Cane Tops and Molasses Supplementing Pasture. Preliminary Observations.

(1) The animals used consisted of ten 2½-3 year old Afrikander-Sussex and four Aberdeen Angus-Friesland steers of the same age. They had been pastured at Umbogintwini during the previous summer until they were in grass prime condition. From the 18th May until the 3rd July, 1939, they were given nightly a ration consisting of 40 lbs. of chaffed cane tops and 5 lbs. of molasses. During the day, i e., from 8 a.m. to 4 p.m., they had access to any pasture available at the time, chiefly short Kikuyu, Napier and Panicum maximum. The cane tops ration was fed in pens which were cleaned

out from time to time, and the manured bedding stacked and watered for compost. Fresh bedding, which was supplied daily, consisted of accumulated waste grass cuttings from paddocks mown after grazing during the summer months. It must be mentioned that the animals took very readily to the cane tops-molasses ration.

The steers were trucked for slaughter on the 4th of July. The following Table (1) gives the individual weight gains and slaughter grades, the latter being placed on the standards laid down for export quality high grade chillers.

TABLE 1.

Animal No.	Weight 18/5/39	Weight 3/7/39	Gain or Loss	Slaughter Grade
2	1,191	1,196	+ 5	Good medium
3	1,124	1,136	+12	Poor medium
4	1,151	1,140	−11	Poor medium
5	1,181	1,204	+23	Good medium
6	1,250	1,273	+23	Medium
7	1,157	1,200	+43	Medium
8	1,229	1,236	+ 7	Medium
9	1,188	1,205	+17	Good medium
10	1,152	1,185	+33	Medium
11	1,118	1,110	− 8	Poor medium
37	929	983	+54	Medium
41	1,150	1,156	+ 6	Medium
42	1,213	1,258	+45	Poor medium
50	1,072	1,092	+20	Medium

It must be mentioned that neither the quality of the beef nor the colour of the fat was adversely affected by the cane-tops-molasses ration.

In Table I it is revealed that the bulk of the pasturage was successfully replaced by cane tops and molasses. In general, the animals improved in condition to a lesser or greater extent at a time when pasture considerably falls off in production, and, considering that no grain was fed, the slaughter grades obtained were very satisfactory. The utilisation of this ration has thus, in this instance, meant a considerable increase in the carrying capacity of the pasture for the cost of the molasses and the collecting and chaffing of the cane tops. The latter cost is probably greatly offset by the value of the animal manure and thus the compost obtained.

(2) Further observations on the value of cane tops and molasses were made by feeding six Aberdeen Angus-Friesland first cross steers of a conformation unsuitable for the export market, and in low condition, with a ration consisting of 35 lbs. cane tops + 5 lbs. molasses. Additional feed consisted of second line grazing on intensive pastures and 2 lbs. cottonseed daily. The feeding period lasted from 4th July to 16th September, 1939, after which the animals were sold locally on a favourable market. The individual weight gains and slaughter grades obtained, the latter based on local standards, are given in Table 2. It must be stressed that these animals were not intended for the export market.

TABLE 2.

Animal No.	Weight 10/7/39	Weight 4/9/39	Average daily gain	Slaughter grade
35	864	956	1.64	Prime
43	821	930	1.95	Good medium
44	721	805	1.50	Good compound
46	759	866	1.91	Good medium
48	731	808	1.38	Good medium
49	800	908	1.93	Prime
Aver.	782.7	878.8	1.72	

Though the animals were still young and growing, the slaughter grades indicate fairly satisfactory condition. The improvement registered in this connection during the comparatively short feeding period was most marked, indicating the nutritional value of the above ration. The pasturage available was poor in both quality and quantity.

Experiment 3.

Cane Tops and Molasses vs. Pasture.

