COTTON.

REPORT ON THE POSSIBILITIES OF COTTON CULTIVATION IN CEYLON.

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The following report submitted by Mr. G .R. Hilson, B.Sc., Cotton Specialist to the Government of Madras, whose services were loaned to the Government of Ceylon to report on the prospects before cotton cultivation in Ceylon, is published for general information :—

I arrived in Peradeniya on the 24th December, 1925, and between that date and the 15th January, 1926, made two separate tours through the actual and possible cotton growing tracts. Each of these tours I have dealt with separately and have made separate recommendations in each case.

In essence the problem in both tracts is the same. In the one case the soil is heavier and the rainfall lower. In the other case the soil is lighter and the rainfall heavier. In both cases, as in other cotton growing countries there is the possibility that rainfall will be in excess or deficit or come at the wrong time, and in consequence the yield or the quality of the crop will be poor. It then becomes a question of determining how often on the average a good yield can be expected. This can be done by growing the crop for a succession of years, and keeping a careful record of the behaviour of the crop each year. It is essential, however, that the results should not be vitiated by failure on the part of the human factor. Every advantage should be taken of rainy and fair weather between crops to get the land cleaned and to prepare it for sowing as soon in September as the rains will permit, and every opportunity should be taken to keep weeds down while the crop is growing.

The problem of cotton growing is however only part of the bigger problem of how to wean the cultivator from chena cultivation and induce him to a more permanent system of land tenure and a sounder system of agriculture. Cotton growing is a means towards this end. A sound system of agriculture will increase the chances of success of cotton, but the failure of cotton need not do more than delay the introduction of a sound system of agriculture.

It seems to me therefore necessary, in discussing this question of cotton growing, to give some consideration to the wider problem of which it forms a part.

The first point to be determined is the minimum size of a holding. Where cattle can be kept, as they can here, it is unsound not to use cattle for draught purposes. With a system of agriculture depending on rain-fed crops such as is contemplated there should be not less than 10 and not more than 15 acres actually under the plough for one pair of bullocks. Again, where draught animals can be bred, as they can here, it is unsound to depend upon another country to supply them. It is equally unsound to depend upon a communal area upon which to graze breeding stock. To this area of 10 or 15 acres must therefore be added another area upon which to graze a cow and its calf. Again, in view of the fact that as the land becomes occupied the area under jungle will decrease, and with it the supply of fire-wood, provision must be made for each cultivator to grow his own. The area must in fact be big enough to provide food for the cultivator and his family, fodder for his cattle, space for his cattle to move in when the cultivated land is under crop, fuel and a reasonably large enough area under a money crop. From what I have seen and heard of conditions here, I should put the minimum area at from 20 to 25 acres.

The next item for consideration is the supply of drinking water. It is very much better that each family should live on its own holding. This is not likely to happen unless there is a supply of water on or very near the holding. Information on this head is at present meagre, the point needs investigation.

Lastly come the conditions upon which the land should be held. From what I have seen of conditions in Madras, I would suggest that it would be advisable to make it impossible for the cultivator to alienate his holding or on his death to divide it up among his family into units smaller than 20 or 25 acres.

To attempt to introduce this system of agriculture by allowing the cultivator to take up the full economic unit at once would be hazardous. It would be better to move more gradually. Instead of giving permits to cultivate a chena for one year, the permits should be current for a longer period on the condition that the area was cropped in rotation and on the understanding that if the cultivator worked this area properly he would be allowed to extend it later. Such areas of chena cultivation should then be so selected that it would be possible gradually to work up to an area of 20 to 25 acres in one block.

FIRST TOUR.

Itinerary.

27-12-25.—Peradeniya to Bandarawela—by train

28-12-25.—Bandarawela to Badulla—by road

do Badulla to Meegahakiula and back

29-12-25.—Badulla to Kalmunai *via* Bibile and Batticaloa

30-12-25.—Kalmunai to Haputale

31-12-25.—Haputale to Hambantota *via* Madampe and Embilipitiya

1 & 2-1-26.—At Hambantota

3-1-26.—Hambantota to Matara *via* Tangalle, Beliatta and Dikwella

4-1-26.—Matara to Peradeniya—by train

Plots of cotton and chena cultivation were inspected at Meegahakiula, Bibile, Godakawela, Embilipitiya, Lyangahatota, on the experimental station at Ambalantota, in villages in the neighbourhood of Ambalantota but off the road, and on the road between Ambalantota and Tangalle.

