

Mr. Booth stated he had been speaking to a planter who had always been very keen on getting this cake, and was informed that he had been unable to obtain any from the mill he usually obtained his supplies from, owing to the cake being burnt. Mr. Booth wished to know whether Mr. Dymond considered the cake had been decreased in value by the burning.

Mr. Dymond replied that since the value of filter press cake is generally accepted on its nitrogenous content, he considered it would be decreased because by burning you naturally destroyed the nitrogen,

which was the principal value of the filter press cake. The press cake contained a large percentage of water, and the longer it is dried out the better it is for spreading over the soil.

Mr. McAusland asked if it was possible to give the soil too much lime.

Mr. Dymond replied that all soils contained a good deal of lime, in some cases more than the safety mark. It was possible to increase the lime content of the soil above the safety mark, which would tend to destroy the organic matter.

Insect Pests of Cane.

(Paper by Mr. C. P. VAN DER MERWE, Government Entomologist, Durban.)

My intention in this paper is to say something not only about the insects attacking sugar-cane that we have got; but also something about those we have not got. This seems to be very necessary, as sufficient interest is not taken by people, even sugar-growers in the sugar-cane insects in other parts of the world, and which we are in danger of introducing with importations of cane. There are even some who think that there is no necessity for the restrictions on the introduction of sugar-cane which are now enforced, as we have already all the pests we are likely to get in sugar-cane. If there are any present who hold this opinion, I hope to convince them, before I am finished, that they are mistaken.

The Insects we have got.

There are certain locusts and grass-hoppers which are often found in cane-fields and feed upon the foliage; but the damage they do, except in the case of the Red-winged Plague Locust (*Acridium purpuriferum*), is so small that it hardly is worth mentioning. The plague locust for many years now has not been troublesome, and should it appear again in large numbers, cane-growers are not going to be unduly alarmed, as they know it can be controlled.

Then there is a small Frog-hopper or Spittle Insect, the Red-winged Frog-hopper (*Locris areata*), which is sometimes found sucking the sap from sugar-cane in moist places; but the damage it does is of still less importance than that by the grass-hoppers. The insect only attracts attention on account of its conspicuous red colour as an adult, and the bunches of foam in which the nymphal stages are passed.

At times one finds on the leaves of cane an abundance of a small aphid or green-fly. They suck the sap from the plants, and the ground below them appears to be damp from the abundance of honey-dew they throw off. These insects could be a very serious pest; as even such a vigorous-growing plant as the sugar-cane could not long stand the serious drain of millions of insects sucking its sap; but fortunately the conditions never remain favourable for them for any length of time, and they soon disappear.

Of more importance is the Sugar-cane Mealy Bug (*Pseudococcus sacchari*). It infests the stalks of cane, and is usually found towards the top under the leaves, where the cane is still soft. The growth of the crop does not appear to suffer; but a black fungus grows on the honey-dew excreted by the insect, and causes the black appearance commonly seen on sugar-cane. This must increase the impurities in the juice, and cannot be otherwise than undesirable; but unless the mills pay a higher price for cane which is uninfected, growers cannot be expected to go to expense and trouble in order to control it.

The Black Beetle (*Heteronychus lycas*) has been reported to cause rather extensive damage at times to seed-cane, boring into the sets, and eating out the sprouting buds. The damage often, if not invariably, follows a flood. The insects are driven out of their hiding-places by the water, and seek refuge on the rubbish which is being carried along. When the rubbish is deposited near a cane-field, there is such an accumulation of beetles that they can be very destructive, and may necessitate the replanting of a field. Usually the beetles are not

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abundant in one place, and the damage they do is inconsiderable. There, however, it is the larva, or grub, that does the damage by destroying the cane roots. Here it is the adult that is destructive, and the larva has not yet been convicted of any mischief. It seems to satisfy itself with dead organic matter.

Specimens have been sent me of another related beetle, *Hypopholis vittata*, which was said to occur in large numbers in sugar-cane fields in Zululand. Considering the bad record some of its relatives have, it is only natural that we shall look upon its presence in cane-fields with suspicion.

