X. 10230	KENYA	X. 10230 2
1927		1927.

Wheat Industry in Kenya. Report by Prof. Sir Rowland Biffen

Previous

Gov. 3227/26

(Gov. 882 - 30.9.26)

Subsequent

[illegible] 10259 (Man 27 Tours)

Seel	15/3	Mr Seel G.A.D.	30
Room [illegible] Mr Allen		Room 3	1/6
G.H.	18/3	Room 1	2/6
Mr Allen	19/3	Sir C. Strachey	2/6
Sir C Strachey	24	XEA	5/8
Room 3	28/3	Room by E.A.D.	5/8
Room 1	30/3	Mr Allen	8/8
Mr Allen	30/3	Mr Bottomley	[illegible]
Room 1	12/4	XRB	17/8
Mr Allen/Seel	16.	Room 3	25/8
Mr Allen	19/4	XEA	
Mr Bottomley	19/4		
Sir C Strachey	19		

X(Ea)	5/5
Room by G.A.D.	6.5
Mr Allen	6/5
Room 1.	9/5
G.A.D. Mr Seel	17.5
Mr Allen	9.5
Mr Bottomley	19.5
Sir C. Strachey	
X(Ea)	20/5

X. 10230

3

/ ———— Ag Gov Denham ———— 18 Feb 4?

115

... copy Section 9 of Prof Biffen's Report and states any measures or proposals in connection therewith will be considered at a meeting of Executive Council on 18 Feb. Adds as to contributions by local Maize and Wheat growers. Complete Report is being prepared in England. Requests thanks be conveyed to Prof Biffen

Mr. Allen. Sir C Strachey

This section of Professor Biffen's Report on Wheat Reproduction in Kenya is most interesting. The Acting Governor states that the question of making provision for the recommendation made in this section of Professor Biffen's Report was to be considered at a meeting of the Executive Council to be held on the 18th of February, and we shall no doubt hear the result in due course.

The principal recommendations made by Professor Biffen in this section of his Report are:-

Page 4 1. The appointment of an additional Plant Breeder in order to secure continuity of the investigations which are being carried on. Professor Biffen states that under the present conditions each period of leave checks the normal progress of the Plant Breeder work. He also mentions as another feature making the appointment of an additional Plant Breeder necessary, the large scale on which the work has to be carried out.

Page 9. 2. That the experimental substation at Gilgil should be abandoned owing to its inaccessibility, and that another substation at a similar elevation and easily accessible should carry on the work now done at the Gilgil Station. He suggests that the best site

for

for the new substation proposed would be at Mau Summit. The three stations would then be the Scott Agricultural Laboratories, Njoro and Mau Summit, and Professor Biffen thinks that the question which of these stations should in the future, become the main station, should be determined by financial considerations.

Pages 9 & 10

3. Two possible programmes for improving the wheat crop :

(a) The first is to produce -- wheats resistant to both black stem and yellow rust,

(b) The second is to produce wheats resistant either to the black stem or the yellow rust.

Professor Biffen strongly recommends the adoption of the first programme which would involve Njoro becoming the growing and distributing centre as well as the breeding centre.

Page 12.

The cost of staffing and equipping the stations to carry out the first programme is estimated by Professor Biffen to be:-

non-recurrent expenditure £4,200
recurrent expenditure £2,748.

The estimated cost under the second programme is

non-recurrent expenditure £1,930
recurrent expenditure £2,098.

We can only wait and see what programme the Kenya Government decide to adopt.

I inform Professor Biffen that the O.A.G. has forwarded to the Secretary of State a copy of Section 9 of his Report on Wheat Production in Kenya, and that he states that the question of making provision for the measures recommended in this section of his Report and for any other proposals that may be put forward in connection with it, would be considered at a meeting of the Executive Council to be held on the 18th of February.

And

And say that the Acting Governor has asked that the thanks of the Government of Kenya may be conveyed to him for the valuable advice and assistance rendered by him to the wheat industry during his recent visit to the colony.

And in view of the minutes on 3227/26 we should send Mr. Lloyd, Empire Marketing Board, by minute the duplicate of this despatch and its enclosure. Say that it will be observed that the question of making provision for the measures recommended by Professor Biffen was to be considered at a meeting of the Executive Council on the 18th of February; that it is expected that the local Maize and Wheat Associations will each contribute £500 a year towards the cost of carrying out such measures as may be finally approved; and that he will also observe that it is proposed to seek the assistance of the Board.

