

Problems of Cane Transportation.

(Paper by Mr. T. A. WARNER, Umhlati.)

Among the many factors which have to be considered in deciding whether cane can be economically produced, that of transportation to the factory is by no means the least important.

This applies to all countries, but owing to the configuration of the ground, especially to South Africa.

It can be assumed that any system which would reduce the costs of getting cane to the mills would not only help to relieve the financial strain on those already growing it, but would help to widen the sugar belt and so allow the industry generally to expand.

The Secretary has impressed on me that brevity is not only the soul of wit but is essential to any papers to be read here, so I will not take the usual course of first going through the practices in other countries, but confine myself to local conditions.

As far as South Africa is concerned, the only forms of transport worth considering are by railway, trams and wagon. Water transport I do not think is in any way practicable in this country. The other three methods have their distinctive features.

Like many other South African industries, sugar has been to a great extent built up by the help of the good old "trek ox," and he is still an important factor. In the past, with cheaper lands and larger margins between cost of production and cane prices, the farmer could afford to keep quite a large portion of his ground for grazing, but present-day conditions make it imperative that both in tons per acre and acres under cane he must strive for the absolute maximum if he is to make a living. Therefore his grazing area becomes more and more restricted, and I think it is reasonable to suppose that we will eventually be forced into conditions similar to those already existing in Mauritius and other countries, where the animals are stall fed.

Stall feeding costs money. The position even today is that on the South Coast wagon transportation of cane has almost ceased, and the North Coast is in a transition stage. Bound up closely with the question of transportation, is that of the handling of the cane, and I am going to treat them in conjunction.

An ideal system is one in which the cane is not handled from the time it is loaded in the field until it is put into the carrier. Every additional handling means increased cost and generally waste of cane. This cost is either directly or indirectly always borne by the producer.

After some 25 years' experience, my opinion is that up to one mile radius from the mill wagon transport is the most economical. From one to ten miles, trams or light railways. Over ten miles, railway. These figures would have to be modified to meet special conditions, especially where the country is very hilly or large rivers have to be bridged.

I have already dealt with the grazing difficulty; this practically controls the wagon system. Its advantages are that the field loading is made easy because the wagon can be brought close up to where the cutters are working and so eliminate a long carry. On the other hand, in wet weather the cutting is often seriously interfered with, if not stopped altogether; fields are cut up by the wagons and the mills held up for want of their regular supply of cane. A further objection is that under present methods there is a considerable loss both in the mill yards and at the railway loading sidings; cane is dumped all over the place, and a large percentage (in some cases up to 10 per cent.) is destroyed by the animals and wagons.

Railway transportation for long distances is unfortunately necessary, but under present conditions it is carried out at very heavy cost for the following reasons:—

Firstly, it always means the cane has had at least two handlings. Secondly, the railway trucks provided are most unsuitable. Even the railway authorities are at last beginning to recognise this, and I am glad to say are making an effort to improve them.

Thirdly, an enormous amount of labour is required, under the present system or rather want of system, to deal with the truck loading each season. Not only is this labour gradually getting more expensive, but is sometimes very difficult to get, with the result that other work has to suffer so as to provide the loading gang.

The mills rather like railway trucks to deal with in their yards; most of them are well equipped to transfer the cane mechanically from the truck to

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the carrier, but how many of them know what their inversion losses are owing to the length of time it takes to get the cane from the field to the carrier.

Savings could unquestionably be made in this branch of transport.

- (1) By a more equitable railway rate.
- (2) By providing a more suitable railway truck.
- (3) By using suitable mechanical loading appliances.

Hoists are made to cover almost any range of work and at corresponding cost.

The objection to mechanical loading at present is that with the railway trucks we have it is very difficult to get more than 15 to 16 tons on a truck—that is with the cane loaded loosely. The Government charge on a minimum load of 22½ tons.

If we add losses in delays waiting for trucks, cane lost in transit, etc., to the actual labour costs, I doubt if the loading at present is done at less than 7d. a ton, or at least £30,000 per season; this just for loading.

In Australia, in spite of high wages, I have seen figures showing that this work is done for ¾d. per ton, but all the cane is handled mechanically into suitable trucks, their average load being 16 tons per truck.

I have left the other method, namely, trams, to the last, as I am sure that within quite a short time most of the cane crop will be handled by this means.

The soundest theories in practice often depend on due regard to detail.

Tramways, properly constructed, using the most suitable rail, truck, engine or animal haulage for the work to be done, can not only be extremely economical but make the cutting season a pleasure.

Tramlines badly constructed, with heavy grades; sharp curves, unsuitable trucks, engine out of balance with the permanent way, etc., are not only costly to run but will drive the average person to the verge of lunacy. You have not to travel far through the sugar districts to see good examples of both.

