THE MECHANISATION OF AGRICULTURE AS APPLIED TO SUGARCANE CULTIVATION

By W. L. FIELDING.

Thousands of years ago our ancestors fed on the natural flora and fauna of the earth. Then man commenced tillage of the soil, the cultivation of crops and the domestication of animal species. Early cultivation was done with crude hand tools operated by human energy. Eventually men tired of these slow, laborious processes and harnessed the animal to draw their crude implements of tillage.

It is remarkable that this era of tillage by means of the draught animal lasted from prehistoric times until the last century, before man conceived the idea of attempting to sow and reap crops by means other than that of the human hand. To-day we are moving towards an era of total elimination of human muscular effort in the production of food. Yet it was only in the 18th century that Jethro Tull built a drill for sowing seeds in rows. The planting of row as opposed to broadcast crops made possible yet another advance towards elimination of human effort; it brought about the partial replacement of the hand-operated hoe by the mechanical cultivator.

During the 19th century attention was almost entirely devoted to harnessing animal power to perform operations formerly done by hand. This was far more difficult than the mechanisation of haulage of farm implements and vehicles. From about 1880 to 1915 farming in Europe suffered bad times and there was little interest in the development of farm machinery. The demand for food, and man-power shortage on the land in World War I, gave a new impetus, and the age of the tractor was born. This application of the internal combustion engine swiftly replaced the Fowler steam engine and cable method of plough haulage, which was the only replacement of the animal for draught haulage of implements available up to that time.

In no sphere of human activity is the proverb "Necessity is the mother of invention" more applicable than in agriculture. So to-day there are farms where human muscular power is never used in the production of cereal crops; the evolution of the combine-harvester, delivering grain into tank lorries, of drying plants and of sack-loading devices has been the outcome of the necessity for economising in man-power during World War II. Cereals are the most important group of foodstuffs, but sugar is of great importance as an energy-creating item in the human diet. The development of machinery for planting and harvesting sugar beet crops has made some progress. Mechanical planting of sugar beet has not presented a very difficult problem, because the seed is small, as with cereal crops. The bulky nature of the beet, its inconsistency of size and the necessity for separating adhering soil and foliage, has made the solution of mechanical harvesting more difficult to solve than with the cereals. Problems of mechanisation in the sphere of sugarcane cultivation are more difficult to solve than for cereals or sugar beet. The vegetative propagation of cane entails mechanical planting of bulky "seed" (setts); the produce to be harvested and transported is extremely bulky and, according to the methods used, is contaminated with varying degrees of dead foliage (trash), soil and shoots, which must be contended with by the harvesting machinery and the factory; and the ploughing-out of old ratoons presents special problems in land preparation.

Mechanisation in Sugarcane Industries.

The world's sugarcane industries for long depended on the employment of cheap labour in the tropical and sub-tropical regions where cane is grown. World economic factors have disturbed the equanimity of the labour scene in first one sugar industry, then another. Once again necessity has been the mother of invention. In Hawaii the labour shortage has been acute for a long while. During World War II it became extremely so, as half the plantation workers were drawn into the armed services or accepted more lucrative defence jobs. This resulted in the evolution of the extremely drastic harvesting methods to which I refer in a later section. It also resulted in sound planning.

Planning in the Hawaiian Islands.

Sterniman[16] describes the progress of events in the Hawaiian Islands. As early as 1916 the H.S.P.A. established a mechanisation committee, which reported on all aspects of mechanisation of the agricultural phase of sugar production. Developments continued till in 1945 the programme was crystallised into one integrated research department and established on the grounds of the experiment station which had been started by the same group of planters fifty years previously. At the same time the Hawaiian Sugar Industry, jointly with the University of Hawaii, have established an agricultural engineering institute at the university. The programme is designed to produce an eventual reservoir of skilled men for design, construction, supervision and maintenance of complex machines for the sugar industry.

Other countries where economic circumstances have forced development in mechanisation are

Louisiana and Queensland. In South Africa, study of the labour situation brought about by the expansion of non-food producing industry after World War II caused the sugar industry to conclude that, as far as possible, mechanical implements must take the place of hand labour. Native labour in towns and factories can earn more money than on the land and is attracted by fixed working hours and a more sophisticated existence. The position is not acute, but it is thought that it may one day become so. Meanwhile, the sugar industry has commenced active investigation of mechanisation problems. In 1946 A. D. Goble[8] summarised the position in a paper read to this Congress, and concluded that mechanisation was possible on the Natal sugar farm, but that a great deal of study and experimentation would be required first.