And tell Mr. Lloyd that a further communication will be addressed to him as soon as we learn the views of the Colonial Government on Professor Biffen's recommendations.

G Maybrick
18/3/27

I am told that Prof Biffen wrote the main portion of his report on his voyage home. I think it would be sufficient on this to inform Prof B that a copy of Section 9 has been rec'd from the O.A.G. who states that the complete report is in course of preparation here & ask if he is not in a position to indicate when it will be

which the S of S would (we don't wish to be associated) would come better as a reply to his communication forwarding the report which I take it will be sent to the [illegible]

J N Allen
19/3/27

~~8~~ Biffen Cons 28 MAR 1927

~~3.~~ —— Biffen [illegible] —— [illegible] March 1927

[illegible]

J N Allen
30/3 at once

~~5~~ To Franklin —— 18 March

[illegible] J N Allen
22/3 at once

~~5~~ — To Col Franklin — 23 March

[illegible] April, 1927.

[illegible] copies of the report copies have now been [illegible] to Govt House [illegible]

X 10330/27

5

7. —— Ag. Gov. Denham —— 13 April, 1927
Tel.

Seeks approval to £5,000 extraordinary expenditure and appointment – in consultation with Prof. Biffen – of one assistant plant breeder. Adds as to maize [illegible] and contribution from maize growers.

Mr Allen.

The sums mentioned by the O.A.G. make it clear, I think, that the decision is to go in for Programme 2. – see pp 49 et seq. of the report, & p. 2. of Mr Hazelrigg's minute. In view of the small difference in recurrent expenditure between the 2 programmes, this is only common sense.

Before taking any definite action, ?we can await the despatch with details, but we might be asking Prof. Biffen as to the asst plant-breeder, on the assumption that the proposals will be approved.

It seems a large order to approve all this pending the receipt of the desp & a few days can't matter
J N A.

The report itself has not, apparently, been sent by Prof. B. to the S of S, but to "Govt. House", or possibly to Sir E. Grigg, but – see your minute of 19.3. – the time for the expression of thanks seems to have arrived.

A [illegible] ? write to Prof. Biffen ack'ing No 6

to say that the O.A.G. has asked S of S to convey his thanks (as in § 4 & 1) & add that S of S wishes to be associated with this expression of thanks. And say that S of S has now received a tel. from O.A.G. ~~saying that the Leg. Council has~~ recommending

A additional plant breeding services necessitating an extraordinary exp. of £5000 & recurrent exp. during the present year, & has asked that Prof. B. may be consulted in the selection of an assistant plant breeder. Say that details of the Gov's recommendations are being communicated by despatch, but that pending the receipt of this S of S has asked to ~~Prof. Biffen's~~ learn whether Prof. B. can recommend a cand. whom O.A.G. wishes to be selected as soon as possible. Particulars of the salary to be offered will no doubt be contained in the desp. but it will presumably be based on the recommendation in the last para. of the Report that £500 shd. be assigned for this purpose. Add that the Gov. states that the expenditure recommended is in excess of that suggested in the Report in respect of maize services which he states are best combined in the same organisation with wheat.

And observe that the Comm. of the Trade & Information Office has asked to be furnished with a copy of the Report, & ask if he can let us have 2 spare copies*.

* We shall presumably want one for the E.M.B.

—

Ref. XF 3227/26, ? arrang. of communicating with the E.M.B. can presumably await the despatch.

G.F. Seel
16.4.27

The desp. shd be here in a few days now. For the moment ? write to Prof Biffen as at "A".

[When a copy is sent to the Desp., the O.A.G. can be informed, if necessary, that the S of S has recd a copy of the report & will presumably get further copies later from the Colony. If the new appt is approved a tel. can be prepared & the P.S. Appts can do the canvassing of Prof Biffen]

J.H. Allen
4/4/27

Sir C. Strachey.

Building takes an inordinate time in Kenya and I should like to telegraph at once approval of work being

started on extraordinary services there no departure from Sir R. Biffen's proposals is involved, & say other points will be considered on the receipt of the despatch.

[Unless they have adopted my suggestions there is no reason to be sure that a despatch dated 31 March left then or shortly after.]