Where the cotton had been sown early and had not suffered too much from the competition of weeds the growth made and the promise of crop shown can be considered satisfactory, even in those cases where cotton had followed cotton. I was favourably impressed by the appearance of the ordinary chena crops,—maize, ragi, Italian millet, green gram, tomatos, chillies and gingelly, particularly the last named which was better than I have ever seen it in Madras. I was also impressed by the fact that after chena cultivation for one year the land very rapidly became covered by a luxuriant growth of weeds. This, I think, is a definite indication that if properly managed the land is capable of being cropped every year. The belief that this land can be cropped once only in 6 or 8 years lies I think in the fact that the soil is so good that after one year's cultivation the weed growth becomes very abundant. Therefore, until the heavier scrub growth has killed out the weeds which takes a few years, the cultivator can do nothing with the land. The land is not intrinsically poor.

In most of the plots inspected whether the crop was cotton or the ordinary mixture of chena crops the soil was examined by digging one or two holes to a depth of about 2 feet. Except near the rivers where the soil was stiffer it was of a free working texture. In all cases the soil gradually merged into a sub-soil of a distinctly clayier nature. This clayey sub-soil will prove a blessing or a curse depending upon the crop cultivated and on the quantity and incidence of the rainfall. In one case where the soil was obviously water-logged and the cotton crop was obviously suffering from an excess of moisture, inspection revealed the presence of this clayey sub-soil near the surface.

It may be taken that the soil is suitable for the cultivation of cotton. Whether the crop will yield satisfactorily or will not however depend on the management of the land and on the quantity and incidence of the rainfall.

Rainfall.—The rainfall records of the various stations near plots inspected in the areas which appear suitable for cotton are tabulated below. If the present water-logged condition of the level tract of country on the East coast from Batticaloa southwards through which I passed is typical of that area at this time of the year, I do not think it is suitable for growing cotton and have therefore ruled it out of count.

Average of	Taldena		Bibile		Godakawela		Embilipitiya		Lyangahatota		Mamadola		Am alantota		Hambantota	
	25 yrs.		24 yrs.		11 yrs.		9 yrs.		11 yrs.		30 yrs.		3 yrs.		56 yrs.	
	Ins.	Days.	Ins.	Days.	Ins.	Days.	Ins.	Days.	Ins.	Days.	Ins.	Days.	Ins.	Days	Ins.	Days.
April ...	4·25	7	5·09	10	9·28	16	7·54	12	4·83	10	5·29	9	1·77	4	3·29	8
May ...	3·04	5	2·34	6	5·52	11	3·04	8	2·43	7	3·10	8	3·96	5	3·15	8
June ...	1·16	2	1·06	2	6·87	20	1·91	6	1·76	8	2·78	9	2·97	8	2·38	9
July ...	1·49	2	1·81	3	6·42	19	3·30	8	2·99	7	2·27	7	3·87	7	1·78	7
August ...	1·93	3	3·01	4	4·45	14	1·71	5	0·94	3	1·27	4	0·62	6	1·21	6
September ...	2·83	5	4·36	6	6·27	15	2·84	16	2·80	7	2·83	8	4·97	11	2·41	8
October ...	10·67	14	11·40	15	9·25	16	9·75	14	6·94	12	6·28	12	4·83	9	4·85	11
November ...	11·35	15	12·38	16	11·83	19	8·88	14	8·43	15	6·89	13	5·63	9	6·76	13
December ...	16·47	17	14·73	16	8·37	15	8·84	13	6·53	12	6·90	11	3·52	7	5·42	10
January ...	15·79	13	14·86	14	5·33	11	3·68	8	3·14	8	3·59	8	2·66	6	3·38	7
February ...	4·17	5	4·56	6	2·91	5	2·32	3	1·20	4	2·00	4	2·03	2	1·43	4
March ...	3·77	6	5·07	7	10·89	14	7·87	11	5·83	9	3·29	7	4·16	7	2·29	6
TOTAL ..	76·92	94	80·67	105	87·39	175	61·68	108	47·82	102	46·49	100	40·99	81	38·35	97
September to February ...	61·28	69	62·29	73	43·96	81	36·31	68	29·04	58	28·49	56	23·64	44	24·25	53

After sowing, which would be better to be done in September if possible, in order to give the plants a good start before the heavy rains set in, the critical months appear to be January and March.

