

Uses of Statistical Data in Relation to Economics of Sugar Production and Merchandising.

(Paper by Mr. C. W. COUSINS, Director of Census, Pretoria.)

Statistics at first sight, or in the present case at first hearing, may not seem a very promising subject for a paper which is designed to have practical value, and which even seeks to provide interest, for the very simple reason that statistics as such have been viewed, if not with actual distrust or perhaps aversion, at least with a detachment and an obvious lack of enthusiasm by the great majority of persons. Amongst these, it is to be feared, are many business men, and, still worse, many of those who govern, whether in the Legislature or Administrative Departments. To the rule (and there are probably none here who will dispute the fact that it is the rule) there are of course conspicuous exceptions. There always have been, for the matter of that; but there are abundant signs that the neglect of statistics, whether used for public or private purposes, which in the past has been so noticeable, is giving way to a complete change of attitude, and that the business world, and even the world of the legislator and the bureaucrat, especially in such days of stress as faced our rulers in the years of the Great War, are showing signs of grace.

The issue of the war was a perilously near thing for Britain and her Dominions, and those who were ultimately responsible for the guidance of her destiny freely admit that the war was won by statistics, a statement of fact and not a hyperbole.

It is a far cry from the great nations of the West to the more mystic and philosophical but less practical nations of the East. But the other point of view is worth referring to even though it may only provoke momentary amusement. I give you, therefore, an extract, I believe from the "Lancet," of answers given to a statistical questionnaire issued by the French statistical office at Paris to the Pasha of newly acquired territory at Damascus:—

What is the death-rate per 1,000 in your principal city?—In Damascus it is the will of Allah that all must die. Some die old, some young.

What is the annual number of births?—We do not know. God alone can say.

Are the supplies of drinking water sufficient and of good quality?—From the remotest period no one has ever died of thirst.

General remarks on the sanitary and hygienic conditions of your city?—Since Allah sent us Mahomed, His prophet, to purge the world with fire and sword, there has been a vast improvement. But there still

remains much to do. And, now, sir, cease your questionings, which can do no good either to you or to anyone else. Man should not bother himself about matters which concern only Allah. Peace be to you.

There are several ways in which the subject of this paper can be dealt with, and it was with some difficulty that a choice was made for the purposes of the present occasion. One method was actually to utilise some of the available statistics regarding the sugar industry, not necessarily only in South Africa, and to attempt a correlation of these figures with figures of the world's production and consumption, illustrating the uses to which statistics could be put under given circumstances. This method, however, has been discarded in favour of that adopted in this paper, in which an attempt has been made to deal with broad principles and to seek, in general, and in some cases particular, terms, to apply them to the special needs of sugar producers in South Africa.

I turn at once, then, to the particular aspects of the subject with which this paper is concerned, and ask your forgiveness if I venture in such an assembly as this to take the elementary step of attempting some sort of a description of statistics, while avoiding the attempt to make a clear cut definition or to accept one of the many definitions which have been put forward from time to time.

Statistics are simply concentrated information, scientifically treated, presented mainly in figures, and directed to the elucidation of facts by means of comparison with other times and other sets of facts. They are in fact a species of bookkeeping and accounting, not one whit less important, or significant, for a country, or a business, or an individual, than the accounts and books without which business could not be carried out in any country, except perhaps a Soviet Russia (and even Russia is not entirely devoid of statistics, though she may not care at present to make all of them public). It is urged, therefore, that statistics are of fundamental importance, and can no longer be looked upon as a mere trimming of business or government.

Can it be argued, for example, that the Treasury returns of national income and expenditure are in actual fact of more importance than the census returns of population. The first go without saying as an essential of government; but the second might go by default simply because convention and tradition have not to the same extent decreed their

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importance. It does not directly affect the pocket, and it is in the pocket that the public conscience may too often be found. The Treasury returns deal with silver and gold and paper, symbols of material wealth: the census deals with the flesh and blood, the very life and being of the nation. And, similarly, accounts (and you cannot do without them) deal with symbols and tokens, which are not more important to count, and enter, to balance, and record, than the real things which they represent; in South Africa the minerals, the factories, the agricultural production, and for the purposes of this congress the great industry of growing, manufacturing and merchandising sugar.

