

# QUESTIONNAIRE FOR REPORT AT PUERTO RICO CONFERENCE

## A.—Location.

1. Name of estate.
2. Nearest railway station.
3. Magisterial division.
4. Name of factory supplied.
5. Approximate area under cane.

## B.—Soil.

1. Contour of cane lands, whether predominantly flat or hilly. If hilly, state whether slopes are mainly steep or gentle.
2. Predominant types of soil, whether sand, loam or clay, and whether normally dry or naturally well watered.

## C. Preparation of New Land for Polanting.

1. Brief outline of method of clearing original bush land, if any.
2. Type of plough preferred.
3. Usual number of ploughings given to new land, whether veld or cleared bush.
4. Depth of furrow measured from surface of unploughed land to bottom of furrow.
5. Type of harrow preferred in new land.
6. Number of harrowings generally given, and what is usual interval after ploughing?
7. What interval usually elapses from the first breaking of the soil till the land is considered fit for planting?

## D.—Preparation of Old Cane Lands.

1. How do you deal with cane trash before ploughing out—by burning, ploughing in, or otherwise?
2. Type of plough preferred for ploughing out old cane lands.
3. How are old cane stools dealt with?
4. How many ploughings are usually given to old lands?
5. Do you allow land to fallow before replanting with cane, and if so, for how long?
6. What crops are used for green manuring, if any?
7. What fertilizers, if any, are applied to green manure crops?
8. What type of harrow is preferred for old lands?
9. Number of harrowings ordinarily given, and intervals between each.
10. Normal interval of time between first ploughing out of old cane land, and replanting.

## E.—Preparation of Furrows for Planting.

1. Distance apart of furrows, and how set out.
2. Depth of furrow, measured from ground level, not from top of furrow ridge.
3. Type of plough preferred for this work.

## F.—Use of Fertilizers, etc., for Plant Cane.

1. Is liming practised, or the application of filter (press) cake or molasses, or stable or kraal manure? If so, state approximate quantities per acre and area treated annually. If molasses is applied, give

also method of application, and length of interval before planting cane.

2. Commercial fertilizers used, and usual quantities applied per acre.

## G.—Method of Planting Cane.

1. What age of cane is preferred for planting?
2. How is cane for planting selected?
3. How is cane prepared for planting, whether trashed or not? If cut into lengths state average length of sett.
4. Are tops used for planting?
5. Method of planting cane, whether single line, double, or overlapped.
6. How are setts covered, and what is average depth of soil covering?
7. What months of the year are generally preferred for planting? Is it frequently unavoidable to plant at other times?
8. What is your treatment of misses?

## H.—Cultivation of Plant Cane.

1. What is your usual practice in cultivation of plant cane?
2. What is the average number of cultivations or hand weedings?
3. Type of cultivator used.
4. Draught power used for cultivators.
5. Do you practice inspection and roguing of streak diseased plants?

## I.—Harvesting Cane.

1. Average age of plant cane crop at time of harvesting?
2. Average age of ratoon crops at time of harvesting.
3. Is cane usually burned before harvesting?
4. Normal task of labour harvesting cane, stating whether cutting only or cutting and loading; also average number of labour units per 100 tons of cane harvested.
5. Method of loading cane—whether loaded into wagons or cart or conveyed direct to factory or railway siding, or portable tramline used, or other method.
6. During which months of the year are you ordinarily harvesting?
7. Which months give you the best results for yield of cane and sucrose content?

## J.—Cultivation of Ratoons.

1. What is your method of dealing with the cane trash left on the ground after harvesting—whether (a) raked into alternate rows, and if so whether (b) raked back again eventually, or (c) burned, or (d) raked away from the stools, or (e) merely left undisturbed except for subsequent hand weeding, or (f) other treatment not mentioned above?
2. How do you cultivate ratoon crops—ploughing, or surface cultivation only? If ploughed, state average depth.

3. What fertilizers are used on ratoon crops, if any, and how applied?
4. How many ratoon crops are generally grown?

#### K.—Irrigation.

1. Area of land under irrigation, if any.
2. Method of applying irrigation water.
3. Average number and volume of waterings per crop.
4. At what age is irrigated cane usually harvested?

