

# AN EXPERIMENT IN GREEN MANURING FOR SUGAR CANE

The soils at the Experiment Station at Mount Edgecombe, like nearly all those in this country that have been long under cane and many that have not, are very deficient in organic matter.

Experiments done in the effect of green manuring on a very light sandy soil at Chaka's Kraal showed the outstanding benefits of even a very short course—only three months—of green manuring. The results of these experiments are published in the annual report of the Station for 1927.

In the experiments to be described, an area of about three acres at the Experiment Station was selected that had been long and continuously under cane, probably for about 50 years, with only one interim of three years under wattle trees during that period. The soil is a heavy clay loam of very poor drainage qualities.

It was divided off into 27 equal and similar sections of 1/10th of an acre each, 21 of these being sown with seven various green manure crops, each treatment being in triplicate, the remaining six sections being left as controls, growing only the natural crop of weeds during the fallow period.

The seven different green manure treatments were as follow:—

## Non-Legumes.

Buckwheat, three successive crops.  
Niger Oil, followed by Buckwheat.

## Legumes.

Cowpea (Wonderful), followed by Sunn Hemp.  
Cowpea (White Bechuana), followed by Sunn Hemp.  
Mung Pea, followed by Sunn Hemp.  
Sunn Hemp, three successive crops.  
Velvet Bean (Black Mauritius) and Sunflower (Russian), followed by Sunn Hemp.

The land was thoroughly prepared by ploughing, cross-ploughing and harrowing, in October and November, 1926. All sections, including controls, were fertilised with 450 lbs. per acre of Egyptian raw rock phosphate and 60 lbs. of sulphate of potash, broadcast and harrowed in,

The green manure crops were sown on December 6, 1926.

Germination and growth were good and the buckwheat and sunn hemp sections matured and were ploughed in on February 1st, 1927, being immediately re-sown to the same crops.

The Niger oil and remaining legume sections were ready to plough in by the middle of March, but at about this time heavy and continued rains set in (19 inches in one month), and it was not until April 12 that field operations could be resumed. By this time all sections had matured, including the second crops of buckwheat and sunn hemp, and the whole field was ploughed, including, of course, the controls. It was then considered too late to re-sow the slower growing legumes, consequently the sections previously sown to various legumes were all re-sown to sunn hemp, and the non-legume sections, whether Niger oil or buckwheat originally, were all sown to buckwheat on April 18.

The whole field was ploughed again early in August, the April sown crops being then mature, and yet another crop of buckwheat or sunn hemp, or weeds in the case of controls, being sown, which were ready for ploughing in again at the end of October, after which the sections were harrowed and furrowed ready for planting with cane.

Superphosphate, at the rate of 250 lbs. per acre, was applied to the whole field in the furrows on November 1st and the cane planted during the first rains thereafter, on November 14.

Germination was excellent, and a good stand of new shoots was recorded on December 9, 1927.

The field was harvested in September, 1929. The weight of cane and analyses showed that there was no apparent difference in yields between the various legume treatments on the one hand or the two non-legume treatments on the other, so for purposes of record the sections were grouped as 15 legume sections, 6 non-legume sections, and 6 controls, respectively, although the entire treatment of the legume group and the non-legume group had not been identical.

The yields of cane were as follow:—

Treatment.	Yield in in Tons of Cane per acre.	No. of Plots.	Standard Deviation from Mean.	Standard Experimental Error.
Plain Fallow— No Green Manure ..	39.20	6	2.53	1.03
Green Manure— Non-Legume .. .. .	41.22	6	2.45	1.00
Green Manure— Legume .. .. .	43.13	15	1.76	0.45

The average differences in yield are sufficient to show a significant advantage from the legume treatments.

The analyses of each plot were taken from small hand-mill samples, the average results being as follow:—

	Sucrose per cent. Cane.	Purity.	Sucrose Yield per acre in Tons.
Controls .. . . . .	15.50	92.4	6.08
Non-Legume .. . . . .	15.24	92.3	6.28
Legume .. . . . .	15.07	92.2	6.50

It is interesting to note that, as is not uncommonly found in other countries, the effect of green manuring has been slightly to retard maturity with a somewhat diminished sucrose content of cane; but taking the increase yield of cane per acre into account there is a substantial increase in yield of total sucrose per acre as a result of the green manuring.

In these experiments the controls were of course given the benefit of the long fallow equally with the green manured sections, and the heavy growth of weeds to some extent no doubt simulated the effect of the green manure crop.