In the cases of any who as yet have realised too little the value of statistics, the services which they can render, and the uses to which they may be put, a little reflection will show that the above statement is in no sense an exaggeration and really represents the simple truth. Statistics in importance should in fact precede accounts, and accounts properly understood and properly used are the superstructure upon the bed-rock facts of any business or industry, or country, the extension of these facts into the higher region of finance. It is useless to attempt a superstructure upon foundations neglected and uncertain. If this paper is addressed to any who have not analysed the subject sufficiently, one may hope that a new light will be shed on the matter and that the rightful place which statistics should occupy will be recognised.

Mention has been made of three classes of concern which have need for statistics. The individual needs them, and generally uses them, unconsciously perhaps, because he never finds it necessary to enter them in a written record. His statistics of population relate to himself, wife and children and servants; his statistics of finance to the salary or income drawn month by month, his investments (if he is lucky or unlucky enough to have them); and so forth, all simple facts bearing upon his everyday life and used consciously or unconsciously at every turn. The same sort of thing applies to the small business. The statistics are there, even if not formally recorded; the proprietor is keenly alive to them. He knows how many pounds of leather he requires, how many boots he has repaired, whether his living is comfortable or if the business provides only a bare existence; and to an extent he knows how he stands to-day as compared with last year or ten years before. But once a business increases in size a statistical service of a more definite character becomes a necessity. The greater the business, the more complicated its transactions, the more need for better, completer, more relevant statistics.

Such is the truth of the matter as recognised by all authorities upon business management; and, if anyone has a doubt, let him look into the working of any great business. Take the South African Railways as an example, and try to imagine how the general manager could attempt any intelligent handling of this big concern without an adequate service of statistics. I could, were it permissible, name at least one great business concern close at hand of which I am privileged to have some knowledge, where the whole is run efficiently and successfully with a system of statistics which enables the management to read at a glance the "barometric" features of the business at any given time. Without this, obviously there would be confusion, waste, drift, and eventual failure.

The successful business man will almost invariably admit that he owes success to a careful service of statistics, or at least that success would otherwise be impossible. This almost goes without saying; but on the other hand extraordinary cases have within recent years come to the notice of the census office of men, successful too to an extent, who have had to confess inability to furnish even the simplest information in the analysis of some important section of their business. It is satisfactory to know that the significance of their failure has in not a few cases led to a reconstruction of their accounting and statistical systems. And one may venture the opinion that businesses casually run after the pattern of those referred to, while successful to an extent in days of boom, were the very first to suffer and go under in the days of stress which have followed during the last two years.

So much for statistics in individual businesses, of which in relation to sugar production something further will be said shortly. Statistics in industry become even more essential. Many, if not all, present will know something of the admirable body of statistics insisted upon by the Chamber of Mines, one of the most highly organised systems probably in the world. These statistics are produced under the direction of a distinguished actuary, some of them for public information, others probably of a more searching and intimate character for domestic consumption, but all of them necessary for efficiency. Thus gold-mining, once an adventure, tinged with romance, speculative even to the point of a gamble, has now become a stable industry, vast in scale, and scientific in the character of its organisation. Into this organisation statistics enter as an essential element.

Are there any reasons why statistics are less necessary to the agricultural and manufacturing industries, or to the great industry represented at this congress? Surely not. For if there is any industry which means more to South Africa than

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the exploitation of its mines, that industry is agriculture; and in the huge industry of agriculture sugar production now takes a leading place. Here let me venture a tribute to the statistical work of your own association. This service may not realise all that the members may desire; but it goes a long way to this end and is an excellent example of one of the first-fruits of successful organisation. Moreover, it has given a definite lead to other agricultural industries which they will do well to follow and develop in their own interests.

Having said thus much to set out the view I hold as to the place of statistics in your industry, it is perhaps well to attempt some illustrations of the sort of service which statistics may render, in the first place noting, however, that statistics to be of real value must comply with the following conditions:—

(a) They must be collected on such a scale as to cover the ground completely, in such a way as to secure a set of absolutely definite facts, on such a basis as to apply precisely in the case of every party or concern contributing to them.

(b) They must be capable of clear and definite classification, effected in such a way as to illuminate features which have to be studied, remarked and recorded.

(c) They must be so compiled that they can be compared with statistics of an identical character for other localities or for other periods.

(d) They must be presented in a form which will give the salient points the necessary prominence. Nothing perhaps is more exasperating, or has done more to bring statistics into disrepute, than the obscuring of their real meaning in long columns of figures and great masses of undigested material.