#### L.—Labour.

1. What type of labour do you mostly use, Indian or Native—if the latter, whether mainly local or recruited from a distance?
2. Is labour paid by calendar month, or 30 working days, or otherwise?
3. What are your seasonal variations in number of labour units employed?
4. What kinds of work are considered suitable for task labour, with average tasks required in each?
5. What kinds of work are not considered suitable for task labour?
6. Is there any system of bonus in cases where more than the allotted task is performed?

#### M.—Draught and Transport.

1. Are mules, oxen, or mechanical transport used? If more than one type, state which is found most useful for particular kinds of work.
2. What are the usual (a) working and (b) resting rations fed to transport animals?

#### N.—General Layout of Estate.

1. What is the average size of field preferred, and length of lines?
2. Do lines go up and down the slopes, or in straight lines at right angles to general direction of slope, or are they contoured?
3. Usual width of fire break between (a) fields, (b) estates.
4. What is your method of maintaining fire breaks? Are they generally utilised in any way?

#### O.—Cane Varieties other than Uba.

1. Have you experience as yet of any variety of cane besides Uba? If so, how do they appear to compare so far with Uba under your conditions?

#### P.—General.

1. Please outline any particular method of general interest, or give remarks on any apposite subject not provided for under preceding headings.

### SUPPLEMENTARY NOTE.

This report was prepared in January, 1932, for presentation to the Fourth Congress of the International Sugar Cane Technologists in Puerto Rico, but has never yet been published in this country.

There is, perhaps, not much that one need add to this report, except to remark on the progress that has been made during the past year in irrigation on a few of the larger estates. The use of motor traction is becoming more common, and rapid progress is being made in the commercial planting of the sugar cane varieties new to this country released from the Experi-

ment Station. It is impossible to estimate even approximately the present area under such canes, but it is rapidly expanding and must already occupy several thousand acres. Most plantations have some at least of these new varieties, of which Co. 290 and P.O.J. 2725 appear the most generally useful, with P.O.J. 2878 for irrigated or naturally moist lands.

Experiment Station,

South African Sugar Association,

Mount Edgecombe.

March, 1933.

CHAIRMAN: This paper covers a very wide field, and it gives you an opportunity of spreading yourselves if you wish to ask Mr. Dodds any questions arising out of it.

Mr. BECHARD: Would Mr. Dodds consider it good economic practice to burn all cane, on the strict understanding that green manuring was practised?

Mr. DODDS: I believe I would, if green manuring was sufficiently practised; but that is a very big "if," and it would be difficult to restore the organic matter to the soil within the time usually available—that is to say, during one year fallow between ploughing-out of the old cane and replanting. There are some countries where the burning of cane trash is general. I may say this question was discussed at the Puerto Rico Conference, and it seemed quite homelike to hear the question of burning versus trashing of cane being very

keenly and somewhat heatedly contested. There are some countries, of which Hawaii is a notable example, where cane is burnt almost invariably, but they manage to keep up their organic matter in the soil by maintaining heavy crops so that there is a very large root system which remains to decay in the soil, and they fertilise very heavily also. Furthermore, they irrigate most of their fields, so their conditions are very different to ours. In Puerto Rico, on the other hand, they would not hear of the burning of standing cane; they were strongly of opinion that it was a very injurious practice, and the only time they fired their fields was to burn the trash lying on the ground after the last harvesting and before they ploughed out the old cane. They never burned the standing crop, except in some cases where Uba was concerned, but the area under Uba in Puerto Rico is small and is rapidly decreasing; however, it was a common practice, though not a universal one, to burn Uba.

CHAIRMAN: Following upon the question of Mr. Bechard as to burning and green manuring, would Mr. Dodds consider the addition of molasses in quantity to get the same result as the green manuring, by the addition of organic matter?