The object of this experiment was to determine whether it would be possible to fatten for the export market young animals off summer pasture by feeding them during the cane harvesting season with a ration consisting of cane tops, molasses, grain, cottonseed (whole) and a small daily allowance of a phosphate-salt lick. For this purpose six 2½-3½ year old Sussex-Afrikander steers and one rising four year old Aberdeen Angus grade steer were used. Simultaneously, a similar parcel, with the exception that there were two Aberdeen Angus grades and only five Sussex-Afrikander animals, was given first line grazing, maize, cottonseed and a phosphate-salt lick. Grass silage was supplemented when pasture became scarce.

The first mentioned ration consisted of 60 lbs. cane tops, 7½ lbs. molasses, 2½ lbs. cottonseed and 5 lbs. maize meal per animal per day, fed as follows:

Early morning:

20 lbs. cane tops + 2½ lbs. molasses.

Mid-day:

10 lbs. cane tops + 2½ lbs. molasses.

2 p.m.:

5 lbs. maize meal + 2½ lbs. cottonseed.

Evening:

30 lbs. cane tops + 2½ lbs. molasses.

The pastured animals had access to the normal winter growth made by 4 acres of Kikuyu, 3 acres of Paspalum spp., 3½ acres of Napier, 3 acres of Panicum maximum and 2½ acres of miscellaneous grasses. The silage fed was obtained from two acres of Panicum maximum cut once for this purpose during the previous summer. In addition they were given 10 lbs. of maize meal daily, and, until the grass became luscious, i.e., in early Spring, two lbs. of cottonseed. The experiment was started on June 12th, 1939, and the animals were on full ration by June 26th. Progress was determined by averaging the individual weights obtained over three consecutive days at fortnightly intervals.

All animals were submitted for export, four from each group on the 28th of September, and the remaining six on the 15th of November. At the abattoirs the individual carcasses were weighed, graded and scored, the killing out percentages and points out of a possible 10, allotted to each being given in Table 3.

graded A, ten quarters graded B, and the remaining ten graded C.

Although the pastured animals put on more weight and graded better, both groups as a whole lacked the degree of finish required of high grade chillers. There was, however, also considerable individual variation and it is therefore unwise on these data to try and establish the superiority of one ration over the other, without further confirmatory experiments. The experiment has, however, indicated that there is a definite use for cane tops in a fattening ration for the production of export quality beef, and that it may be possible to substitute half the maize ration on a starch equivalent basis with molasses, without in any way adversely affecting the quality of the meat.

Value of Cane Tops Silage.

In view of the success obtained with the feeding of fresh cane tops, about 25 tons of this material was chaffed and ensiled in a pit dug into the ground. The extremely dry conditions experienced

TABLE 3.

Group	Animal No.	Weight 26/6/39	Weight 27/9/39	Weight 13/11/39	Av. Daily gain	Killing out %	Carcass Points
	4	940		1,166	1.61	54.1	5.0
	5	917	1,125		2.26	55.8	7.0
	9	945		1,153	1.49	55.9	3.0
Cane Tops ..	10	999		1,164	1.18	56.1	2.5
	12	1,031	1,199		1.83	51.7	3.0
	13	1,037	1,176		1.51	54.9	8.0
	28	1,023	1,156		1.45	53.9	7.5
	Average	984.6	1,162.7		1.62	54.6	5.1
	1	940	1,118		1.94	55.7	3.5
	2	945	1,126		1.97	53.4	6.0
	11	935		1,227	2.09	54.0	4.5
Pasture	14	1,022		1,334	2,23	54.3	4.0
	15	886	1,096		2.28	54.7	3.5
	24	1,047		1,182	0.96	55.6	8.0
	30	994	1,196		2.20	55.7	8.5
	Average	967.0	1,182.7		2.12	54.8	5.4

Note.—No. 24 was severely ill during experiment —average daily gain not included in average daily gain for group.

With regard to the suitability of the carcasses for the chilled beef market, out of the 28 quarters comprising the cane tops group, 12 quarters were rejected for condition, 12 quarters graded B, and the remaining four graded C. The pasture group fared somewhat better, as out of the 28 quarters only four quarters were rejected, two quarters

during the 1939-1940 summer, and the subsequent drying up of the Umbogintwini pasture afforded an excellent opportunity to test the palatability and fattening value of this product.