White Ants, those troublesome pests in Natal, against which almost everybody has some complaint or other, also trouble the sugar-cane farmer, especially in new land, where they attack the planted sets and also, at times, the growing cane. Afterwards, when the trash begins to accumulate, they seem to prefer that, and leave the cane alone. The destruction of the nests before planting the ground is usually possible, and will prevent damage. Not all the species of white ants give trouble. The most destructive, and perhaps the only ones concerned, are *Termes badius* and *Macrotermes Natalensis*.

An insect that has at times attracted much attention is the Sugar-cane Leaf-binder (*Marasmia venialis*). At times one will find almost every spike at the top of a cane-stalk infested by a small caterpillar. The situation naturally looks serious to the grower who does not know how much damage the insects are going to do before they are finished feeding. It is only right that they should ask for information and assistance from the Division of Entomology. Usually, however, when the infestation is observed, most of the caterpillars have finished feeding and are ready to pupate. The cane plant is such a strong grower that it can afford to supply the small amount of food required by the little caterpillar for its development without feeling the strain. Owing to its methods of attack, the larva can only live in the spike (the unfolding leaves) of the plant, and as there is seldom more than one insect in a spike, and, besides, it is heavily parasitised, we have no reason to be scared of the Leaf-binder.

Sugar-cane Cut-worm.—When the cane has been harvested and young shoots are sprouting through the trash, it sometimes happens that they are extensively eaten off. In searching beneath the trash, one finds numbers of cut-worms in hiding, which come up at night to feed on the leaves. Fields, where the cane is burnt, are not so badly attacked, and it is apparent that the reason why the trashed fields suffer more is because the trash affords the caterpillars a hiding-place from their enemies. These caterpillars are much larger and more destructive than the Leaf-binder, and if the attack should con-

tinue for any length of time, the effect would be very serious; but here, too, when the grower observes the presence of the insects, most of them have usually finished, or nearly finished, feeding. When they disappear, and the cane is relieved of the attack, it recovers so completely, if the season is favourable, that it is impossible to see whether it has suffered damage. The caterpillars are heavily parasitised, especially by flies known as Tachinids, and the outbreak is reduced apparently in one generation, as two infestations have not yet been observed to follow close upon one another. As the cane recovers from the attack, it seems doubtful whether control measures will be profitable, although the application of a poison bran mash, which suggests itself, will not be very expensive, and has proved practical in the case of crops of no more value than cane. The adult of the cut-worm is a moth (*Cirphus leucosticha*).

The Mystery Army Worm (*Laphygma exempta*) at times appears in myriads and destroys mainly grass and grain crops. It will attack sugar-cane and cause a certain amount of damage; but as in the case of the cut-worm, the infestation does not last long, and the cane recovers after a slight set-back.

The last of the insects of those we have got which I shall mention is the Stalk-borer, which may prove to be the most important. At present, growers do not have much trouble with it; but that may be because the cane generally grown, the Uba, is a hard cane and not suited to it. When soft canes are tried, they often are worse attacked. As soft canes are not extensively grown, it is quite possible that the borer has not yet been given a chance to show what it can do in the way of injury to cane, when it has a suitable food-supply. In the maize-growing areas, the Maize Stalk-borer (*Busseola fusca*) is a most serious pest, and has been reported to cause losses of 50, and even 75 per cent. of the crop. This same insect is known to attack sugar-cane; but on the coast a closely related species, *Sesamia calamistes*, is the more common in maize and sugar-cane. If borers become as destructive to sugar-cane as they have been to maize, it will be a serious matter to the sugar industry. However, borers are not destructive yet, and we hope that, should they become destructive, we shall be able to devise methods of control. Meanwhile, it is a matter of satisfaction to our cane-growers that they do not suffer the losses from borers which, according to our calculations they might.