In designing and laying out a tramway system, the controlling factor is the quantity of cane to be moved per day. Like most other industrial undertakings, a tramway only reaches its highest economical efficiency when it is doing its maximum amount of work. Therefore the tonnage to be moved will decide whether the capital to be spent on earthworks, bridges, etc., is a sound investment, and, if so, what kind of haulage is to be used, power or animal, and this again fixes the weight of rail and general equipment.

To get to the ideal where the cane is not handled except in the field and at the carrier under a tram-

way system is very simple. Assuming a fairly large tonnage of cane to be dealt with, it would be something as follows:—

One or more main line tramways radiating from the centre (mill or loading station). These lines would be laid for engine power, with rails of not less than 25 lbs.; with the best possible grades, none of which under any circumstances should be steeper than 1 in 40; curves of nothing sharper than 150 feet radius; reversing stations being studiously avoided.

It is false economy to stint capital on these lines; the best possible should always be aimed for, and pays in the long run.

An engine hauls just twice the load on a 1 in 80 grade that it does on a 1 in 40.

It should be hardly necessary to point out that wherever possible gravity should be used to take down the full loads. Nearly as important as the main lines are the branch or feeder lines. It has been found that the economic limit to carry cane by hand is 100 yards. Therefore the field lines should be 200 yards apart.

These lines entirely differ from the main lines. The engine does not work on them, and 14 lb. rails with metal sleepers are put down just to carry the trucks.

Earthworks are as light as possible, and although grades should still be not steeper than 1 in 40, curves may be sharper and reversing stations may be used.

In many cases, if properly laid out, these lines can be put in with one continuous down grade, so that animals are only used to bring up the empties, the full trucks gravitating to the main line.

The lines are laid in a temporary way, and as soon as the cane is cut out in one section the line is moved to another.

It is surprising what a large cane area can be dealt with by a mile of portable track in the course of a season.

The earthworks for the field lines, although as light as possible, still cost money to construct, but if care is used when ploughing out old fields not to disturb them, the first cost is practically the last.

The most important thing in the proper use of field lines is the class and carrying capacity of the trucks. On long lengths of main line haulage, granted the bogie truck of 4 to 6 ton capacity has some advantages, but as soon as the question of the field lines is considered they are not at all suitable.

To use main line trams without the light field lines is to throw away half the advantage of a tramway system. The cane has to be double handled and animals and wagons used in the fields.

I consider the 2-ton basket truck is the most suitable in every way, possibly under certain conditions a 1-ton truck might even be better.

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The use of the 2-ton truck has another very big advantage. It gives much better control over the cutters. Taking the usual task of one ton of trashed cane or two tons of burned cane per unit, it is a very simple matter to check each man's work, and the offer of a bonus for all cane over the task cut is a big inducement towards efficiency.

The initial cost of a tram system with its complement of engines, trucks, etc., is certainly considerable, but if the lines are properly constructed, especial attention being given to keeping grades as flat as possible, and care taken to keep the rolling stock properly lubricated, the life is a long one.

I will give you some running costs of various systems:—

(1) This is a small line, $3\frac{1}{2}$ miles long, owned and run by farmers, the loads gravitate to the mill, and animals are used to haul the empties to the fields.

The cost per ton, including maintenance, renewals, and interest on capital invested, has for the last two years worked out at 1s. 6d. per ton. The line at present only handles about 100 tons per day, but when it is working at its full capacity of 200 tons per day, as it shortly will, the total cost will certainly not exceed 1s. per ton.

A farmer on this line with an average distance of four miles to move his cane, handles the whole of a crop of 4,000 tons per season with ten mules, and then they are occupied only half the day on this work.

One of the planters using this line contracted for the transport of his cane by wagon three years ago. The price he paid was 4s. 3d. per ton.

I do not suggest that this is a model line, not by any means, but I think, considering the line was built when material was very expensive (about double what it is to-day), it is a fair sample of what the costs should not exceed for a line of this kind capable of handling up to 200 tons per day. I should have mentioned that each farmer has his own field lines, the cane is loaded direct into 2-ton basket trucks.

(2) I am glad to be able to give you the following figures, taken from the very well-kept books of one of our largest estates. I might state that this is one of the most difficult estates to work tramlines on in the whole sugar area. The ground is extremely hilly, and still by good management and perseverance it has been brought to such a state of transportation perfection that not a stick of cane reaches the mill except by tram, or is it double handled.

Dealing with 100,000 tons of cane last year, with engines on the main lines and mules on the branch lines, the crop was handled at a total cost of 1s. 4.52d.

per ton. This includes the cost of lifting and relaying the branch lines, equal to an amount of about 4d. per ton.

(3) An estate with lines up to seven miles long, using mule haulage, did last year's crop—also including cost of relaying branch lines, at a cost of just under 1s.