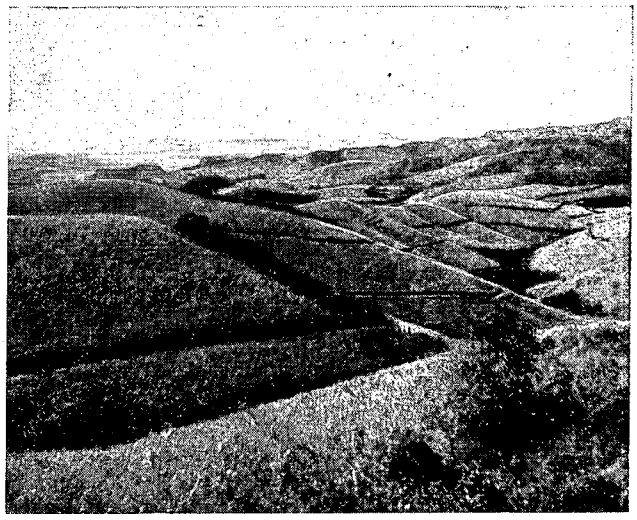
In this paper I have set out the plans and early achievements of South Africa in mechanising the sugar farm. The references I have made above to the success achieved by man in the mechanisation of crop production in general, in such a short space of years, is encouragement for the belief that success will be achieved in mechanising the agricultural phase of sugar production in Natal.

Planning in South Africa.

A start was made with survey tours of the South African industry by W. F. C. Jex and O. Pearce, acting under the direction of Dr. H. H. Dodds. These men studied conditions in the Natal sugar belt and reported on various approaches to mechanisation achieved by individual planters and companies at that time (1946-47). Both surveyors are members of a mechanisation directorate which subsequently evolved partly through the outspoken expression of opinion by Mr. Pearce. W. F. C. Jex[11] has since made an extremely interesting practical contribution to mechanisation literature.

A Mechanisation Sub-Committee of the South African Sugar Association was established in April, 1948, with wide powers for the collection and distribution of information culled from overseas and national sources. The administrative section of this committee was established by the appointment of a secretarial and publicity bureau from within the Sugar Association's organisation. The appointment of an agricultural engineer, acting in collaboration with the senior agricultural officer of the Experiment Station, has made it possible to devise and carry out suitably designed field tests of machinery under strict supervision. A consulting engineer now works in close co-operation with these investigators, advising on the engineering aspects of modifications which the field tests may indicate to be desirable.

The members of the committee are themselves closely associated with sugarcane culture. Further, the opinions of growers throughout the industry are constantly sought, especially during field demonstrations and at meetings where films depicting various aspects of mechanisation are exhibited to give publicity to available machinery and to promote discussion.



An example of the steep hillside which composes a small percentage of the land under sugarcane in Natal.

In order to plan soundly, the committee found that it needed definite information on the terrain of the Natal sugar belt, on sizes of estates, daily deliveries of cane to the mill, the percentage of planters conserving trash, and so on. A questionnaire was distributed to growers (excluding miller-cum-planter companies and Umfolozi), and the information obtained has been ably analysed by Lloyd.[12] I will only illustrate the importance of this survey by citing one or two facts. 63.0 per cent. of the industry's cane is grown on flat or sloping ground, and very steep hillsides inaccessible to tractors have now almost gone out of production, being only 6.9 per cent. of the total. 78 per cent. of the farms analysed vary in size up to 500 acres under cultivation, and 83 per cent. of these farms deliver from 0 up to 40 tons cane per day—at once a basis for assessing the required capacity of harvesting machinery. 61 per cent. of these planters conserve trash, whilst 17 per cent. partly burn and partly trash.

Research and Practice.

Culpin[6] concluded that the solution of the many practical cultivation problems can only be achieved by co-operation between farmers, agricultural engineers and agricultural scientists. A general summary of the discussions at the 1937 conference of leading farmers and scientists on mechanised farming, at which Culpin spoke, concludes :—

"There is an obvious tendency for research workers to regard any example drawn from practical farming as a particular case unsupported by exact evidence. There is an equal tendency for the farmer to regard the result of any experiment as

something which has no connection with real farming; and only discussions on common ground can reconcile the two points of view."

Of this sage conclusion we, the scientists, and the industry for whose benefit we strive, may well take note. So often, perhaps, we, the scientists, tend to disregard "extraordinary instances" of treatment effects recounted by observant farmers which may lead us to new discoveries; whilst the farmer tends to regard as impractical our small plots which, arrayed in randomised formation, so often lead us to a correct generalisation because our methods have eliminated experimental error.

The force of my foregoing remarks will be more apparent in the consideration of the present position and achievements in the sphere of mechanisation of the Natal sugar industry which follows. I hope that my remarks will stimulate argumentative discussion.

Land Preparation.

Ploughing. Every eight years or so, old ratoons have to be ploughed out, and the land prepared for a new cane crop. If the planter conserves the trash of his last ratoons, the first problem is the ploughing-in of this mass of dried foliage and the ploughing-out of the old roots. For those farmers who believe in a long fallow of six to twelve months, under green manure (velvet bean or sunn hemp), must be added the rider problem of ploughing-in the green manure crop. The difficulties vary according to the yield of cane, the thoroughness of trashing by the cutters, and the soil texture.