Mr. DODDS: I do not think so at all, having regard to the composition of molasses. It contains, admittedly, a good deal of organic matter, but mainly in the form of carbohydrates which ferment and pass in gaseous form into the atmosphere. As I mentioned in my report, molasses has been found to be a very good fertiliser where it has been used, especially in sandy soils. That is the experience of other countries as well as one or two estates that have tried it here. I think the benefits of molasses as fertiliser are mainly due, firstly, to the potash it contains, and, secondly, to the bacterial fermentation of the sugar and reducing sugar it contains; this fermentation brings about changes in the bacterial life of the soil, which appears to be beneficial to the growth of the plant. I do not think it has ever been very fully studied from the bacteriological standpoint, but there seems to be considerable evidence to suppose that it is one of the benefits of applying molasses.

Mr. BECHARD: Arising out of that, I have heard very heated arguments in connection with the use of filter cake, both from the point of view of convenience and value. The argument was about the use of filter press cake after being burnt and before being burnt. With the very small area we have for the storing of our filter press cake, most of it gets burnt probably by self-combustion. I have heard planters say they prefer using the burnt stuff, as it is more concentrated. This, to my mind, is not quite sound. I would like to ask Mr. Dodds the value of filter press cake as a manure. The next point is whether Mr. Dodds considers, with the amount of knowledge he has now, that it is economically sound to devote one year or more to green manuring rather than practice trashing, burying it, and generally heavy fertilisation.

Mr. DODDS: To take the first point, the value of filter cake as a fertiliser or soil improver depends mainly on its organic content. It is one of the ways in which we can restore some at least of the organic matter taken out of the soil by the crop. But it also contains mineral elements of importance, and its mineral content varies very considerably according to the practice in the factory from which it comes. Most factories make raw sugar using the sulphitation process, and their filter cake may contain relatively little lime; the amount of phosphates they contain generally ranges from 1% to 2%, but varies a lot according to the amount of phosphoric acid that it has been found necessary to use in clarification and with the source of the cane. So it is impossible to give even a very general idea of the mineral value. Carbonatation filter cake contains more lime and probably less of the other mineral substances. When the filter cake is burnt, of course all the organic matter, including the nitrogen, is lost; you still have the mineral matter, and the residue is much easier to apply, being in a more friable condition, but it is not nearly as valuable.

I should say that in most soils which are deficient in organic matter, and therefore will respond to green manuring, that it certainly pays to lose the use of the land for a year and put it under fallow. I cannot say that we yet have any proof positive of that; we harvested some experiments last year which eventually will give an answer to that question. We found from these experiments that soil which had had a year's fallow gave from 7 to 8 tons of cane more per acre than soil which had been growing cane and replanted the same season. Seven or eight tons is not going to pay you for the loss of the use of the land for a year, so the final result will depend on the ratoon crops and on what happens eventually after the land has been replanted. But from the present appearance of the field there is still a difference in favour of the fallowed portions; the difference is not so great as it was in the plant cane crop, still there is going to be some improvement, we believe, and I am of opinion that when the total benefits, including the plant cane and the accumulated benefits in the ratoon crops, are summed up we shall find there has been a definite advantage from the fallowing.

But, as I say, we cannot say positively until those results are available.

Mr. LADLAU: I do not think Mr. Dodds has quite answered one of Mr. Bechard's questions. I think he wanted to know, in connection with green manuring, whether you could not do it in between the last ratoon crop and replanting the same season.

Mr. BECHARD: That is not the question I asked, but I should say planters would be pleased to hear the answer to that.

Mr. DODDS: Our first experiments in green manuring at Chakas Kraal were done in that way. The cane was not burnt, but we tried a short season green fallow crop. The cane was cut and ploughed-out as early as possible in the season, and then it was put under various green manuring crops and then planted again the same season. We did obtain quite a marked improvement over the plots that had not been green manured. So that even a short season fallow was of benefit, but not as much as we found from an experiment in which a whole year had been set aside for the fallow.

Mr. LADLAU: That is not the point. Why not plant something in between your cane rows which you can plough in?