(4) Another estate, using ox haulage but on very easy country, did the crop at 9d.; this again including the laying of field lines.

I would like to express my thanks to the various estates who have so kindly allowed me to use their figures.

Noel Deerr, in his standard book on cane, gives as an inclusive cost for tramline transport 3.2 pence per mile. My experience is that this is a very reasonable figure.

It may be argued that to lay out a system of tramlines means calling in a technical adviser, which is expensive.

Although I think it would always pay to get a technical man to lay out the general design and main lines, there is no reason why all the branch and field lines should not be laid out by the farmer himself. With the help of a grading plank and a little intelligence he can easily do all this work.

There is one subject I would like to raise now, and that is the question of a standard truck. Admitted that some estates are still wedded to the large bogie truck, there is no reason for there to be more than two standard trucks throughout the industry.

A representative of one of the largest importing firms of tramway material, when discussing costs with me lately, pointed out the large assortment of spares they have to carry. This means money out of pocket to them, and naturally more cost to us. Fortunately the 2-ft. gauge is practically universal, but otherwise there is a tremendous range; diameter of axle, axle boxes, wheels, couplings, brakes, etc., etc. Mass production, the Americans have taught us, is the secret of minimum costs. I am sure that if the persons interested in tramways were to get together, in a few hours they could agree on a standard design, and if the manufacturers were assured that the industry was going to use that truck only in the future, the suppliers would be able to quote a very much lower price than they can under present conditions, not only for trucks but also for spares. I have paid up to 7s. each for small orders of brake shoes, the reason being cost of making pattern, etc.; if these were turned out in bulk I am sure we would get them at half that price or less.

With the tendency for the mills to increase their capacity, the question of the transportation of the canes becomes more and more acute.

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Looking to the future, I think tram lines will gradually be used to serve the mills up to their maximum economic radii. Outside this the cane will be carried by trams to railway centres and reloaded on to railway trucks. The weak point at present is the transferring of the cane to the railway truck. I have tried to show you what a big drain on the industry this is. Possible improvements that suggest themselves are:—

(1) Mechanical loading. This must come.

(2) Whether the system of loose loading cannot be got over by bundling the cane in the fields in suitable slings, and the cane remaining in these bundles till fed into the carrier.

In other countries a matter of hours is considered important in transporting canes from the field to the mill. When the manager of one of our largest mills, in a district where canes are generally burned, tells me he thinks something between three and four days is about the average time which elapses from the time the cane is burned until it is crushed, I think you will agree that there is room for improvement in our transportation methods in South Africa.

DISCUSSION.

Mr. G. S. Armstrong considered that they should all be very grateful to Mr. Warner for his excellent paper, and that every planter must realise that the time has come when economy must be gone in for, and the only method was that laid down in Mr. Warner's paper. So far as the company which he (Mr. Armstrong) represented was concerned, they have adopted the small truck on 28 miles of tramline. He mentioned that the method of mechanically loading railway trucks, as suggested by Mr. Warner, was being carried out by one of the planters in the Empangeni district. That man to-day is the heaviest loader of any planter in the company's concession. He loads into chains and it is transported in bundles into the truck and down to the mill. He has put up to 36 tons of cane on an ordinary S.A.R. truck, which was not the correct truck for the purpose.

Mr. Armstrong stated that he had tried for years to get the railways to provide a reasonable truck for the despatch of cane, and he believed that something in this direction was about to be done. The method of transporting cane in bundles and chains was very suitable, and there was no chance of cane being lost on the way down. The only difficulty just now was to return the chains to individual planters, but if all the planters were using the same thing there would be no difficulty at all. The paper which had been read ought to help the planters considerably, and he hoped they would weigh the suggestions well and follow them up.

Mr. Lester expressed his appreciation of Mr. Warner's paper, and stated that he considered the time had come when the millers should get together and agree on a standard truck. If that was done the material could be purchased very much cheaper. He agreed with Mr. Warner's remarks as to the suitability of what is known as the two-ton truck. The four-ton truck in parts of Zululand was a perfect nuisance and was continually coming off the line, and was very difficult to work, whereas the two-ton truck was very much easier to handle.

Mr. Alfred Townsend stated that one of the great troubles of a tramline was in connection with the sleepers. On the sea coast iron sleepers had a very limited life, and the wooden sleepers as supplied in the country were hopeless. The difficulty was in obtaining a sleeper like jarrah. The question of suitability of the large or small truck also had a great bearing on the line. The heavy bogie truck was so much heavier on the line and sleepers. He considered the two-ton truck was the most suitable for economic and efficient working, and wished to emphasise the want of a hard and lasting sleeper.