A tandem cover-crop disc breaking down rough ploughing after ploughing-out an old ratoon. This implement is serviced when it sets out at dawn and again at mid-day. Maintenance of implements is very important.

Pre-cutting of the trash mat or green manure crop with an implement such as an offset disc harrow is usually desirable before ploughing. The successful use of a reversible hillside disc plough is described by Fielding and Hall[7], but the invention of an implement which will cut through the trash mat and plough, in one operation, would be a labour-saving advance.

It is conceded that conserving the trash of the last ratoon provides anti-soil erosion cover and a moisture conservation and weed-suppressing device during the period from cutting to ploughing. Much depends on the length of that period, but if ploughing can be done within a few months of cutting, one wonders if it is worth the struggle and expense of ploughing-in a trash mat ? An experiment to determine this has been set out at the Experiment Station this year. What is the real value of this last trash mat as organic matter and mulching material ? In contrast to the mat which existed on the soil surface after the plant cane and earlier ratoon crops which decomposed on the soil surface, it will, if ploughed-in properly, decompose beneath the surface and, presumably, utilise some nitrogen supplies in doing so. Nitrogen-fixation by an ensuing leguminous green manure crop is expected to make up for this. But does it ? There is no exact experimental evidence to answer this question under Natal conditions.

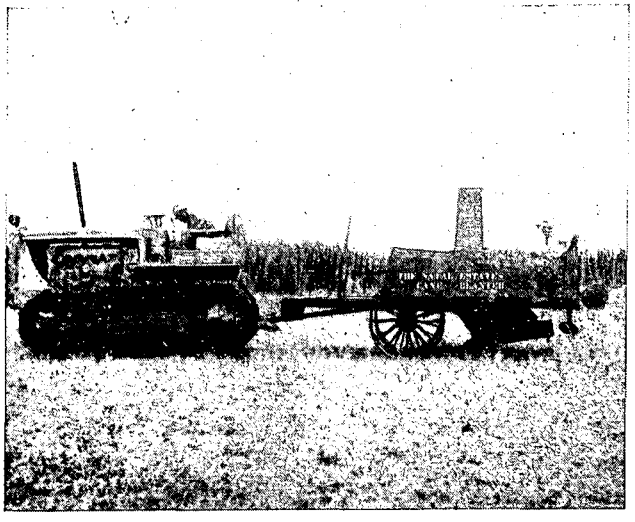
In any case, a considerable bulk of vegetable matter is returned to the soil in the form of old roots, and leaves and shoots if, as often happens, the latter have emerged before planting.

Close collaboration between the bio-chemist and field experimentalist in the investigation of this controversial question, burning versus conservation of trash at the last ratoon, would be essential before deciding whether it is worth devoting time to the perfection of implements for ploughing-in trash.

Discing. There is, of course, the controversial subject of the plough versus the heavy disc in land preparation. Is it really essential to invert the soil? Here again we have no conclusive evidence in the cane belt. Russell and Keen[13] concluded, after a six-year experiment in England, that ". . . the primary function of ploughing is weed control, and that it is only advisable to omit ploughing either if the land is already fairly clean or if the crop will be hoed very early on in its development." As far as the latter is concerned, mechanical cultivation of plant cane can begin even before the cane germinates, thus eradicating early weeds. Behne[3] describes an implement comprising a straight coulter, a middle buster, and two gangs of scalloped discs extensively used for ploughing-out stools in Louisiana.

Planting.

Considerable headway has been made in supplying the Natal sugar belt with both single- and double-furrow "Don" planters, built in South Africa on the lines of the Australian model but with modifications. The Mechanisation Committee has afforded this machine publicity at demonstrations and on films,



The Natal Estates' cane planter, built in the Company's workshops on a Ransome's ridger chassis, and powered by a D.6. Caterpillar.

with the result that 129 mechanical planters are now at work in the belt, whereas a year ago there were only one or two, mostly home-constructed planters.

The machines are at present hand-fed (drop type), but the evolution of mechanical feeding is bound to come. The manufacturers of the "Don" in this country are working on the problem, and the Mechanisation Committee recently imported a William "TR" cane planter from Cuba which has a neat mechanical feeding device installed. This machine, which is designed to operate in conjunction with a tractor hydraulic lift, is now under test in Natal.

Since in another paper Fielding and Hall[7] deal more specifically with the planting machine, there is no need to elaborate here.

Cultivation.

By cultivation, I mean weed control and the maintenance of soil texture in plant cane and ratoons.

Available means of weed control in plant cane are the hand-operated hoe and various mechanical contrivances. Also available are a variety of chemical herbicides.