For this purpose a group of 12 animals consisting of six Herefords, 2½-3 years old, and six Aberdeen Angus steers, rising four years old, was used. Until the drought began to make itself felt, these animals, obtained from the Natal Midlands at the end of October, 1939, were on pasture, and by the end of January were ready for finishing off with grain.

The then inadequate pasturage was supplemented with cane tops silage. This material was found to be of good quality, if somewhat fibrous in appearance, and was well liked by the animals, which consumed it in quantities varying between 20-40 lbs. each per day, the actual amount depending on the amount of pasturage available. It is rather significant that an animal which refused its grain ration alone, ate it readily enough when mixed with the silage. As usual the fortnightly weights of these animals were recorded, and an indication of the progress made whilst on this feed may be had from the following table.

TABLE 4

Breed	Animal No.	Weight 29/1/40	Weight 11/3/40	Total Gain	Average Daily Gain
	1	1,179	1,196	17	0.40
	2	1,002	Ill	—	—
Hereford	3	1,132	1,180	48	1.14
	4	1,000	1,036	36	0.86
	5	1,088	1,134	46	1.10
	6	1,056	1,086	30	0.71
	Average	1,076	1,126	35.4	0 84
	1	1,040	1,091	51	1.21
	2	1,110	1,178	68	1.62
A. Angus	3	1,022	1,076	54	1.29
	4	1,022	1,084	62	1.48
	5	1,042	1,071	29	0.69
	6	1,009	1,050	41	0.98
	Average	1,041	1,092	50.8	1.21

The gains recorded in the above Table have been made during a period which was very dry, and extremely hot, by animals which were approaching the "finished-off" stage. These preliminary observations would indicate that cane tops silage can be very advantageously used in a fattening ration for beef animals. In normal seasons this feed can profitably replace the bulk of the pasturage, leaving the latter available for the growing out of animals in a less advanced stage of growth. As a stand-by during periods of drought this silage should prove invaluable.

(For slaughter results and details of feeding see appendix to this paper).

Compost.

As has already been indicated, the manured bedding of stall fed animals was treated for the manufacture of compost. In this connection it was found that the compost obtained from the manured bedding of the seven animals described under Experiment 3, amounted to 22 tons, or a daily production pre animal of, 55 lbs., of which approximately 30% was moisture. The nitrogen content of this material submitted for analysis amounted to 1-1.5% on dry basis.

The animals were given fresh bedding daily, either waste grass, the accumulation of pasture mowings after grazing during the summer, or cane trash gathered during harvesting. Both grass and trash rotted down well, and the end products were to all intents and purposes the same.

The procedure adopted was to clean out the pens weekly when the manured bedding was watered and stacked. The stacks were turned at odd times when labour was not required elsewhere. Under these conditions the material was ready for agricultural use after three to three and a half months.

The utilisation of cane tops as a stock feed has thus made possible the cheap production of compost. This should prove a valuable source of organic matter for satisfactory cane production on soils which are deficient in humus, and should increase the benefit derived from the use of artificial fertilisers.

The Chemical Composition of Cane Tops and Cane Tops Silage.

The cane tops fed to the animals in the feeding experiment described were sampled at weekly intervals, and submitted to the University of Pretoria for analysis. Six of these samples, taken at random, were analysed, and their average composition is given in Table 5, as is also the analysis of the cane tops silage used subsequently. For comparison, the average composition of good grass hay and immature maize silage is also included.

TABLE 5.

Chemical Composition on Moisture Free Basis.

	Cane Tops	Grass Hay	Cane Top Silage	Maize Silage
Ash Total	8.16	6.0	7.44	5.5
Ash Soluble	4.60	—	4.17	—
Crude Protein	7.48	7.7	5.62	8.0
Crude Fibre	38.34	34.0	33.77	30.0
CaO	0.44	0.53	0.32	0.25
K_2O	2,27	1.50	1.67	1.70
P_2O_5	0.36	0.19	0.44	0.20
Ether Extract	—	2.80	2.00	2.50
Dry Matter	31.3	89.0	28.4	20.0

The composition of cane tops and cane tops silage, as shown above, immediately places these materials on par with recognised fattening feeds, and stresses the wastefulness of the present practice in which little or no attention is given to this valuable waste product. This becomes even more apparent when it is realised that much time, money and labour is devoted by the up-country farmer to growing and conserving, during the summer months, for winter use cattle feeds of apparently very little more nutritional value than the cane top usually destroyed by fire or sun and wind.