It will be seen that the list of injurious insects we have in sugar-cane is not a long one, and, better still, those we do have are not very important. Except in the case of the White Ant, Black Beetle, and the Plague Locust, I am not aware that growers go to the expense of control measures, and those

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against which remedies have to be used are only at times destructive. So most of the time the South African sugar-cane grower has no need to worry himself about the control of insect pests. Surely a most satisfactory state of affairs, and one we can congratulate ourselves upon when we compare our conditions as regards insect pests with other sugar-producing countries.

The Insects we have not got.

In a publication issued in 1917 by the United States Department of Agriculture, and entitled "Dangerous Insects," a list is given of 264 insects which attack sugar-cane. These insects do not include the pests of cane in the United States, at least about twenty in number, as the intention of the publication is to draw attention to the pests which are liable to be introduced into that country. Then the list is by no means complete, because since its publication other pests have no doubt been noted. There is, for instance, no mention of the "Cane-Grubs," which are such a serious pest in Queensland. So even with this long list of insects, we cannot say that we know all the potential sugar-cane pests.

It is not necessary to enlarge upon all the insect pests they have in other parts of the world where sugar is grown. A few references to the types of damage caused, the losses suffered, and the remedies employed, will be sufficient.

All parts of the cane-plant are subject to attack by certain insects.

Amongst the most serious pests of the cane are those which destroy the roots. The Cane-Grubs, or 'Hard-Backs,' of Australia, are a notorious example. In dry weather the canes shrivel when they are deprived of their roots. In wet weather they remain green and make an attempt to throw out new roots; but as they have no proper hold in the soft soil, they are readily blown over by strong winds, and the fields present a sorry appearance. It may be thought that there would be no danger of introducing a pest of this kind. But the danger exists. In Mauritius they have been unfortunate enough to introduce a pest, *Phytalus Smithii*, probably in the soil about rooted plants, from South America or the West Indies, and now they have to go to great expense in controlling it.

The adult insects are collected by hand during the night by labourers, who go about with a light to discover the beetles. The beetles collected are paid for on a sliding scale, depending upon the degree of abundance or scarcity of the insects. To check the spread of pest, gangs of labourers are engaged on the boundaries of the infested areas to collect the beetles at night. The funds for carrying on the work are found by those engaged in the production of sugar, being raised by an export tax of two cents per 100 kilos of sugar exported. In addition, it is

compulsory to dig out the larvae from the ground when they become too plentiful. The expense of picking grubs from the soil over a large area can be imagined.

Other serious pests are those which bore in the stems, mostly the larvae of moths or beetles. They not only reduce the crop, but also its value. There is considerable risk of introducing borers in seed-cane. Inspection is a useful safeguard, but not an absolute safeguard. Large open burrows are easy to detect; but when the small insect has recently made its way into the cane, the hole it enters by is so small that it can be easily overlooked. Then there is the possibility that eggs are present.

Some insects devour the leaves of cane, as, e.g., numerous caterpillars, locusts, etc. Seed-cane is often imported with the trash on, or growing plants may be imported, and so various pests harbouring in the leaves can get admission. Even if the trash is removed, eggs may still be present on the cane.

There is a family of insects which live by sucking the sap of plants or the blood of animals, and amongst these we find very important cane pests. This is the family of the bugs, aphids, and various hoppers. They are amongst the most difficult insects to control, as almost the only way of killing them is by touching them with some contact spray, and this, apart from the question of expense where large areas are concerned, is often impracticable, as the insects may be too active to be reached by a spray, or they be hidden under the foliage. Amongst them, too, are those most likely to be introduced, as some lay their eggs in tiny punctures in the cane, easily overlooked in the inspection, and not likely to be affected by the poisonous fumes in fumigation.

Amongst other insect pests may be mentioned those which destroy the buds or eyes, which burrow into the roots and which mine in the leaves.

That the insect pests of sugar-cane in other countries are not there of as little consequence as those we have in South Africa is shown by the measures growers employ to keep them in control.