G. L. Calvinson [illegible]
19.4.27

I agree –
(as to the E. M. Board, it would appear from para 3. of (1) that the Kenya Govt propose to approach them direct) –

[illegible] 19.4

[illegible]

Draft to Gov. copy — 20 April, 1927

To Professor Biffen (& encl's) (Wheat Production) — 21 APL 1927

[illegible] — 4 May, 1927

[illegible] to be considered for appt as Asst Plant Breeder scale recommended [illegible]

It has been decided to await the desp promised in 7 before considering approval of the new appt. This letter must also wait?

G. Beal 6.5.27

[illegible]

Now see No. 11

11 — Ag. Gov. Denham — Conf 29 (dupl.) — 31 March, 1927.

* The original desp. has been registered 10327/27 and I have inserted references only in connection with para. 6.

[illegible]

Sets out the estimated cost of carrying out Sir R. Biffen's recommendations and suggests grant be made from E.M.B. funds of £1,500 towards capital expdre and a £1,500 p.a. for 5 years. Trusts expdre will be approved.

The question of applying to the Empire Marketing Board for assistance towards meeting the cost of these proposals, as well as the other proposals made in this despatch, is dealt with on X.10327/27. In the meantime the Secretary of State has not yet generally approved the adoption of the proposals for expenditure made by Sir Rowland Biffen, the approval given in No.8 having been limited to extraordinary services. Para.1 of the Director of Agriculture's memorandum now enclosed by the Acting Governor makes it clear that the only other expenditure, apart from that specifically mentioned by Professor Biffen, in connection with his "first programme", is a capital expenditure of £800, with £1,200 recurrent, for maize breeding. The Director of Agriculture says that the Maize and Wheat Associations have shewn their interest in the work by promising contributions of £500 per annum each, but the Acting Governor says in para.6(1) of the despatch that, while the Kenya Farmers' Association have promised £500, "it is hoped" that

that a similar measure of co-operation will be available from the Wheat Growers' Association. The telegram of 13th April (No.7) shows that the contributions from maize growers are expected to total £375 this year. Expenditure sufficient for the present year, together with the full £5,000 extraordinary expenditure, has been passed by the Legislative Council, and the Secretary of State's approval for the whole may presumably now be given. In the event of an application to the Empire Marketing Board not being successful, the whole expenditure (apart from the contributions of the local Associations) will have to be ~~made~~ met from Government funds.

A

As regards the appointment of an Assistant Plant Breeder, No.10 says that Mr.Lathbury wishes to be considered for this appointment. The scale suggested is £480-£600-£720, although Professor Biffen only allows £500 for this post in his estimate. Mr. Lathbury's present salary is £540.

B

We should write to Professor Biffen and say that the Acting Governor states that Mr.Lathbury wishes to be considered for appointment to the post of Assistant Plant Breeder recommended in his report and ~~it is~~ has suggested that he (Prof. Biffen) should be consulted. Say that the S. of S. would be glad to learn whether he thinks that Mr.Lathbury would be a suitable officer for this appointment or, if not, whether he is in a position to suggest any other candidate for the post, on the scale proposed.

C

As the Empire Marketing Board will no doubt want printed copies of Prof.Biffen's report ~~if they are to consider~~ in considering the application for assistance, perhaps we should send a telegram to the Governor saying that the Secretary of State hopes that printed copies of the report will be communicated as soon as possible.

G. Seel 17.5.27

H. Allen 19.5.27

Act A, B & C?

G. Bottomley 19.5.27

Mr. C. 2/6 cl. ora

~~DESTROYED UNDER STATUTE~~ A. C. Denham — 28 May 1927 tel

App. received from Sir C. Strachey

Would be grateful for early selection of plant breeder owing to preliminary work at new station. If Lathbury selected, could at once post him.

Mr Bottomley

Although action above is not yet "actioned", I have, in view of this tel. drafted to Sir R. Biffen for consn as at 'B'. Pp. should be recirculated for the other action (A & C) proposed.

See above C.

G. Seel 30.5.27

[illegible] 30.5.27

Recirc. [illegible] 13 To Biffen cons. 1 JUN 1927

(DESTROYED UNDER STATUTE.) 4/8

4.6.27

15 To Gov Conf 8 JUN 1927

16 —— Biffen Sir R —— 3 June, 1927.