In other words, statistics must be collected, compiled and published in an intelligent manner, having in view definitely the nature of the information desired and the purposes which are intended to be served. They must be continuous, for otherwise their chief value, that of comparability, ceases to exist. And, in order that continuity may be observed, it is essential that the maintenance of the individual records which make up the body of statistics for a business, an industry, or a nation, shall be insisted upon patiently but with absolute determination; and further that the statistics shall be secured and tabulated by an office definitely responsible and properly qualified for the work. Statistics as a sort of office side-line are almost inevitably a failure. But statistics under a bank, an insurance company, a railway, a chamber of mines, an industrial association, and not least the Government of a great country, when valued sufficiently to be the first call upon officers detailed for the purpose,

become a very different thing. So lamentable have been the cases where the contrary has been the case that the point is one worth stressing in the strongest terms.

Assuming compliance with the above conditions, statistics may be made to serve as a very exact measure of progress or retrogression, and their services may be likened to the physician's use of the clinical thermometer, the meteorologist's use of the barometer, the actuary's tables, the mariner's chart and compass.

But the first essential on the part of the user is that he shall realise the "facts behind the figures." Figures in themselves have a fatal power of hypnotising their users. Indeed, some people seem to love the handling of figures just as a miser loves to handle his pieces of gold. From statistics so regarded and so misused may we be delivered! But translate the figures into the facts for which they stand, and, instead of becoming a useless and even dangerous obsession, they become a servant whose service is beyond measure of value. They give exact knowledge where all else would be ignorance, they throw light where all else would be darkness, they give certainty where else all would be guesswork. And, once they have been pressed into service their user is the first to admit that they are indispensable, and to wonder that he, along with many another in his own, and in other industries, has been content to allow himself for so long a period to have been served so ill.

In order to bring the matter home even more closely to the sugar industry, let it be said that for centuries this industry in other countries has come to be regarded as of a special character, involving some of the greatest of commercial interests. It has proved the subject of the very keenest competition; the demand is universal but not unlimited; though the limit, at a price, has never yet been approached. The cultivation has been reduced to a science, and the manufacture calls for high-grade machinery. The disposal in a special sense presents difficulty, because at a certain stage, protection or no protection, the product enters into competition on the world's market. Then a variation even in the decimal point of price may mean the difference between loss and profit, and sometimes a bad loss, and sometimes, if it may be permitted to me to say it, a handsome profit to somebody. It may not always be the man on the spot. Two years ago, in London, at a chamber of commerce banquet, I sat next to a gentleman who had that very day handled a big parcel of Natal sugar on terms highly satisfactory to himself, terms which, even if the sum had been spread over years, would have spelt affluence for the modest official whose mouth was made to water over the tale.

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It follows from the above special characteristics of the sugar industry that it has all the marks of a finely-cut organisation. The margin in the long run is a small one, and in a special degree the industry is one which demands a sound system of statistics for its guidance.

But statistics have their dangers and are so often wrongly used that a caution is necessary. Let me attempt an illustration of useless statistics of a kind, unfortunately, only too common; avoiding for the moment reference to the sugar industry. The Government of the State of X announces with conscious pride that the country had produced no less than 1,440,897 lbs. of potatoes. So expressed, with a roll of the tongue round the word "million," the statement sounds well as evidence on the one side of the progressive agricultural policy for which the Government of X, represented by the Party Y through the Minister of Agriculture Z stands, and on the other of the extreme exactitude of its statistical service and the convincing manner in which it has reckoned up the potatoes to the very last pound, and gives the impression that it might have carried its precision even into the ounces. Almost you can hear the cheering marks of approval. But the speaker is faced by one of those useful but unpleasant gentlemen of penetrating character who asks the following questions and gets the following replies:—

To what season do these figures relate?—They relate, I find, to the year 1917; but I can give the assurance that they are the most recent figures. I am not quite sure of the season.

What area was covered?—It is not clear; but I think the whole country. I am perhaps mistaken; I see that the figure includes the production of the neighbouring territory A. B. C.

Does it mean that was the total production of all farmers?—No; I find a note that these figures relate only to those who described themselves as potato-growers.

How does this compare with previous years?—I do not know, as the previous figures are not available.