Where the planter burns his cane the same means are available for cultivation of ratoons. Where he does not burn, but conserves his trash, the trash mat can, if left undisturbed, act as the cultivation and weed-suppression device. The trash mat is an outstanding natural contribution to labour-saving. Jex[1] claims that with a good mat only one old man is necessary, roaming the farm and removing the odd large weed that matures. And, if one examines the lower layers of the trash mat and the upper layers of soil, one often finds an extraordinary matrix of decaying trash, white with fungoid growth, riddled with the tunnelling of insects and covering a moist, friable soil with a network of young, food-seeking rootlets at the surface.

How much do we know of this, to me, amazing phenomenon ? Not in half a lifetime of research on many crops have I observed such a remarkable instance of a gift from the lap of nature's gods to the needy farmer. The trash mat conserves moisture, it suppresses weed growth, protects the soil from erosive influences of sun, wind and tropical downpours of rain and, in the ultimate, must contribute to the maintenance of soil organic matter. When a planter tells me that shortage of labour necessitates his burning, I feel that he is quite unconscious of his overall long-term loss.

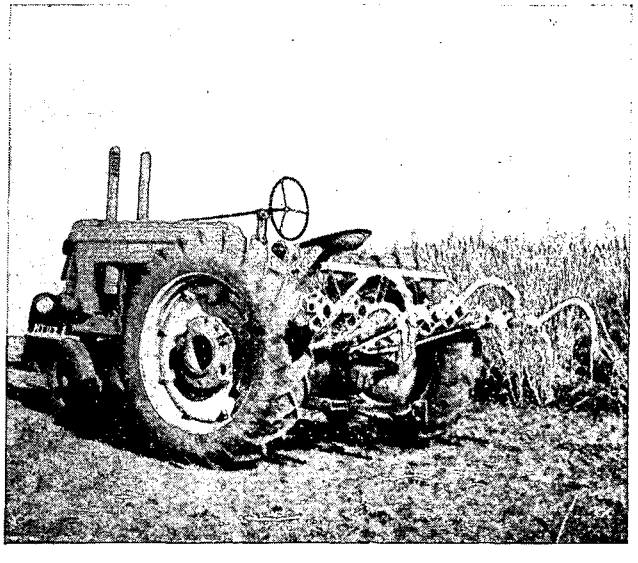
Figures for tons cane per acre of Co.281 ratoons on the trashed and burnt plots of a trial at the Experiment Station are interesting.

	1943. First ratoon.	1945. Second ratoon	1947. Third ratoon.
Trash conserved	61	49	41
Trash burnt	53	40	28

A point of further interest was that response to a complete NPK top-dressing was greater on the trashed than the burnt plots.

At the moment the Experiment Station has eight complex experiments in progress at different points in the sugar belt to investigate this question. The data, when they become available, will afford exact information of set circumstances. But we shall still know nothing intrinsic about micro-biological happenings within and beneath the trash mat. In a moment I shall refer to the application of fertilizers in relation to this question. It seems to me that herein lies a profitable field for research, only the fringe of which has so far been touched.

Now to return to the mechanical. Crowther[5] demonstrated that where weeds were allowed to



Three-row Abrahamson cultivation unit hydraulically operated on high-clearance tractor.

grow unrestrictedly up to two months after sowing, cotton was severely checked in its early growth and final yields were reduced by up to 30 per cent. He related this loss of crop to nitrogen uptake by the weeds. The botanists at Mount Edgecombe[4] in the course of a weedicide experiment have demonstrated the deleterious effects of weeds on the early production of shoots in sugarcane.

Jex,[11] a practical planter, has stressed the importance of fast effective weed control in young cane. Abrahamson[1] produced the nucleus of the mechanical means of achieving this rapid, timely control with tines fitted to the hydraulically-operated toolbar of a John Deere tractor, capable of inter-line scarifying at the rate of 60 acres a day. Jex has gone a step further, with modification to the hydraulically-operated toolbar of a Ferguson tractor, so that the implement achieves not only weeding of two inter-lines but of one cane line as well.

New developments on these lines are constantly studied; as are the developments in weedicide control. A reduction in the originally prohibitive price of these substances is a welcome advance towards their possible usefulness.

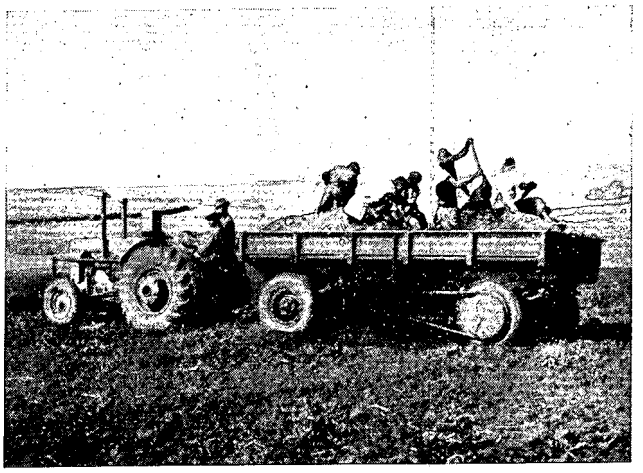
Application of Manures.