Digging out the grubs and collecting insects by hand have already been mentioned. In Australia, besides collecting by hand, the destruction of trees in the neighbourhood of cane-fields, on which the adults of the cane-grubs feed; the distribution of disease spores and parasites; and ploughing in of arsenic have been recommended. In Hawaii, the removal of the lower leaves and spraying the worst infested fields have been advised against the Leaf-Hopper. Putting out traps of split cane, to which insects are attracted and where they are collected; the use of a hopper-dozer, which is dragged between the rows, and on which the insects are caught on a sticky material or in oil; poison; baits; light traps; and the collection of egg clusters, are other measures which assist in reducing certain sugar-cane pests.

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For some insects the infested stalks have to be cut out and destroyed. Others require the old stools to be dug up and burnt. Flooding the fields with water and keeping them submerged where the conditions allow of the treatment, or injecting carbon bisulphide into the soil, is recommended against another pest.

Though in many cases the remedies are not applied over the whole estate, but only to the worst infested fields or to those which are just beginning to be infested, still it is evident what trouble and expense people in other countries have to go to control their pests. And it is not a case of doing the work one year and having done with it, but every year the grower must keep up his control measures. He can never hope to eradicate the well-established pests; he can only keep them down. The breeding and distribution of parasites have been employed against several pests, and many sugar-growing countries spend considerable sums of money in the search and introduction of parasites for their cane-pests, a liability South Africa is fortunately not yet subject to.

Experience has shown that the danger of getting serious pests in introductions of sugar-cane is not merely imaginary. The Brown Hard-Back Beetle has been imported from America into Mauritius, the Sugar-Cane Leaf-Hopper from Australia into Hawaii. The Hawaiian Sugar-Cane Borer, a very serious pest, is now found in the greater number of sugar-growing countries. Certain species of Mealy Bugs are found widely distributed in the world, in many cases no doubt carried on importations of cane. When I add that many of the pests of sugar-cane are likely to infest maize, another important South African crop, I think I have said enough—without referring to the diseases of cane liable to be imported—to convince everybody that there is no need to take risks with uncontrolled or unnecessary importations of sugar-cane.

DISCUSSION.

Mr. Lester remarked that one of the insects seemed to like the trash, and that would appear to be a strong argument for burning the trash.

Mr. Rapson stated that he had a block of cane attacked by an insect pest. In one particular field cane had been growing for three months, and as a result of the attack of the insects there was not a visible sign of greenness. Mr. Van der Merwe was called in by him to inspect the field, and reported that the insects had reached a stage when they would do no more damage and might not appear again for

many years. That, continued Mr. Rapson, showed the necessity of having a man like Mr. Van der Merwe available.

Mr. Ladlau said that he did not think Mr. Van der Merwe saw sufficient of this particular grub. For about six months that particular grub had kept his cane down between the months of May and September. His neighbour went so far as to burn his trash because the grubs were polishing off the new cane, and he was alarmed. Mr. Ladlau was on the point of burning his trash also, but decided not to. The result of the attack of these grubs was that cane cut in October grew before the cane cut in May. If they were to be subject to this sort of thing, it would be necessary to cut their cane later than May.

Mr. Van der Merwe, in reply, stated that he could only judge from what he saw on the field at the time; they were full grown caterpillars, and he could see that they had finished feeding. It was essential that they should know all about these insects; we all had a great deal more to learn about them yet. As a general rule, when it is so bad that people notice it, the parasites have got the better of it. If the planter finds they are going to continue doing damage then there are remedies that can be employed. He would be glad to hear from anyone who finds the grubs seriously attacking their cane.

Capt. Greig stated that he had also suffered in the same way as Mr. Ladlau with these grubs. From July to September were the worst months, and he had found that by disturbing the trash and moving it away from the cane it had a very wonderful effect, because, particularly in the early morning, swarms of little birds were to be seen digging the grubs out and eating them.

Mr. Jelley asked whether the Government were making any provision against locust attack on cane in Natal in case they came down here.