Let me inform the Minister that, as a matter of fact, in the season 1915-16 the production was 2,000 tons. Will the Minister express the figures he has quoted in tons? 1,440,897 lbs. was, I think, his statement?—I find this amounts to roughly 720 tons, a production, I am bound to admit, considerably less than that now quoted for the previous year.

And what was the production during the last season?—That I cannot say, as for reasons of economy the Government discontinued the collection of these statistics, and decided to rely upon the potato-growers' association. Here, however, I

frankly admit, the Government was met with quite unforeseen difficulty, as the association has ceased to exist.

And so I am correct in deducing the following facts:—That the figures quoted do not entirely refer to this country are not complete even for this country, are therefore entirely incorrect not only in the odd 897 lbs., but in the millions; that, as far as the figures show anything, they show when reduced to tons a large decrease of production; that they relate to a period of five years ago, before this Government was in office, and are in fact ancient history; and that in point of fact the action of the Government has deliberately deprived the country of the only possible source of information as to the progress, or possibly the complete failure, of this important source of food production?

To this last question one may imagine that the only reply was a sorrowful, even a pained, expression of face, as the questioner's points were made.

Nor is the incident quite as far-fetched as at first it may appear. It has, of course, no reference to so enlightened a country as our own, but things not quite unlike it do happen even here; and worse still, responsible people constantly, for purposes of their own, make use of figures and statistics which go unchallenged, and are yet as useless in their way, and are often as misleading as those quoted.

There is only one moral to point, and that is that statistics of the kind illustrated offend every one of the three canons already quoted:—

(a) They do not cover the ground, and are indefinite and imperfectly collected.

(b) They are not capable of any intelligible classification, and far from illuminating cast the subject into the outer darkness.

(c) They are not comparable with statistics for any other period or area.

In other words, they serve one purpose only, and that is as an object-lesson either in unenlightened administration, or of conscious bluff.

Further, one has seen so much misuse of figures, which in themselves are correct, illuminating and definite as a means of measurement and a source of exact knowledge, that even here there are dangers. One instance is ready to hand. In the Union it falls to the lot of the Union census office to take annually a complete census of the manufacturing industries, to certain sections of which some at least of those present are contributors. The census itself satisfies, I believe, within the limits of practicability the most exacting tests of statistical science and practice. It bears favourable, perhaps more than favourable, comparison with similar censuses in other countries. But the

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published results are constantly misused, simply because the users will not trouble to read the interpretation of the figures as given to them in the context. The result is as follows—Amongst other things, each manufacturer in the Union, and each sugar producer is of course included, gives the total value of his output. These values are again totalled in classes of industry, and a grand total evolves which each year up to the present has reached a more and more imposing total, £98 at the last completed census. Unfortunately, the imposing figure is the one which appeals and is generally quoted. It is, however, far from representing the fact which those who quote it perhaps have not realised. It is a gross figure and not a nett figure. It contains much duplication of values. For example, the sugar appears in the raw stage, is repeated in the refineries, and enters into the composition of many other manufactures—cakes, sweets, biscuits, jams and so forth.

Leather appears in the tannery returns, and again in the boot and saddlery factories; and so on with numerous other articles. The census does give another figure—but it has reached only the more modest total of £40, and does not attract so much attention. This is a net figure representing the value added in each process of manufacture. This added to the prime cost of raw materials, would give the actual, the true, value of manufacturing production, at the last census estimated (because the final figure in the nature of things cannot be ascertained) at £85.

It follows, therefore, that bad figures should be avoided as one is exhorted to avoid the enemy of mankind, and that even good figures must be rightly used or they too constitute a real danger. How this danger is to be avoided entirely, one cannot say; but this much is certain, that the forethought which prompted the Sugar Association to call this congress has given an extraordinarily fine opportunity to me as the Government statistician to meet so representative a body of men and to utter a warning against the misuse of statistics, a warning as greatly needed as the suggestion that I now purpose making as to their proper use.

Statistics, it may be well once more to remind you, are concentrated information designed to illuminate the essence of the subject of which they treat. They serve first of all as a record of observed fact strictly measured, and thus afford in the second place a basis for the strict measurement of other facts as from time to time the observation of these become possible. They should therefore be secured with an intelligent appreciation of the ends which they are intended to serve. In a sense they should precede your system of accounts; in a broader, and even truer, sense, they should dovetail in exactly with accounts. The statistician should be the

accountant, and the accountant, if he is to serve well, must be a statistician, able to weigh with judgment the value and significance of the facts of which he comes to be master.