Mr Jeffries vide on 15

Recommends Mr. Lathbury for appt. on condition that he works directly with Mr. Burton Govt. Plant Breeder for a season. If practicable he should attend Plant Breeding Inst. when on leave

[As indicated on X10351/27 the encl. to No 6 has been lent to the Editor of "East Africa". Pp should be recalled in a week if it has not been returned.]

Restored 15th

Mr Bottomley

No 16. ? Tel as in dft & recive

(a) to thank Sir R Biffen & say that the appt is being approved on the basis he suggests,

(b) to send covering desp. enclosing copies of 13 and 16,

(c) P.P. Promotions Branch to see.

Noted on Lathbury's file & in St. HM

Noted in Prom. B. VH pf 16

C J Jeffries 9.6.27.

17. Tel to Gov 9th June 1927.

[Copy placed on file 15267 Ea (Lathbury)]

18 To Biffen (No 16 ansd) 22 JUN 1927

19 To Gov 522 (w/ copies 13 + 16) 22 JUN 1927

[redacted] ------499------8th July 1927

Transmits 25 printed copies of Professor Sir R. Biffen's Report on Wheat Production in Kenya. 9

Copies in P.Ea.

Mr Allen Bottomley

? 12 copies to E.M.B. ref. para (1) of the Note enclosed with C.O. letter X10327/27 of 29 June. (No 20 on that file)

? 4 copies to D.E.A.T.M.O. S.O. ref. 4 on their file.

? 2 copies to Prof. Biffen

See in short dft. ref. 6

G. Steel 8.8.27

It may be assumed that the Govt of Kenya will be making a fairly wide distribution of this report: but 1 copy might go to the B of Agric. ?

J.W. Allen 13/8/27

As proposed. Then reinforce.

W. C. Bottomley 12.8.27

(DESTROYED UNDER STATUTE) 21 To Biffen (w/ 2 copies Report)

(DESTROYED UNDER STATUTE) 22 To E.M.B. (w/ 12 " ")

(DESTROYED UNDER STATUTE) 23 To Dale (w/ 4 " ")

24 To M.A.F. (w/ one copy " J.B.)

25 AUG 1927

A copy should be sent to the Already Govt. Subject to that, put by

W.C.A. Ormsby

16.9.27

Copy sent

[illegible] 20/9/27

Received & Returned [illegible] 21.9.27

COLONY AND PROTECTORATE OF KENYA.

Report on Wheat Products in Kenya.

By PROF. SIR R. H. BIFFEN.

PRINTED BY THE GOVT. PRINTER, NAIROBI,
1927.

WHEAT PRODUCTION IN KENYA.

Wheat Production in Kenya

By PROF. SIR R. H. BIFFEN

At a meeting of the Economic and Financial Committee in March, 1926, a recommendation was made that I should be invited to report on "the wheat industry of the Colony with particular reference to the methods of plant-breeding now in progress and the organization of an extended service in the future."

The University of Cambridge granted my request for leave of absence in order to undertake the enquiry and I was able to arrive in the Colony at the end of September, 1926. Before my arrival a comprehensive tour of the wheat-growing areas had been planned by the Department of Agriculture and arrangements made at several centres for meeting growers and discussing their problems. Though the difficulties of travelling during the period of the short rains interrupted the carrying out of the programme occasionally none of these meetings were missed and all of the districts were visited. The months of November and December were devoted to the work. The time chosen proved to be a peculiarly suitable one, for in most districts the wheat crops were seen at various stages of growth and an unexpectedly clear insight obtained into the problems peculiar to Kenya. I am indebted further to the staff of the Agricultural Department for placing at my disposal information with regard to the climatic conditions of various districts and statistics with regard to acreage and yields and especially to the Government Botanist who accompanied me on most of the tour. My thanks too are due to wheat growers in all parts of the country not only for their kindly care and hospitality but also for the information they placed so freely at my disposal.

The information collected by the Statistical Branch of the Department of Agriculture makes it possible to give a reasonably complete survey of the present position of wheat-growing in the Colony. A summary analysis of the data it has collected is shown in Table I which gives the area under the crop during the past eight years and the average yield for six of these.

TABLE I.