In a further series of experiments in this subject which have been laid down this season, the control sections are carrying cane while the test plots are being fallowed with or without green manuring. We shall thus have a direct comparison between plots that have been fallowed with controls that have not, which should give us some interesting results, and will probably show very positively the benefit of green manuring and fallowing compared with the common practice of ploughing out old cane fields and re-planting with cane the same season.

Experiment Station,  
South African Sugar Association,  
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Mr. BECHARD: We owe a great debt of gratitude for the extremely good work done by the Experiment Station. In this country planters very often have no choice but to burn the cane in order to get rid of the trash. As the soil gets poorer and poorer through burning, green manuring becomes more and more of an absolute necessity. Yester-

day we heard a lot about irrigation, but so far we have not heard much about the preservation of moisture in the soil, and this is the time when the subject can be discussed, and we would like to hear the voice of the planters on the subject.

CHAIRMAN: Exactly how the advantages of green manuring are to be allocated is difficult to say in any scheme of costing, but we found at the experiment plots at Chakas Kraal that while as was to be expected there was an increase in organic matter in the soil after green manuring, it was very small and not sufficient to account for the big difference in yields of cane. There was, however, a very significant increase in the moisture-holding capacity of the soil which had been improved in some way by the cultivation of the green manure crop; and although the total content of mineral constituents in the soil remained the same, there was a greater proportion of potash and phosphorus soluble in dilute citric acid, which form is generally considered the more available to the needs of the plant. The benefit is probably due to these reasons; also to what we may call bio-chemical reasons, that is because of the changes brought about by the living organisms in the soil, introduced and fostered by the green manure crop. Whatever the reasons might be (and in this particular set of experiments we have not yet had time to study very fully and interpret the results of our soil analyses), for the improvement, there is no doubt there is a very definite response to green manuring, and we believe it should be an essential practice of our sugar cane agriculture, as it is in many of the more highly developed countries that have similar agricultural problems to our own. In this particular series of experiments the controls have been fallowed, and they had a heavy growth of weeds periodically ploughed in, simultaneously with the ploughing in of the green manure crops. A series of experiments we planted this season in which the controls have had no fallow at all, will be much more interesting and instructive.

Mr. BECHARD: I would like to know if the possibility of increasing the use of farm manures has been considered by the Experiment Station?

CHAIRMAN: There is no doubt that humus in any form, but perhaps more particularly in the form of farmyard or kraal manures, is very valuable in the soil for a good many reasons, and not the least for the fact that it tends to conserve the moisture. In some figures given by Mr. Edelman at one of our Congresses, he said that whereas various types of soils would retain moisture in a dry condition up to from 5 per cent. to 10 per cent., in the case of kraal manure, the moisture retained in the air-dry condition was over 50 per cent. The difficulty always occurs with regard to kraal manure, however, that the supply is never equal to the demand on the average sugar plantation. A good many attempts have been made in other countries, and a

few experiments have been carried out here, to see whether the trash left on the field cannot be utilised in some way to convert it into a material resembling farmyard manure. As most of you know, the Adco process was introduced a few years ago, but it appears to have several disadvantages for our conditions. For one reason it is very necessary to have active micro-organisms to break up the waste organic fibre, and this necessitates the heap being well supplied with moisture. It entails conditions which are difficult to carry out in the field, and the prospect of conveying the waste to a farmstead and finally transporting it back to the field is impracticable when working on a large scale. There is a big opportunity waiting for anyone who can discover ways and means of promoting the decomposition of the cellulose of the trash in the field so that it may be speedily converted into available humus in the soil. The cellulose in the trash for the first few weeks or months until decomposition is effected is more of a danger than an advantage, because it is withdrawing nitrogen from the soil, at least temporarily, for the requirements of the cellulose decomposing bacteria.

Mr. PALAIRET: I have tried the Adco system

in conjunction with my kraal manure, especially when fresh, and I find it successful. It does rot your trash down, making a very excellent manure, but it is rather bulky. My idea for the future is to use Adco or kraal manure on irrigated plots, and green manuring on all other lands. In this climate if your heap is very well soaked at the start, it needs very little more water. Adco does rot your trash down and makes a very excellent manure, but it is so bulky for its weight that the handling of that class of manure is a very big item which needs to be very carefully planned out.

Mr. BECHARD proposed a hearty vote of thanks to the Director and staff for the two interesting papers.—Carried with acclamation.

CHAIRMAN: The Experiment Station is also responsible for the next item on the programme. I am afraid we have occupied rather more than our share of your time to-day. The next is a paper on Experiments in Harvesting Burned Cane. This is the third paper we have prepared on this subject, and I will ask Mr. Fowlie to be good enough to read it to you.