Clearly, therefore, you will look to statistics for assistance in a variety of directions, and rightly secured and rightly used they will not fail you:—

(1) They will maintain an exact record of all important facts relating to your industry.

(2) They will mark exactly where and to what extent that industry maintains or increases its output, where and to what extents it fails.

(3) They will give you the data which will answer the question why there is success, stagnation or failure in any given locality, under any given circumstances, at any given time.

(4) They will tell you exactly under what conditions production will be profitable or should not be undertaken; i.e., they will give you exactly under certain conditions of soil, climate and locality, the costs, the overhead costs, and the local costs of production. They will, in other words, be related to statistics of capital, labour, production per acre, and so forth.

(5) They will tell you what is the present and annually increasing extent of South African consumption, and they must be related to statistics of the world's demand at the world's prices.

(6) They will tell you exactly how much, if anything, in the way of protection the sugar industry demands for its maintenance, and they will satisfy the public that the national advantages of any policy of protection warrant the cost to the country. They afford the only possible means to allay suspicion; and give the complete answer to the ill-informed critic.

(7) They will, studied in relation to international statistics, give you an indication of the possibilities of useful expansion, so that there may never be a glut, nor the need to resort to dumping.

(8) They will indicate the lines of profitable merchandising, reveal the imperfections of systems tried out, and make possible refinements of management, cultivation, handling, manufacturing, distribution and disposal.

The list is illustrative and not exhaustive. It will at least show those responsible for a great industry may, if they will, have at their disposal a service of information which will enable them to chart their course with certainty and confidence. Without it there can only be drift, with the accompanying waste and possible disaster. A knowledge of the groups of classified facts which we call statistics is obviously worth vast sums of money to the growers, refiners and merchants. In so far as the

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sugar industry has these statistics already it is fortunate; but I make bold to suggest that these statistics are not all that are needed, and that those who use them most are the first to realise that something fuller, more comprehensive of all growers and others concerned, and something more analytical, is needed.

In order to attain these ends most careful organisation is necessary, and a high degree of loyalty to the industry as a whole amongst the individual members. The prosperity of the whole should mark the prosperity of the constituent units; and the interest of each is bound up with the interests of all. It follows, therefore, that the basis of a large part of the statistics of sugar production must be found in the careful records maintained by individuals. These will probably be quite simple in character, but should be precise, consistent, and be rendered immediately available at the central office of the sugar industry. The sum total of these records will provide the fundamental data for the whole industry, which will reap a rich reward as the result of pooled information. There will always be the disloyal members, or persons who for reasons of their own refuse association with others; and it is in cases of this kind that a law such as the Statistics Act makes possible the demand under compulsion for the necessary information for national purposes. Thus the exceptions are prevented from spoiling the whole.

Statistics of a different character, more elaborate and more complex, will be expected from manufacturers at various stages. Here again pooled information should prove of great advantage, quite apart from the necessity which may or may not exist for securing, for office and administrative purposes even if not for publication, information as to individual concerns apart from totalled figures.

Finally statistics are required for the guidance of all concerned in the marketing of the product. The actual consumption of the Union of South Africa and its potential consumption must be known, the state of the world's markets, and a hundred other things which will guide those responsible for the distribution of the product. And some of this information at least will be information jealously guarded from the public just as there are figures jealously guarded by most business concerns, banks, insurance societies and others.

At every stage, however, skilled direction is required—so that the labour of statistical record, collection and tabulation may be reduced to a minimum, and waste (far too common) may be eliminated, and so that the facts to be known may be carefully selected, defined and classified. This direction can only come, if the expression of a personal view is permitted, from a central authority in the industry

capable of viewing the whole from one commanding point, and capable of shaping the course which will bring the greatest advantage to all who share in the work of production, and its necessary corollary the merchandising of the products.