Mr. DODDS: We have not tried that with ratoon crops, but we have tried it this season with plant crops with rather interesting results, which I mentioned yesterday. We planted this season cane with various plants in between the rows, and we compared those with sections of the same field having no interplanting. In some cases the interplants were grown for green manuring purposes. We tried for this purpose buckwheat and soya bean and cowpeas. Then we tried what Mr. Schultz this morning called a cash crop—we tried mealies and sunflower. Perhaps the effects are not altogether normal, because this year we have had an abnormally low summer rainfall, but the result now is

very striking. Those canes which have not been interfered with at all but have been cultivated in the ordinary way, are far ahead of the canes which have had other plants in between, even where, as in the case of the cowpeas and the buckwheat, it was ploughed in as a green crop. The cane at present is not looking nearly as good as where it had no such treatment; and as for the cane which is growing between rows of mealies and sunflower, as I explained yesterday, it is difficult to say which is looking the worst, the mealies or the cane!

Mr. ASKEW: It is obvious, I think, that you cannot grow two crops on the same land. On general principles, if you are going to grow mealies, grow mealies, and if you are going to grow cane, grow it. I do not see how you can get as good crops with the two. Coming to the question of resting the land, does it not appear to be common sense on general principles, that land should lie fallow at certain periods, every six or seven years? Then we have a very ancient law which goes back thousands of years—grow your crops six years, and in the seventh year let it have a rest. If we were to work fifty years without a break, I do not know what we should be like! You cannot expect your land to go on for twenty to forty years without resting it. As I said just now, we have a very great law that goes back to the time of Moses that provides for the resting of the land every seventh year, and you will find some difficulty in improving on that law. Coming back to actual practice, on my farm we make a rule of letting the land lie fallow after three or four crops. With what result? In some cases we have had 40 tons to the acre in the next crop! I am satisfied it pays you to let your land lie fallow in the seventh year. It seems to be common sense, apart from any scientific truth. You cannot expect a human being to carry on for fifty years without a rest, so why should you expect your land to do it.

Mr. DODDS: I quite agree.

Mr. BOOTH: I think the question of organic material in filter press cake was discussed very thoroughly by yourself, Mr. Chairman, in 1921, and I think it is available in the records. My experience is that the planters in Zululand would not have filter press cake that has been burnt. I would like to ask Mr. Dodds, since he will not admit that molasses is of very much organic value, whether in the case of fallow lands it would not be a good idea to mix the filter press cake and the molasses, and in cases where there are tramlines to convey it in tanks and then apply it through Scotch carts with suitable tanks run through a 1½ in. or 2 in. pipe.

Mr. DODDS: The practice of using a mixture of the waste products of the factory is an excellent one and is practised very largely in Mauritius, where they use molasses and kraal manure and all the waste products they can scrape together. The same thing is done to some extent in the West Indies, where, I believe, manure is often mixed with mill waste. Undoubtedly it is a very good practice. I quite agree with Mr. Askew that on general principles one would certainly say that the land ought to have a rest; but people want more than general principles, they want to have figures, and that is why we are trying to get definite facts to show the value of fallowing at the Experiment Station, which I have no doubt will be of interest.

Mr. ASKEW: We let our lands lie fallow for a year and gave three ploughings and harrowings, and as a result we got 40 tons to the acre on a hill farm where previously it has come down to 22, 24 and 28 tons. Of course, one gets very heavy crops on the Umhlatuzi flats.

Mr. DODDS: Under our conditions, I consider the interplanting of crops in sugar cane rows, even for green manuring purposes, should be condemned, because we are so often short of moisture during the growing season. (Hear, hear.) We must admit that in other countries where they have a better rainfall and moisture supply that is the principal method of green manuring; that is so, for example, in Trinidad and Puerto Rico. There we saw no fallowing, but green manuring was done in that way by sowing plants between the cane rows. There was a very interesting paper that Mr. Dymond referred to last night, from Hawaii, that was read at that Conference. There they claimed to have built up a system of agriculture whereby they are maintaining and in fact increasing the fertility of the soil, and yet giving the land no fallow and growing heavy crops every year. They have succeeded in doing this under their conditions, but I very much doubt whether you could do it here owing to our lack of moisture. Many of our soils are low in organic matter to begin with, so that it is not merely a case of retaining the organic matter but of restoring it as it has already been lost.

There being no further discussion, Mr. Dodds was accorded a very hearty vote of thanks for his interesting paper and remarks.