As has already been indicated, a 40 ton cane crop per acre will yield 9 tons of tops. This represents about 5,600 lbs. of dry matter. It has been established[9] that the appetite of a 1,100 lb. steer is 25 lbs. dry matter per day. In these terms an acre of cane tops will supply the daily requirement of over 200 mature animals, and considerably more if molasses is added to the ration.

In terms of compost, provided sufficient bedding is available, an acre output of four to five tons, of which the conservative plantfood value is from £2 to £3, should be obtained.

The question of obtaining animals for this purpose should not present any undue difficulties. From March onwards the up-country farmer must, in many instances, dispose of stock in excess of the number for which feed is available during the winter months. From May onwards the cane planter has a constant supply of cane tops, which, as has been established, are both nutritious and palatable. Moreover, at that time of the year cattle prices, owing to large supplies, are usually low. At the other end of the season the market for cattle is more favourable, and animals in condition demand a good price. It is necessary, of course, either to have pasture available or to conserve cane tops in the form of silage to tide over the period between the time of purchasing the animal and the time of harvesting the cane.

"With the market growing these animals into money," it is evident that the proper utilisation of cane tops and molasses places the cane farmer in the enviable position of being able to produce beef and sugar from the same area. This practice will bring in increased profits, and enable him in his cane culture to maintain soil productivity to the full extent.

Cane Tops and Molasses in a Balanced Ration for The Production of Export Quality High Grade Chillers

In order to meet the market requirements for high grade chillers, the animal must not be more than four years, preferably younger; have a carcass weight of about 650 lbs.; have a blocky conformation; be well and uniformly covered with fat of good quality and colour, and show the lean interspersed with fat (marbling). The live weight of such an animal varies between 1,100 and 1,200 lbs. According to Wood and Woodman,[9] the maintenance ration per day for a 1,100 lb. steer is 7 lbs. starch equivalents, and the total digestible protein required for maintenance plus production is 1½ lbs. The appetite of such an animal is 25 lbs. dry matter daily. For steers over two years of age, the food required in excess of maintenance to make 1 lb. live weight increase varies between 2½-4 lbs. starch equivalent, the amount depending on the condition of the animal. Fattening rations are computed according to the above and similar figures.

According to Morrison,[5] the ration for fattening a two-year-old steer of 1,000 lbs. weight, computed with maize or sorghum silage. legume hay and ground maize is as follows:—25 lbs. silage, 4 lbs. hay and 14 lbs. ground maize. Until such time as digestion trials have been carried out with cane tops and cane tops silage, it will be impossible to compute a ration with these feeds with the same degree of accuracy. On the other hand, the available information both regarding the animals' response to and the chemical composition of cane tops and cane tops silage makes it possible to suggest a ration which will probably not be far off the right one.

With molasses and cane tops of the quality used in these trials, it is indicated that the daily ration for fattening a steer, 1,000 lbs. in weight, should be in the neighbourhood of 35 lbs. cane tops, 7 lbs. molasses (half a gallon), 5 lbs. maize and either a few hours access to good pasturage or 4-5 lbs. of a legume hay. The last-mentioned could be grown as a soil improver in rotation with cane. Should the recent development in the curing of hay at the Estcourt Pasture Research Station be applicable to the coast, it can be confidently accepted that the making of good quality hay, be it grass or legume, will give very little trouble in future.

With the same feeds as the above, but substituting cane top silage for cane tops, the dry matter content and chemical composition would seem to indicate that it is necessary to feed this silage in somewhat greater amount than the fresh material, say 40 lbs., adding to this ration perhaps ½ lb. to 1 lb. daily of a high protein containing meal, such as cottonseed or groundnut.