Various makes of manure distributor are available for general agricultural purposes. There is the simple machine which deposits a ribbon of fertilizer in the bottom of a shallow furrow. The "Don" cane planters have attachments which deposit fertilizer in the furrow with the cane setts. At the demonstration at Ukulu Properties[14] in May, 1948, home-made machines for broadcasting filter cake and raw rock phosphate were demonstrated.

At the last Congress, Sherrard[15] summarised the results of fertilizer experiments carried out over twenty years in Natal. These show that, by and large, phosphate is generally required in the furrow at planting, and that nitrogen is generally beneficial as a top-dressing in ratoons. Questions of phosphate fixation, of fertilizer placement, and of the relationship of fertilizers and organic manures and trash, have not yet been thoroughly investigated. The possible value of organic manures at high altitudes in particular, as suggested by some Eshowe area planters' belief in their benefits, has not been explored. We are aware of some of these possibilities and are planning their investigation.

A device which is being investigated is a machine for distributing crude Karoo manure, designed by the inventor of the already well-known Van der Watt self-tipping trailer.

One experiment at the Experiment Station has shown better results from applying nitrogen over the cane row, on top of a trash mat, than from applying a mixture of nitrogen and superphosphate in a shallow furrow in the exposed inter-line, where trash was lined. Other experiments indicate similar results but conclusive evidence from a range of experiments in progress will have to be obtained before definite statements can be made. Also, it is necessary to decide whether applying fertilizer on top of trash gives an equally good result as applying it on top of the soil, under the trash mat, the trash being replaced after the application of the fertilizer via a pipe leading from a bag, as is practised by one company. Perhaps there will be a useful role for a distributor able to broadcast fertilizer over the trash mat. The saving in labour costs would be considerable.



A device for broadcasting karoo manure or filterpress cake, in use at Ukulu Properties.

It is important for designers of machinery to realise that knowledge gained from experiments may necessitate changes in design or the invention of new devices for distributing manures.

Goldschmidt[9] states that in conditions where fixation of phosphate is high the fertilizer should be applied in the row, near the root system. This, of course, is achieved where superphosphate is placed in the furrow when cane setts are planted. He also draws attention to the fact that some legumes break down rock phosphate to obtain their phosphatic requirements; so that it might be useful to broadcast rock phosphate and lime with a machine before sowing a green manure crop. The latter, when ploughed-in, would return phosphate in organic form to the soil. The proper ploughing-in of a well-grown crop of velvet beans, a popular green manure crop, is not always easy. Is mulching-in with a heavy disc harrow satisfactory, or should one plough under after pre-treatment with a cover-crop disc harrow? There is scope, too, for the agricultural engineer to design the most economical and effective mechanical method of placing the green manure crop at whichever soil level experimental evidence shall show to be best.

Cane Harvesting.

The S.A.S.A. Mechanisation Committee is interested in facilitating the development of mechanisation in all phases of cane production. It has, however, concentrated its activities on the development of means of cane loading and transportation to the mill, because, whilst developments in general agricultural machinery have provided equipment basically suitable in Natal cane fields, no progress was apparent in the development of suitable harvesting machinery.

E. R. Behne[3] has written a comprehensive review of available harvesting machinery in important cane growing countries.

He describes the drastic rake and grab method of harvesting recently developed in the Hawaiian Islands, where a two-year-old tangled mass of 100-odd tons cane per acre is the usual thing. The urgency of the labour problem forced this method on the industry. The cane is literally dragged or plucked out *in toto* by a bulldozer-cutter and then, with all other surface material, loaded by grab and sent to the factory. This completely disorganised the milling work and necessitated the development and installation of cane-cleaning plants at the factories.

The degree of development of mechanical harvesting in Louisiana may be gauged from the fact that 400 mechanical harvesters and 2,000 mechanical loaders were in operation there in 1945, and machinery manufacturers were building new machines as fast as possible. Behne remarks on the co-operative attitude of the Louisiana growers; this spirit, although probably developed from sheer necessity, has been a big factor influencing the successful development of mechanical harvesting on the contract system.

Mechanical cutting machines are expensive units, sometimes costing in the region of £5,000. Although planter-cum-miller companies would be able to contemplate capital expenditure of this nature, for a machine of suitable design for Natal terrain, the private planter could only afford to use it on a co-operative basis with other planters. Behne's remarks on this subject are important, and I give them here because I think they are applicable to Natal.