Mr. G. S. Armstrong stated that it was eleven years since his company's main line had been laid down, and it is entirely equipped with steel sleepers 5 ft. wide and projecting a foot each side. They were double tarred, and he could assure them that a half of those sleepers were very nearly as good to-day as when put down. The only places where they had suffered were in the low-lying portions of the country where there appeared to be some chemical action in the ground; they had also tried the wooden sleeper but it was unsatisfactory, and they had reverted to the steel sleeper. An important point in connection with the steel sleepers, however, was that they must be properly looked after and properly tarred and kept covered under ground. If the sleeper projects above ground it will rust, but if kept covered under ground it will last fifty per cent. longer than wooden sleepers. That had also been the experience of the Natal Estates, who had gone back to steel sleepers.

Mr. Piccione also thanked Mr. Warner for his paper, which was an excellent contribution and should be taken seriously to heart. He supported the adoption of the two-ton truck as a universal standard, as it cannot be beaten from the point of view of economy. It could be loaded by one boy and tends to cheapen transport, as you could have a system of bonus for the boys. With a bogie truck you cannot do this, and you never know which boy has put the largest loads on. He confirmed the statement that the Natal Estates have discarded wooden sleepers; other companies were also doing the same.

Mr. Warner, having been asked to explain the "grading plank" mentioned by him, stated that it was very important to the ordinary farmer. Twenty years ago he was asked to go over a sugar estate and reorganise their tramway system. The manager had asked him if he could not give them something which could be used easily by his Indians so that they would not be continually calling him to lay out the branch lines, and he had done so. It was simply a plank a little over 10 ft. long, with one fixed leg about 3 ft. 6 ins. long, and a movable leg at the other end that enabled you to slide the plank up and down. On the movable side you have the plank scaled off into inches. Ten feet is 120 inches, so that if you slide the length of the leg at one end one inch and then put a level on the top of your

plank, you are running either up or down a grade of 1 in 120. If you alter it two inches it is 1/60, and 3 inches 1/40. So all you have to do is to fix the position for your starting point, set the plank and let the gang go ahead.

With regard to the two-ton truck a great point is the derailment on the field lines, which debars the four-ton truck. As to sleepers, he quite agreed that the whole point is to cover the steel sleepers. There is nothing to beat a steel sleeper. You should also be careful to look after your side drainage; if you allow water to collect in between the lines you are going to have deterioration. If the sleepers are well tarred and covered you will find they are the most economical.

Sucrose Losses of the Uba Cane.

(Paper by Mr. L. E. ROUILLARD, La Mercy.)

From the report of the technical sub-committee appointed to consider and report upon certain recommendations of the Sugar Inquiry Commission, it appears that according to the returns sent by 12 colonial factories for a period of seven years for ten mills, three years for one mill and two years for one mill, the average sucrose recovered on a sucrose content of 12.98 per cent. was 8.67 per cent., and sucrose lost 4.31.

I thought it might be interesting to some of you to obtain a little more light on this perfectly true but somewhat distressing statement, especially so when the recent Java figures give a loss of 2.44 on a sucrose content of 12.6.

The Mauritius figures calculated on the same sucrose content are, I believe, more or less the same.

The only possible explanation for the striking difference between the above results must, of course, be that the raw material is not the same. It seems without doubt unfair to compare the results obtained from two very different varieties of cane, just as it would be unfair for a planter to boast of his crop growing on a rich loam and compare his results with those of his neighbour cultivating on shaly land.

Inefficient returns would be due to rock in one case, as an excess of fibre is the cause of the other. All the factories I have visited in this country are just as good, and many better, than the average sugar factory I have seen in Mauritius, which is the only other cane country I have been to, and I maintain that given the same material the results in both countries would very likely be the same.

I cannot, therefore, call the factories inefficient. That they are not wholly fitted to deal with the Uba is possible, but this is another matter.

The factories were built on the supposition that Natal was a cane country; it turned out to be entirely a Uba country, and unfortunately the Uba does not yield its sucrose except under the strongest compulsion, which cannot be applied in a day.

Before going into the question of manufacture, it is of course essential to give some attention to the cane and to follow the struggle it has to go through before finally reaching the rollers. Seldom well treated, it must indeed possess a wonderful vitality to come out victorious, under sometimes the most atrocious climatic conditions imaginable, and in spite of all to contain on an average of many years 13 per cent. sucrose.

Considering the length of the cutting season, eight months or more, the deterioration through burning too large patches at once, the delay in transport, the damage due to droughts, the fact that the cane is never properly topped, and the trash and dirt adhering to it, I have no hesitation in saying that the Uba will hold its own against most of the other varieties on the point of sucrose content.

According to Geerligs, the percentage of sucrose in cane varies from between 11 to 16. It is known that under good conditions the Uba will sometimes contain the highest limit mentioned.