January because, if the rains are heavy, all fruiting members except bolls above a certain age are liable to be shed. This is I think because the clayey sub-soil holds up the water and causes a temporary saturation of the soil to which the plant reacts by dropping most of its possible crop. If the under drainage were improved danger on this account would I think be reduced. In spite of this danger if a sufficient number of bolls have reached the age when they are not liable to be shed sufficient crop will still be obtained to make it profitable to grow cotton. This condition can be aimed at I think by sowing early an early type of cotton like Durango.

March because in this month most of the crop is harvested, and wet weather, when the bolls are bursting, results in a reduction of quality. For this there is no remedy. The only thing that can be done is to pick as often as possible while the weather is favourable so that if rain comes there shall be as little crop unpicked as possible.

Examining the rainfall records in the light of these remarks it will be seen that the tract of land in which the four last stations lie is the most hopeful. The other areas are less hopeful, but probably not altogether hopeless as the distribution as well as the total quantity of the rainfall has to be taken into account. At Taldena and Bibile the crop will probably do well only in years of low rainfall.

Management.—It is abundantly evident from the results of previous years' work at Hambantota and from the appearance of the cotton plots generally this year that if cotton is to be grown successfully the land must be clean. In this respect Ceylon is not different from any other cotton growing country.

I consider that this condition can best be achieved by introducing a definite system of agriculture involving a definite rotation of crops and the use of bullock power and efficient agricultural implements, full advantage being taken of the dry period of the year to get the better of the weeds and to prepare the land for sowing as soon as the rains will permit. To do this it will be necessary to remove the cotton plants as soon as the pickings from the first flush are finished, say by the middle of April. The rotation I would suggest would be a four course rotation of cotton, cereal, cotton, legume. The precise cereal and leguminous crops to be grown is a matter for experiment.

Recommendations.—(1) I think it would be better to concentrate work on the area referred to above as being most hopeful and in which the greater part of the 1,500 acres under cotton this year lies.

(2) As the land at the Ambalantota Experiment Station is not typical of the general area, and as I understand it is in an area which will be in a

few years given over to paddy cultivation, I would suggest that this Station be used as a seed farm and plant breeding station for the time being, and that another station be opened on more typical land. On the latter station the work done should aim at discovering—

(a) How best to free the land from weeds and keep it free,

(b) A suitable rotation,

(c) Which of the two cottons Durango or Cambodia is the more profitable to grow.

(3) On the Ambalantota Station the plant breeding work should be directed towards—

(a) Maintaining a supply of pure Cambodia and Durango seed and

(b) Evolving a hairy type of Durango of equal value to the present smooth leaved type.

This latter is necessary because while at present the damage done by the Jassid does not appear to be heavy, it is likely to become so when cotton is grown on a larger area.

(4) Seed given to cultivators should be of one variety only, for the present I think Cambodia, and they should be instructed to uproot the crop as soon as the pickings from the first flush are over and to grow the crop in rotation with their ordinary chena crops until a suitable rotation has been worked out on the lines indicated above.

(5) It would be better to start a small ginnery in the neighbourhood, so constructed that when the area expands more gins can be set up.

SECOND TOUR.

Itinerary.

9-1-26.—Peradeniya to Nalanda and on to Dambulla
10-1-26.—Dambulla to Maha Iluppalama and on to Anuradhapura
11-1-26.—At Anuradhapura
12-1-26.—Anuradhapura to Polonnaruwa
do Polonnaruwa to Kantalai
13-1-26.—Kantalai to Allai and back to Trincomalee
14-1-26.—Trincomalee to Horawapotana and on to Vavuniya
15-1-26.—Arrived at Peradeniya

Except the last, journeys in all cases done by road.

Plots of cotton were inspected on the Experiment Station at Nalanda, in a chena near Dambulla and in a school garden at Horawapotana. In the first case the cotton was poor, partly because of late sowing and consequent excessive competition of weeds, and partly because the soil is very light; in the second case the crop was good, though a little sparse, and provided the rains from now on are not too heavy should give a fair yield, in the last case the crop was a ratoon one and was bad.

Ordinary chena crops were inspected along the road between each halting place.

As before the soil was examined by digging holes 2 feet or more in depth in the cotton and chena plots, and where chena cultivation was sparse, in the jungle. The soil was also examined on the Experimental Stations at Nalanda and Anuradhapura, and on an old Experiment Station at Maha Iluppalama.

In this part of the Island the country is more undulating than in the Hambantota area and the soil varies considerably from place to place. Omitting ridges where the soil was so stony as to be hardly entitled to the name, we encountered four main classes of soil—(1) a light sandy or gravelly soil of varying depth usually underlain by gravel, (2) a heavy sticky clayey soil, sometimes mixed with coarse gravel and fit only for paddy, (3) a good fat loamy soil of good depth, and (4) a light loam with a heavier but still friable loamy sub-soil underlain between 2 feet and 3 feet from the surface by gravel which in turn was underlain by decomposing rock.