COMPARATIVE STATEMENT OF WHEAT AREAS AND AVERAGE YIELDS FOR THE YEARS 1920 TO 1926.

	Areas Under Wheat (Acres)							Area sown as at 31st July, 1926, but not reaped.	Average Yield per acre (bags of 200 lbs.)						
	1920	1921	1922	1923	1924	1925	1926	Acres	1920	1921	1922	1923	1924	1925	1926
KENYA COLONY ..	4,613	4,999	10,593	15,158	19,599	23,996	29,749	45,564		2·58	2·69	2·36	2·85	2·69	2·55
PROVINCE—KERIO.															
Eldama Ravine ..	57	52	7	197	362	680	1,097	1,814		1·94	3·00	2·01	3·84	3·79	1·93
PROVINCE—KIKUYU.															
Fort Hall (including Embu and Meru) ..	15	34	27	20	3	5	4	181		2·88	0·79	1·19	2·00	2·00	2·75
Kiambu	48	117	83	50	61	19	9	234		1·79	0·75	2·30	2·08	3·58	1·11
PROVINCE—NYANZA.															
Kericho ..	10	280	407	443	57	18	34	22		2·55	1·80	2·44	2·65	5·55	3·23
Nandi	0	19	150	1	0	0	0	0		4·21	1·85	7·00	—	—	—
PROVINCE—UKAMBA.									Not Enumerated						
Kitui and Machakos ..	127	464	666	952	1,217	1,294	1,590	951		2·16	0·73	1·63	3·05	3·58	2·83
EXTRA PROVINCIAL DISTRICTS.															
Kisumu-Londiani ..	2	100	184	616	731	1,041	1,403	2,440		2·48	4·02	1·49	2·66	3·05	3·06
Laikipia	0	4	31	49	135	297	341	697		7·25	4·81	1·84	3·39	3·36	1·34
Naivasha	873	42	150	556	883	2,601	3,034	2,977		2·19	1·81	3·42	3·63	3·43	2·64
Nakuru	1,010	2,222	3,439	3,348	2,696	3,206	5,503	9,878		2·51	2·59	2·47	4·04	2·80	3·85
Nyeri North	55	37	97	111	55	88	36	157		2·16	1·77	1·59	2·56	3·75	2·77
Trans Nzoia	361	125	464	2,012	3,172	3,069	3,568	3,951		2·73	2·76	2·78	2·50	3·44	1·25
Uasin Gishu	2,105	1,498	4,888	6,803	10,227	11,678	13,130	22,862		2·87	3·15	2·30	2·54	1·78	2·54

NOTE:—As the Agricultural Census for 1926 is not quite complete, the figures shewn for that year are subject to slight adjustment.

It shows that the area increased steadily from 1921 to 1926, the average yearly increase, namely some 5,000 acres, being approximately equal to the whole area under wheat in the first year to which the statistics refer. The current year's crop covers 45,000 acres; that is, 15,000 acres more than in the previous year. The apparently normal growth rate has thus been trebled in a single year. The great increase in the area has not been brought about at the expense of any other crop and it is due almost entirely to the breaking of fresh land. This has entailed the provision of either more teams of oxen or tractors, ploughs, harrows and harvesting machinery the costs of which have been spread over the comparatively small number of settlers who now grow the crop. A further increase of the area has been made possible by the extension of the railway system.

The average yield per acre over the whole country has remained constant for six years at about two and a half bags of 200 lbs. weight per acre. The average is a low one and it is clear that a considerable percentage of growers have either lost on the crop or only just made its cultivation pay its way. Yields vary widely and in the course of the enquiry the fact was established that some growers counted on securing at least double this average yearly. The yield variation is brought out clearly in Table II which shows the results secured on a random sample of farms scattered over the whole of the wheat-growing area.

TABLE II.

STATEMENT SHOWING ACREAGES AND ACTUAL YIELDS OF WHEAT FROM EXAMPLES TAKEN AT RANDOM FROM FARMS OF VARYING ACREAGES AND CONDITIONS.