> "The question may then be asked—Could not the contract-system be adopted, whereby one machine would be available to a group of farmers ? This is the obvious suggestion, but its application in Queensland is not very simple, for each grower desires to harvest his cane at peak of maturity and would doubtless be averse to having his entire crop completely harvested a few days early or late in the season to satisfy the economic requirements of the machines. It is clearly absurd to have machines of high inherent capacity running round the district cutting or loading a few tons for this grower and a few for that in accordance with present allotments."

Behne points out that there must be some very compelling circumstance before a sugar industry will change its methods and system of payment for cane in order to obtain the necessary co-operation amongst growers.

However, perhaps some ingenious brain will succeed in developing a cane-cutting machine capable of operating on sloping terrain within the means of the private grower's pocket.

In the Hawaiian Islands a good burn is regarded as an essential pre-requisite to mechanical harvesting. The climate there makes it possible to cut 24-months old cane all the year round.

In Louisiana all cane is mechanically cut in the leaf because at only 12 months old it is too green to burn effectively. Burning takes place on the ground when the leaves have withered, except in wet weather, when trash is inevitably sent to the mill. Behne's account of this cutting in Louisiana seems at variance with Hunter Freeman's[10] opinion : . . "If you intend to cut your cane 'green,' i.e. unburnt, then you can forget mechanical cutting altogether. I do not believe you will mechanically cut your cane 'green' with any machine yet known, and in my view you would be wasting your time to try and devise one." Hunter Freeman was presumably referring to the "Fairymead" harvester, which he says "will not cut green cane, unduly fallen cane, nor cane on steep hillsides."

If it became essential to adopt mechanical cutting in Natal, we should then be faced with a *volte face* where the policy of trash conservation is concerned. That is, unless the machine is equipped with a satisfactory trash remover, or unless the plant breeders produce a naturally self-trashing cane. N:Co.291, to be distributed to growers this year, is a cane possess-

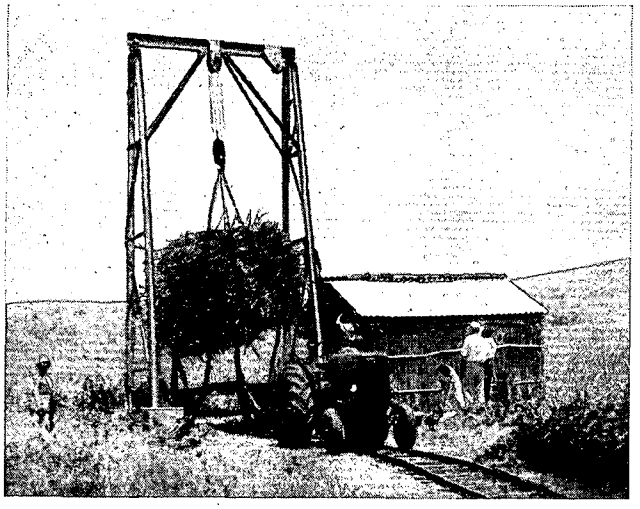
A trailer which dispenses with one handling, being loaded at the cane face and then hauled to the tramline in this Askew golovan trailer. A saving in portable track is effected. In the background is typical rolling terrain representative of a large area of Natal's sugar belt.

ing this potentially valuable attribute to a certain degree. Other desirable attributes in a cane variety suitable for mechanical cutting would be an upright habit, such as N:Co.349, another cane to be distributed this year, and non-lodging qualities.

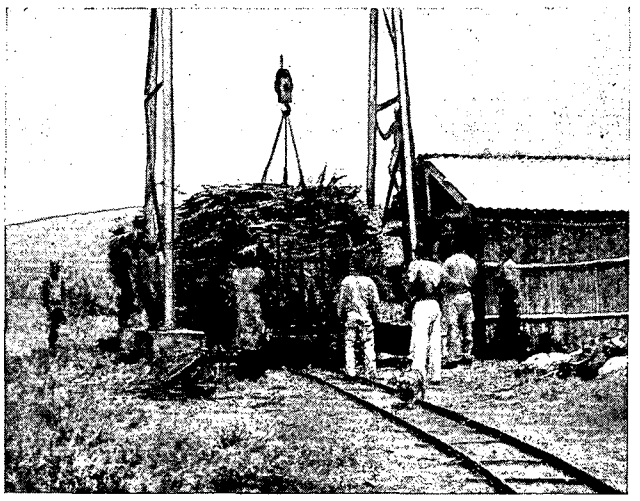
For the moment the Mechanisation Committee has concentrated on the evolution of loading machinery and relegated intensive study of the more complex mechanical cutter to the future, because the labour shortage is not so acute as to demand immediate solution of the cutting problem.

The aim has been the production of equipment within the financial range of the private planter and suitable for use on terrain of varying slope.