Summary.

Four feeding trials with beef animals are reported. In three of them cane tops and molasses formed the bulk of the ration, in the fourth cane tops silage was used.

The value of these products in rations for fattening animals is clearly shown, and also that the finishing off period can be as short as 46 to 74 days if grass prime animals are used.

It is shown that in chemical composition, cane tops and cane top silage are on a par with other well-known roughages used in fattening rations, e.g. grasshay and maize silage.

It also appears as if half the grain ration required for the production of high grade chillers could be successfully replaced by molasses on a starch equivalent basis without a detriment to the quality of the beef or lowering the grade of the carcass. Owing to considerable individual variation in the animals used, however, further confirmatory experiments will be carried out in the near future.

Suitably balanced rations with cane tops, cane tops silage and molasses with and without pasturage for the fattening of beef animals are indicated.

The value of a beef industry from the aspect of supplying much-needed organic matter to the cane soils is stressed, and it is indicated how this organic matter may be obtained with little trouble and cost.

Finally, it is shown how seasonal market fluctuations are in favour of stock feeding on the coast during the cane harvesting season.

Acknowledgments.

The author wishes to express his thanks to Mr. T. D. Hall for the interest shown, and helpful guidance given in these feeding trials, to the staff of the Agricultural Chemistry Department of the University of Pretoria, and to Mr. G. Ingham for the analytical data, to Mr. L. S. West for his supervision of the field work, and to Mr. J. A. van Rensburg, of the Division of Animal and Crop Production, for his sustained interest in these investigations, helpful comments and guidance.

African Explosives & Industries, Ltd.,
Umbogintwini.
15th March, 1940.

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APPENDIX.

Since this paper went to press the slaughter results of six of the twelve animals discussed under the heading "Value of Cane Tops Silage" have come to hand. These animals, the more advanced of the group, were despatched for export on the 27th March, 1940, and the results obtained are summarised in Table 6. In view of the comments in connection with Table 4 of this paper, it is extremely interesting to note that the weights obtained and the quality of the animals slaughtered after the compilation of this data amply confirm the preliminary assumptions.

TABLE 6.

Breed.	Animal number	Initial weight lbs.	Final weight lbs.	Average daily gain lbs.	Killing out per cent.	Carcass points (10)	Age.
Hereford	2	892	1,062	1.21	52.4	9.0	1½ years
Hereford	3	1,035	1,173	0.99	54.6	6.5	3 years
Hereford	5	1,026	1,188	1.16	52.2	8.0	2½ years
Average ...	—	984	1,141	1.12	53.1	7.8	2 years
A. Angus	2	1,032	1,221	1.50	54.2	9.5	4 years
A. Angus	3	970	1,114	1.14	52.2	7.0	4 years
A. Angus	4	949	1,131	1.44	52.3	9.0	4 years
Average ...	—	984	1,155	1.36	52.9	8.5	4 years

Note.—Herefords numbers 2 and 3 were down with "three-day sickness" three weeks and one week respectively before despatch.

Out of the twenty-four quarters comprising the above consignment, six quarters were graded "Super A," eight quarters "A" and the remaining ten "B". The percentages of the different grades in terms of total quarters, total pounds of dressed beef and total gross profits are given in Table 7.

Excluding hides and offal, the returns from which cover the railage and slaughtering charges, this consignment netted £91 0s. 0d., or £15 3s. 4d. per head. This represents £6 3s. 4d. per animal, or 68 per cent. increase in value over a rather high purchase price.

The Grader's remarks on the animals are as follows:—

"A good parcel of well-finished young steers, showing good quality; patchiness and lack of conformation in some quarters were the only features that could be criticised."

TABLE 7.

Grade.	Per cent. of quarters.	Per cent. of lbs. beef.	Per cent. of gross profits.
Super A	25.0	24.0	28.7
A	33.3	34.2	38.5
B	41.7	41.8	32.8
C	0.0	0.0	0.0
Reject	0.0	0.0	0.0
Total ...	100.0	100.0	100.0

THE FEEDING.