Mr. Van der Merwe replied that under the Agricultural Pests Act certain regulations existed for the control of locusts, and applied over the whole of South Africa. People up-country had been complaining a great deal about locusts hatching. It was the duty of every owner of land to report when the eggs were laid, and later to destroy the hoppers as soon as they came out.

Mr. Piccione stated that he was troubled not with insects but huge monkeys, which did considerable damage to his cane, last year having destroyed about twelve acres. He wished to know whether Mr. Van der Merwe could advise him how best to get rid of them.

Mr. Van der Merwe replied that he was afraid he could not give any new remedy. The usual methods were to erect suitable scarecrows in the fields, poisoning, trapping, etc.

The Chairman, in thanking Mr. Van der Merwe for his paper, stated that a great many of the members had probably got a different opinion than they

had at the beginning of the Congress of the personality of the average Government expert. They perhaps thought he was too much of a pundit to worry about their troubles, but it was found that they were all intensely human, and asked for nothing more in their work than to be acquainted with our troubles. It was very pleasant to find that this was so.

Planters' Practice in Cane Agriculture.

(Paper by Capt. F. E. CREIC, Umhlali.)

It was with great trepidation that I received a request from the Secretary, Mr. Eadie, to provide a paper on "Planters' Practice in Cane Agriculture." I fully realised the great compliment which was paid to me, but at the same time I cannot claim to be anything but an ordinary planter, although I try to improve my methods year by year, and produce the best possible cane which my farm is capable of yielding. I do not, therefore, set up to be an authority, nor do I wish to be guilty of any impertinence in setting myself up as one capable of instructing my fellow planters. At the same time there are results of experience which come to all of us from time to time, and knowledge applied to methods, which perhaps come to some of us more than to others, and it is these plain results of what I might term successful experience which I have recorded in this paper in the hope that they may be of some service to planters, and provide food for discussion and thought at this congress.

My farm, which, as most of you probably know, is in the Umhlali district, is composed mainly of heavy black soil, consequently it is with that class of soil I am dealing in this paper.

Planting is undoubtedly the first operation with which the cane farmer has to familiarise himself, and the greatest care should be taken in the selection of cane for planting. My best results have been obtained when 12 to 14 months old plant canes have been used. It is my custom to plant only the best and the most robust of the canes, after removing the basal joints, and to lay the canes in the drills alternately base and top. One should always remember that as the cane remains in the soil for at least eight years, it is obvious that scrupulous care should be taken with the planting. I use nothing but plant cane. All plant cane should be handled most carefully, so that the eyes are not injured. In setting the plants in the drills it is best to remove all heavy clumps to ensure that the bed in which

the cane lies is in a nice friable condition. The plants are laid side by side in two continuous rows, the one distant from the other about 4 inches, and the drills are from 4 ft. 6 in. to 5 ft. apart.

I may say I hope to see the time when it will be considered a crime to plant anything other than plant cane.

At the time the cane is planted the soil receives a dressing of from 400 to 500 lbs. of fish guano and bone meal per acre.

Without doubt the best months in which to plant are October and November. Sometimes cane is planted later than December, but the only consolation lies in the fact that the seedlings are in the ground. Late planting is never really satisfactory, but the majority are influenced by the late rains.

It is a very important thing never to plant the canes too shallow. While they must not be buried too far under the surface, they must also not be too near the top. When planting during a damp season and on a humid day, only a very light covering is necessary, but when planting in dry weather the plants should be covered up fairly well. They should at least be covered sufficiently to keep the air out. If a drought occurs it will probably dry up the cane seedlings.

The very greatest care should be exercised in the selection of fertilisers, so that the best results may be obtained from the soil. The question of price should not come first. Our great aim should be, by every means in our power to maintain our soil in as normal a condition as possible, and to endeavour to give back to it the plant foods that have become exhausted by long ratooning. No one can say with certainty that this fertiliser or that is the best for your soil, but fertilising experts, having scientific knowledge, can help us with their advice, and prescribe for our soils a useful tonic. What our soils