It would be impertinence upon my part to come to you with criticisms of statistics which you have available for your guidance, or to pretend to a specialised study of sugar statistics. But I am profoundly convinced of the immense service to be rendered by statistics to individuals, to industry, commerce, and in my own special sphere to the nation. For some years I have been engrossed in the task of building up from very scattered elements a body of national statistics for South Africa. At the beginning there were only the most meagre and unsatisfactory elements of public statistics; how meagre and how unsatisfactory, few people then realised. There can scarcely have been a civilised country in the world so poorly served. Very fortunately the law has provided for a Statistical Council for the Union, of which the general secretary of this Association is a valued member. This council is primarily responsible for the constructive work which has been done in statistics, work which gives the Union of South Africa a statistical service second to none in the British Dominions.

Study, if you ever have cause to do so, the latest issue of the Official Year Book of the Union and other publications representing the productive industries of the Union and the many ramifications of its material, industrial and social interests, and you will realise how the ground has been covered. Sitting as I do as the director of this national system, it is possible for me to speak with profound conviction of the incalculable value, and I use this adjective advisedly, of the storehouse of exact information which has been provided and is being maintained for the benefit of the present day, but perhaps to an even greater extent for the benefit of the coming generations. It is not possible to answer every question, but it is possible to supply authoritative information on a vast number of questions upon which five or six years ago there was simply no information whatsoever available either to the country or Government.

Apply the same principles intensively to the sugar industry, and you who are most directly concerned in its success and prosperity will be the first to realise the great service which statistics may be made to render.

Before concluding I may be allowed to make two further comments. Statistics, it is often said, are a highly perishable commodity. In other words, they must be punctually available. Being perishable they

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need immediate consumption. That implies immediate use. This statement is important. But statistics also are a commodity worth storing, because the highly perishable commodity would be valueless without a past record as a basis for measurement, just as the zero point of the thermometer serves its purpose; and because they provide over a series of years the basis for deductions of an important nature which could never be made from isolated figures. These two sides of the question must be borne in mind.

The other and final comment is that there is no need for any person to be scared of statistics, because in one form they have become a mathematical science expressed in mathematical formulae hard to be understood by those who have not trespassed into the regions of higher mathematics. There is, of course, this side of technical statistics, favoured of the few, and important because the science of mathematics makes possible treatment and deductions of a character so sure as to surprise those who have not studied the mathematical side of the subject.

But, while this side is of great importance, it will probably always be limited to the few, and there is the intensely practical side which calls for no greater knowledge of mathematics than is required for such work as accountancy. He who can keep and interpret his accounts can similarly interpret and apply his statistics. He will never do without the former; the time is coming when as individual producers, manufacturers and business men, all of you directly concerned in the progress of a great industry, you will find that equally will you never be able to do without the latter, and that an even more efficient, more comprehensive, and more analytical body of statistics will be regarded more and more as one of the essentials for yourselves as individual members and for the industry as a whole.

DISCUSSION.

In thanking Mr. Cousins, the Chairman stated that he had appreciated the paper thoroughly. He was a firm believer in the value of statistics, and had tried in an amateurish way to keep the statistics relative not only to his own business but as far as possible in connection with the sugar industry. He realised the enormous value of such statistics. Since Mr. Cousins had taken charge of the Department he had not only given us statistics of enormous value, but had put them forward in such a way that they are extraordinarily simple to understand and very fascinating to study. He was sure the value of statistics was not realised by all the members of the Union Parliament. The expenditure on the statistics had

been grudgingly granted by Parliament at times. The country in general was beginning to realise more fully the value of statistics, and the Chairman expressed the hope that Mr. Cousins would have even greater scope for his enthusiastic work in the future.

Mr. T. A. Warner confessed that when he had walked into the hall that morning he thought he was in for a bit of a dry time, but he would like to say how much he had appreciated Mr. Cousins' lecture. Perhaps he was in a position to appreciate it more than others because a year or two ago an amateurish attempt was made on behalf of some of the planters' organisations to try and get a few facts with regard to certain costs. In a very small way he had tried to bring those figures into line, and he had to confess that when those figures were put before the people for whom they were gathered, they very much doubted the figures for the reason that there was such an enormous range between figures which were supposed to deal with one particular subject. He was sure that those figures were collected in the best of spirit and with the idea that they should be true figures really reflecting what the particular individual thought was his position, and yet they had a terrific range between the different figures. The whole reason for that was, as Mr. Cousins had indirectly told us to-day, want of education as to how those figures should be collected. The average farmer is not conspicuous for his bookkeeping capabilities.