A.—Pasture.

The animals were at Umbogintwini for 139 days, the first 95 days of which they were on fertilized pasture exclusively. No progress was recorded during the first month, which can be looked upon as an acclimatisation period. Thereafter the general progress was steady. The six animals utilised 7.1 acres of pasturage, consisting of 2.1 acres Napier grass, 2.5 acres Paspalum spp. dilatatum and notatum, 0.5 acres Brachiaria humidicola (creeping false paspalum) and 2.0 acres self-sown Panicum maximum. The fertilizer applied to these pastures, either just before or during the grazing, amounted to 200 lbs. 19.1 per cent. superphosphate, 200 lbs. sulphate of ammonia, and 50 lbs. chloride of potash, at a total cost of £1 16s. 9d. per acre at present rates.

The percentage grazing from each grass type with the fertilizer cost per grazing day were as follows :—

TABLE 8.

Grass type.	Per cent. grazing afforded.	Cost per day pence.
Napier grass	33.6	1.58
Brachiaria humidicola ...	22.1	2.36
Paspalum notatum	18.5	2.83
Paspalum maximum... ...	14.4	3.64
Paspalum dilatatum... ...	11.4	4.61
	100.0	... Av. 3.004

The above table clearly illustrates that the fertilizer cost in the total production of this consignment, namely 3,664 lbs. of dressed beef, varies considerably with the different grass species grazed. Should the total weight of beef have been raised from any one of the grass species involved the following figures would have been obtained :—

TABLE 9.

Pasture.	Fertilizer cost.	Per cent. of average fertilizer cost.
Napier grass	£5 9 0	52.2
Brachiaria humidicola ...	8 4 0	78.6
Paspalum notatum... ...	9 16 8	94.3
Panicum maximum	12 13 0	121.3
Paspalum dilatatum ...	16 0 5	153.6
Average	£10 8 7	100.0

According to Table 9, therefore, it is obvious that, acre for acre, under existing conditions Napier grass has given by far the greatest return for money expended on fertilizer. It would appear to be definitely the best grass for the soil type, which is a wind-blown sand of recent origin, low in organic matter and of poor moisture-holding capacity. It is also clearly indicated that for economic production of beef the importance of choosing the right grass type for a given soil and locality cannot be over emphasized.

B.—Supplementary Feeds.

In addition to the pasturage, the following supplementary feeds, in total quantities per animal, were given for the finishing-off period, i.e. for the last forty-four days of the total feeding period of 139 days.

TABLE 10.

Feed.	Quantity in lbs. Fresh material.	Dry matter.
Cane tope silage	900	256.5
Grass silage	320	93.0
Maize	589	530.1
Total...	1,809	879.6

During this period the total dry matter requirement, calculated on the basis of 25 lbs. per day per animal, amounted to 1,100 lbs. Of this 879.6 lbs. was supplied with the supplementary feeds, leaving 220.4 lbs. to be supplied from the pastures.

Therefore, in terms of percentages, it can be seen that considerable saving of pasture was effected through the feeding of cane tops silage and grass silage as follows :—

TABLE 11.

Total requirements (dry matter)	1,100 lbs.
From cane tops silage	23.32%
From grass silage	8.45%
From maize	48.20%
From pasture	20.03%
Total	100.00%

In other words, with the above ration it has been found possible to substitute more than half the normal pasture requirements with cane tops silage and some grass silage. It transpires, therefore, that on the dry matter basis the carrying capacity of the pasture can be more than doubled through carefully planned and economical supplementary feeding.

The figures given in Table 6 and those that follow speak for themselves and give every reason for enthusiasm regarding future possibilities of beef production on the coast.

Finally, for those who remain sceptical regarding the possibility of success under coastal summer conditions with the two breeds in this experiment, the following meteorological data will be of interest :—

TABLE 12.

Daily Average for the Period of the Feeding Experiment.

Average maximum temperature... ...	81.1° F.
Average minimum temperature... ...	66.5 F.
Average relative humidity	70.6
Average hours of sunshine	6.89 hours.