Here again, if properly managed, these soils are capable of being cropped year after year, but so far as their suitability for cotton is concerned those of the second class may be ruled out of count.

The rainfall records of the different stations in the tract inspected are given in the annexed table. From these it will be seen that the total rainfall for the period September to February inclusive, varies from 38 inches to 61 inches, that in most cases the March rainfall is small, but that in some cases the January fall is distinctly heavy. Here again I think it will be necessary to work with an early type of cotton and sow in September, and here again January and March will be critical months.

Taking soil and rainfall into consideration, I think there will be most chance of success on soils of class (4) and in areas where the rainfall between September and February is about 40 inches of which a moderate amount only falls in January, i.e. to say in areas with a rainfall similar to averages recorded for Maha Iluppalama, Anuradhapura, Maradankadawala, Vavuniya, and possibly Dambulla and Trincomalee.

It is possible that on the soils of class (1) the crop may be able to withstand a heavier rainfall but to get a reasonable return the land will have to be manured. Soils of class (3) as at Taldena and Bibile will be too heavy for cotton, with rainfalls ordinarily of so high an order as these recorded in this table.

I would therefore recommend (1) that cotton should be tried again at Anuradhapura on the higher land where the soil is of the type I have described as being most suitable and (2) that the crop now growing at Dambulla should be watched, and its behaviour in relation to the rainfall noted, and if the yield is fair the experiment should be continued.

Average of Station	19 yrs. Nalanda		43 yrs. Dambulla		20 yrs. Mahailup palama		35 yrs. Anuradhapura		36 yrs. Maradankadawela		34 yrs. Topawewa		49 yrs. Kantalai		55 yrs. Trincomlee		4 yrs. Allai		34 yrs. Horawapotana		40 yrs. Vavuniya.	
	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys.	Ins.	Dys	Ins.	Dys.	Ins.	Dys.
April	5·48	10	6·26	10	7·08	10	6·62	13	7·29	9	4·47	6	3·89	6	1·98	5	1·90	4	3·68	6	4·54	8
May	2·35	5	2·95	5	2·33	4	3·26	7	2·97	4	2·32	3	3·15	4	2·44	5	2·66	4	3·15	4	3·36	6
June	3·74	10	1·79	6	1·76	5	1·36	4	1·73	4	0·68	1	0·84	1	1·28	3	1·41	1	1·21	1	0·94	2
July	2·55	8	1·29	4	1·86	3	1·26	3	1·44	2	1·42	2	2·42	2	2·03	4	1·79	2	1·98	2	1·47	2
August	1·96	5	1·61	3	1·63	2	1·78	4	2·17	3	2·11	3	3·67	4	4·10	8	4·29	4	3·45	4	2·32	4
September ..	2·97	7	2·28	5	2·97	5	2·97	5	3·35	5	2·29	3	4·11	5	4·50	8	4·67	5	5·44	6	3·71	6
October	13·02	15	11·07	15	10·51	15	9·84	16	12·10	15	9·13	12	3·76	12	8·21	16	9·07	11	8·42	11	9·73	14
November ..	13·78	18	10·88	16	10·58	16	10·62	18	10·89	15	11·22	13	12·76	14	13·94	18	15·59	14	11·22	13	11·49	15
December ..	16·16	17	12·04	15	8·85	13	8·89	16	10·51	12	14·92	13	15·15	15	14·37	19	19·12	15	13·22	13	11·18	14
January	11·85	14	6·87	10	5·20	8	3·96	9	5·54	8	10·53	11	7·83	9	6·56	11	8·48	9	7·60	8	4·86	7
February ..	2·77	4	2·43	4	2·19	3	1·51	4	1·94	3	2·85	4	2·49	3	2·06	4	2·35	3	1·78	2	1·86	3
March	4·35	7	3·36	6	3·77	6	2·72	6	2·94	5	2·60	5	1·71	3	1·64	4	2·04	3	1·77	3	1·96	4
Total	80·98	120	62·83	99	58·73	90	54·79	105	62·85	85	64·54	78	66·78	78	63·11	105	73·57	75	62·92	73	57·42	85
September to February	60·55	75	45·57	65	43·30	60	37·79	68	44·31	58	50·94	58	51·10	58	49·64	76	59·28	57	47·68	53	42·83	59