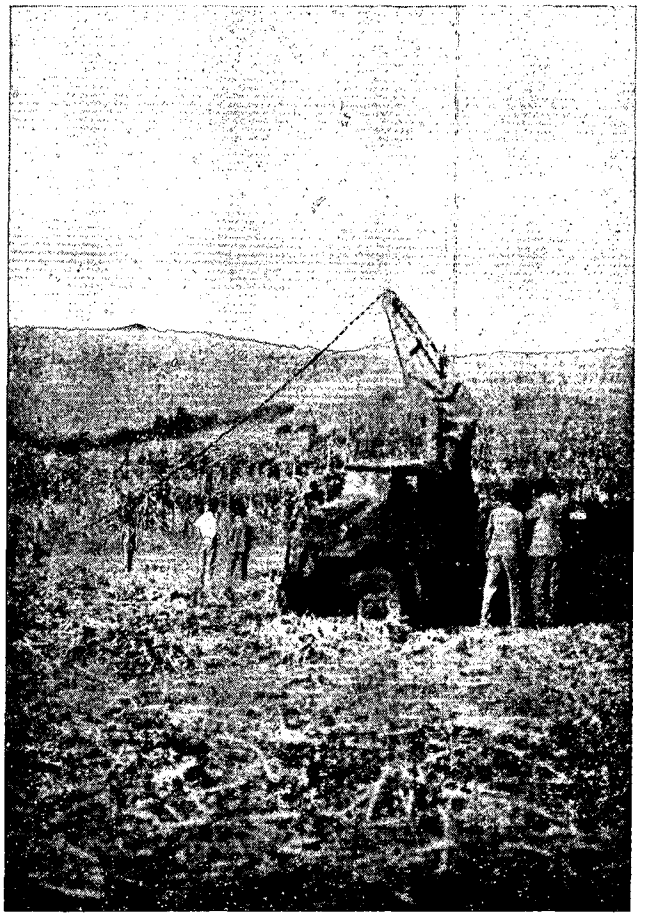
Abrahamson[2] describes in detail the development and capabilities of two such machines, the Van der Watt self-tipping trailer and the Thomas loader, both invented, modified, tested and to be manufactured in South Africa. The Van der Watt trailer will enable the small grower to cut and load three tons cane per man day instead of the two tons previously averaged; the Thomas is undergoing modification, which it is anticipated will enable the drag-line machine to load eight to fourteen tons per hour, according to conditions. It is likely to be particularly useful in hilly terrain where grades might be too steep for the Van der Watt trailer hauled by a wheel type tractor. A Castagnos grab-type loader for loading into mobile trailers on flat terrain was imported from the U.S.A., where, because of its efficiency and low price, it is very popular.



A van der Watt trailer discharging a 3-ton load of cane which is lifted from the trailer by a home-constructed gantry crane on the Jex estate. The crane is powered by a reconditioned Ford V.8 engine.



The three-ton load fits snugly into the golovan now drawn up under the gantry. The Jex estate is one which is laid out for mechanisation.



The first prototype of the Thomas drag-line loader.

It does not work satisfactorily on a slope, but its grab and winch mechanism is very efficient and the machine will be tested on flats again next season and for the purpose of loading from tramline to S.A.R. trucks.

The progress achieved in the evolution of inexpensive loading devices suitable for use in Natal will materially contribute to the solution of the labour problem for some time to come.

Conclusion.

The overall economy in labour made possible by the introduction of mechanical planting, cultivation and loading equipment can be regarded as a distinct achievement. It frequently happens that labour is more plentiful in the first part of the cutting season than in the later months, when, if early rains fall, some native labourers return to their reserves to plant food crops on their own lands. This depletion of the labour force occurs at an extremely inconvenient time, when the planter is cutting the last part of his crop, planting new crops and endeavouring to control the weeds in young plant cane; but with his "Don" planter, his Ferguson rapid cultivation unit, and his Van der Watt trailer, the planter who has learned to use these equipments efficiently can tide over this period of shortage, because fewer labour units will be required to carry out these overlapping operations.

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Experiment Station,
South African Sugar Association,
Mount Edgecombe.
March, 1949.

The PRESIDENT said that it was surprising, in a paper on mechanisation, to see mentioned the need for chemical research. He was pleased that the role of the chemist was admitted in such a paper, but he assured the author that chemists had not been idle in the matter of trash.

Dr. DODDS considered it very encouraging to see the interest now shown in mechanisation. The paper that he had read to this Conference two years ago on the subject appeared to him to fall somewhat on stony ground at the time; but interest in the subject generally had rapidly increased since then, and he thought that very largely due to the very efficient and energetic Mechanisation Committee of the Sugar Association. This country was a little late in adopting mechanical implements, but fortunately not too late. We had a little more leisure than a good many other countries before we would arrive at such an acute labour position as has already occurred in Louisiana, Hawaii and Queensland.

Mr. PALAIRET stated that those planters who said they had to burn because of the labour shortage, meant that they simply could not get the labour necessary for trashing. Burning was therefore forced upon them, even although they knew of the benefits of trash conservation. Where sufficient labour was available at cutting time and trashing could be done, he thought there was an overall saving in labour, due to less weeding being necessary, of about three units per acre. He believed that by leaving a blanket of trash the saving was far greater than was generally realised.