Mr. Cousins has given an illustration as to how well the statistics of the big mining industries are kept. Certainly a good deal of the wealth is hidden from view, but they have reached such a stage of efficiency that they can give very definite figures as to what the underground wealth of those mines is. Can even the best authorities we have got give us exact figures as to what the latent values of our soils are? Mr. Warner proceeded to state that not long ago a certain person had a farm offered to him at what he thought was a reasonable price. Fortunately he had a chemist friend, and he got him to analyse the soil. According to this chemist he would require to spend £6 10s. per acre on that soil before it was of any value to him as an agricultural proposition! Many of us have thought we have been making money out of sugar, or we have known we have been losing. How many of us have known that we have been living on our capital in that we have been using up the capital we have in our soils and calling it revenue.

Mr. R. W. Anderson stated that at a conference of the Zululand Planters a resolution was passed asking that certain statistics should be published by the Government, and he wished to know whether Mr. Cousins was able to publish those statistics.

Mr. Mortifee regarded the lead which Mr. Cousins had given as likely to prove of great financial benefit to the industry. The industry had arrived at the export stage, and the gentlemen connected with the marketing of sugar in the last few years would realise that accurate knowledge as to what the output will be, and various other matters, is essential. There should be attached to every mill a capable officer who would have authority to estimate the production in his district, keep careful records of all planting that takes place, the yields of the farm for each year, and the probable yields of the coming season. It followed that with better co-ordination between the millers and selling agents, greater advantage would be taken of the world's markets in their discretion. Unless there was such co-ordination, losses will be suffered in the future as in the past. It is probable that had the statistical bureau been established, and all the information was available, the gentlemen referred to by Mr. Cousins as his dinner companion in London would not have had such a broad smile on his face.

Mr. Cousins expressed his appreciation of the manner in which his remarks had been received. He hoped he had shown that the heart of the industry must be pierced in the manner he had suggested, and that it was only by doing so would success be achieved. With regard to the request for statistics, Mr. Cousins stated that he had had no formal request, but had been asked by individuals to include the sugar areas in the annual agricultural census which is taken throughout the Union. That had not been done in the past because the associations had been able to give figures of production. Growers, however, would be waited upon shortly with forms for completion with regard to the industry.

In conclusion Mr. Cousins stated that if the Government Statistical Office could be of any service they had only to ask for it. Mr. Eadie is on the Council, and any points raised by him would be sympathetically considered, and anything that could be done in the service of the industry would be done.

Manuring of Cane Lands.

(Paper by Mr. C. O. WILLIAMS, Chemist, Cedara Agricultural College.)

There are certain principles underlying the proper manuring of the soil which every farmer should constantly bear in mind, and it is my object in this paper to bring those principles to your notice, and also to apply them specially to the manuring of the cane crop.

The word "manure" originally had a very wide meaning; it included any process or material by which the land could be improved, and I propose not to limit myself to the modern definition of the word, that is, the application of materials to improve the quality of the soil, but shall rather take the wider view of the term.

Agricultural chemists very often receive minute samples of soils from farmers with the request that we make a complete analysis of these samples, and from the results tell them what the soil consists of: in what it is deficient, what is to be added to the soil, and the exact quantity, in order to grow bumper crops of various kinds. We are always willing to do our best in the way of giving advice, but such people are expecting too much from us, for even if the tiny amount of soil they forwarded to us was thoroughly representative and a fair sample of the whole area under consideration (which it probably

is far from being), and even if we found the exact percentage of every constituent in that soil, and to what extent each is deficient from the average amount found in most good soils, we cannot argue that by merely making up those deficiencies by adding certain fertilisers we are going to bring the fertility of that soil up to what it ought to be.

There are a large numbers of factors governing the fertility of a soil besides its chemical composition. To give examples: (1) The climate may be unfavourable in that neighbourhood for growing a certain crop; (2) the aspect of the land may be such that it gets very little of the direct rays of the sun, and it consequently would be appreciably colder than land lying quite near but sloping towards the midday sun; (3) the natural structure of the soil may be unsuitable for growing a certain crop, being for instance too clayey, or perhaps too sandy; (4) the soil may be too sour on the one hand or too alkaline on the other, for some crops can tolerate a fair amount of acidity in the soil, while others need the soil to be neutral, and will even thrive in a soil which is inclined to be alkaline; (5) the drainage may be at fault, the soil being inclined either to get water-logged, or on the other hand to allow of a