Acknowledgment.

The author wishes to express his appreciation to Mr. J. Lintner for his helpful suggestions and assistance rendered in the compilation of the data in this appendix.

Umbogintwini.
2nd April 1940.

The PRESIDENT, in opening the paper for discussion, remarked on the excellent possibilities in beef production, as disclosed by this paper.

Mr. DYMOND spoke of his interest in compost. He had secured some medium in Durban and had inoculated a series of trash compost heaps. He experimented with four heaps as follows : (1) Filter cake with trash, (2) kraal manure with trash, (3) inoculated kraal manure with trash, (4) inoculated kraal manure with garden refuse. On composting with filter-cake a careful control of temperature was required. He regretted that he had not been able to follow up the experiment more thoroughly.

Mr. HAYES said that Mr. Deeniks' figures on the feeding of molasses to cattle would be particularly useful, as they had had many enquiries at the Refinery on this subject.

Mr. LINTNER claimed that it was very gratifying to notice the extraordinary good results that were obtained with two English breeds. It was also pleasing to be able to determine at last the types of grasses that were suitable for a given locality. Thus Napier fodder was superior to any other at Umbogintwini.

Mr. FOWLIE said that in experimental work one was up against more difficulties than in practical farming, as an experiment required a predetermined feed. The practical farmer could economise by ascertaining the needs of each group of animals and changing their needs when necessary. Mr. Fowlie looked forward to a more prosperous future for cattle.

Dr. FISHER referred to certain crossbred steers on pasture at Cedara which had recently been inspected by some of his listeners. The last weighing of the elder group (two years seven-and-a-half months old) showed an average of over 1,170 lbs. Mr. Deenik discussed in his paper animals which were considerably older but with weights nowhere up to those at Cedara, which had been fed on fertilized pasture.

The Cedara crossbreds were weaned at five months of age, carried through the winter on surplus hay and silage from the pasture, and to-day gave the weights stated. Mr. Deenik on the other hand had no control over the rearing of his young stock. He had to go into the open market and buy his animals. Therefore he starts off with unknown quantities, and that was a very great handicap. The past history is unknown.

Cedara are about to split the group of twenty animals referred to early in May, ten will be sent to Durban abattoirs, straight from grass without any concentrates. A further ten will be fed for two months on concentrates. These, together with ten Aberdeen Angus just purchased, will be fed and the lot will make a nice comparison with Mr. Deenik's coast figures.

Dr. Fisher went on to say that he had not had sufficient time to study Mr. Deenik's results, but in Table I the author said "The utilisation of this

ration has thus, in this instance, meant a considerable increase in the carrying capacity of the pasture for the cost of the molasses and the collecting and chaffing of the cane tops. The latter cost is probably greatly offset by the value of the animal manure and thus the compost maintained." How can Mr. Deenik put a value on this compost which depends so much on the kind of food fed to the animals? How can he differentiate between the value due to cane tops and that due to concentrates?

Dr. Fisher expressed his great satisfaction that this work is being undertaken. It will enable us to collect much more valuable data as to what can be done on the coast when fattening animals for the market.

Mr. DEENIK, in replying to Dr. Fisher's comments, stated the animals were fed on pasture during the day, at night they received 40 lbs. of cane tops and 5 lbs. molasses, giving 25 lbs. of dry matter.

It was doubtful, since molasses has a very low nitrogen content, whether it would affect appreciably the quality of the resulting compost. The compost being valued on the nitrogen content at 10s. per unit.

Another point raised by Dr. Fisher called for reply, namely, the desirability of grazing and then distributing the manure on the pasture by the animals as against stall feeding when the manure has to be collected and returned to the fields. Mr. Deenik found that stall feeding was necessary, he had to take the animals off luscious grass pasture at the fattening stage and substitute feeds with high carbo-hydrate content, and hence the need for cane tops and cane silage.

Mr. Deenik thanked the contributors to the discussion.

The PRESIDENT concluded by thanking Mr. Deenik for his paper. (*Applause*).