Mr. LLOYD informed the meeting that, among his various duties in the Sugar Association, it fell to his lot to become the Secretary of the Mechanisation Committee. One did not normally welcome additional burdens, but in the case of the mechanisation of the sugar industry he realised that there was a subject presenting such a wide scope, with no visible limits, that it presented an opportunity for a considerable degree of imagination, initiative and enterprise, and so he entered upon the work as secretary to that Committee with considerable enthusiasm.

Right from the beginning of the Committee's work, it was realised that it was confronted with a very difficult task. It was appreciated that the conditions then existing justified the small amount of enthusiasm shown in a conversion to mechanical methods. One of the first tasks was to pursue an intensive publicity campaign, designed to stimulate the interest, first of all, of manufacturers and importers of specialised machinery which could be adapted to the mechanisation of sugarcane production. This campaign was intended to bridge the gap and bring the manufacturer and the cane-grower closer together so that they could understand each other's difficulties, and it was the work of the Committee to try and guide would-be inventors and designers. To that end, a memoranda was prepared to serve as a guide to engineers, so that whatever they produced would comply with the specification required of any form of cane-growing mechanical appliances. On the other hand, it was necessary to arouse amongst cane-growers a growth of interest in the possibilities of the use of mechanical appliances, and it would be recalled that two demonstrations were held, one at Empangeni and one at Natal Estates. Films of these demonstrations were sent around, and reports and bulletins appeared from time to time in the Sugar Journal.

All this was part of the preliminary campaign, which the Committee now felt was almost completed, and which was designed to lay the foundation of a general interest which would be receptive of ideas,

and later on of the actual machines themselves, when presented to the industry. The Committee was now busy on the development side of its various ideas. One point he would like to make was that the Committee discovered very early on that it would have to rely almost entirely on the ingenuity of South Africans. A schedule was therefore prepared of some 80 pieces of equipment known to be in use in sugar-producing countries. This list was classified into different operations and then carefully examined by the Committee. Two of the Committee had had considerable overseas experience and knew most of these items, and were able to say that practically none of them would be of any use under our conditions. Now that was a very important point, because the original purpose for which this Committee was formed was to import agricultural machinery from other sugar-producing countries. That was quite clearly stated when a sum of money was voted for this Committee. When it came to discuss what machines to import, it was discovered there were practically none, and up to date only a Castagnos cane loader, costing £550, and a William "T.R." planter, costing £148, had been imported from overseas.

The Committee then had to switch its attention from overseas countries to our own local manufacturing industries, and it had to rely on our own inventors. That necessitated the creation of a field staff, consisting of an agricultural engineer, Mr. Abrahamson, a consulting engineer, Mr. Reynolds, and the field supervisor, Mr. Fielding, who between them formed a very efficient field staff, capable of examining and studying any ideas which were brought to attention. This field staff helped develop all known local ideas and inventions, and the papers presented to-day represented the achievement of the past twelve months. This he felt had been, in such a short period, quite satisfactory.

It was stated that two years ago we were casting our seeds on somewhat stony ground. He felt that we were still walking on very stony ground, in spite of the progress made, and there was a lot of very hard, uncomfortable ground ahead. That was due to cane-growers as a body being inherently conservative and very reluctant to change their ideas, and also naturally reluctant to spend money on new machines, which so far had not yet actually proved themselves. The majority of cane-growers preferred to wait and watch the efforts of others in the use of mechanical appliances, and they were reluctant to change their existing systems. Every grower had transport for moving cane from the fields, and to buy a Van der Watt trailer would necessitate perhaps disposing of either mule wagon or tractor-trailer, or perhaps even a lorry, and buying a trailer. That was a matter which required the grower's careful consideration; and furthermore, the method of transferring cane from the trailer into other transport also required careful consideration and planning. All this required the grower to make a big decision. That is why, he said, the Committee still had stony ground to cover in interesting the grower in the use of this machinery and encouraging him to be enterprising in investing his capital in mechanical appliances as they become available.

Mr. FIELDING, in reply to Mr. Palairet, admitted that many planters were forced to burn because of labour shortages. A very large portion of the cutting season overlapped the time for planting and early weeding of the cane however, and by using the new devices, particularly the planting machines, saving of labour would allow more to be used on cutting.

He would like to refer to Mr. Lloyd's stressing the fact that imported machines were not judged suitable for South African conditions. That was only partly correct, for there was, for instance, the "Don" planter, which has been successful in its original form as imported. It was not possible to import this machine in large quantities as Australia could not supply, and that was the reason why it was now manufactured in this country. The local agents had, of course, brought about a lot of improvement. Other instances were the "Ferguson" outfit, and the "Caterpillar" and "International" tractors.