DISTRICT.	Area harvested between 1st Aug., 1925, and 31st July, 1926 Acres.	Actual Quantity reaped. Bags of 200 lbs	Average yield per acre	Acreage sown as at 31st July 1926 Acres.
Eldama Ravine (Equator)	800	1,967	2·45	900
Machakos (Mua Foothills)	210	790	3·75	100
Machakos (Ulu)	213	1,042	4·89	195
Machakos	280	740	2·64	—
Machakos (Magadi Junction)	188	632	3·36	23
Machakos (Magadi Junction)	90	180	2·00	60
Kisumu-Londiani (Lumbwa)	180	865	4·54	140
do (Lumbwa) ..	105	223	2·12	110
do. (Lumbwa) ..	560	1 720	3·07	1,200
do. (Londiani) ..	150	509	3·39	150
do. (Lumbwa) ..	20	129	6·45	30
do. (Londiani) ..	90	250	2·77	250
Laikipia	60	168	2 80	60
Laikipia	55	70	1·27	37
Naivasha (Ol Bolossat) ..	80	230	2·87	70
Naivasha (Ol Bolossat) ..	350	1,750	5·00	220
do (Kinankop) ..	140	700	5·00	200
do. (Syndicate) ..	70	170	2·43	70
Naivasha	336	1,000	3·00	200
do (Gilgil) ..	100	275	2·75	57
do (Kinankop) ..	85	260	3·06	135
do (Gilgil) ..	100	376	3·76	—
do (Gilgil) ..	105	354	3·37	90
do (Gilgil) ..	63	353	5·60	61
do (Gilgil) ..	200	750	3·75	20
do (Gilgil) ..	72	244	3·38	154
Nakuru (Elmenteita) ..	697	4,527	6·3	653
do. (Pipeline) ..	100	264	2·64	138
do (Mau Summit) ..	300	1,000	3·33	350
Nakuru	300	1 200	4·00	1,000
Nakuru	120	370	3·09	250
do. (Thomson's Falls)	78	457	5·86	120
do. (Molo) ..	250	865	3·46	250
do. (Molo) ..	907	4,377	4·72	962
do (Sabukia) ..	30	120	4·00	70
do. (Mau Summit) ..	50	212	4·24	80
do. (Thomson's Falls)	60	108	1·80	110

TABLE II—(*Contd.*).

DISTRICT.	Area harvested between 1st Aug 1925 and 31st July, 1926. Acres.	Actual Quantity reaped Bags of 200 lbs.	Average yield per acre.	Acreage sown as at 31st July 1926 Acres.
(Nakuru Mau)	30	150	5·00	75
do (Molo) ..	100	858	8·58	140
do (Molo) ..	140	420	3·00	140
do. (Molo) ..	25	178	7·12	50
do (Molo) ..	510	2,295	4·50	510
do. (Thomson's Falls)	157	607	3·86	200
do (Njoro) ..	450	244	0·54	100
Nyeri (Nanyuki)	10	50	5·00	10
Trans Nzoia (Kitale) ..	50	120	2·40	58
do. (Kitale)	60	280	4·66	—
do. (Hoey's Bridge) ..	150	300	2·00	120
do. (Mt Elgon) ..	230	115	0·50	10
do (Kitale)	80	80	1·00	20
do (Hoey's Bridge) ..	50	52	1·40	38
do (Kitale)	155	111	0·72	129
do (Elgon)	50	186	3·72	22
do. (Hoye's Bridge) ..	150	450	3·00	150
do (Cherangani) ..	25	30	1·20	—
do. (Kitale)	25	140	5·60	73
do. (Kitale)	117	487	4·16	270
do (Kitale)	400	Nil	—	400
Uasin Gishu (Eldoret) ..	60	251	4·18	70
do (Heoy's Bridge) ..	178	460	2·59	278
do (Kipkabus) ..	85	336	3·94	95
do (Sergoit) ..	220	650	3·00	270
do. (Sergoit) ..	44	228	5·18	78
do. (Eldoret) ..	100	300	3·00	260
do (Soy)	22	66	3·00	63
Uasin Gishu (Sergoit) ..	400	900	2·25	450
do (Plateau) ..	100	320	3·20	305
do (Eldoret) ..	90	350	3·88	135
do. (Kipkabus) ..	80	360	4·50	131
do. (Turbo) ..	100	300	3·00	120
do. (Sergoit) ..	510	1,750	3·43	725
do (Hoey's Bridge) ..	100	200	2·00	—
do. (Eldoret) ..	270	1,697	6·28	362
do. (Kipkabus) ..	240	1 800	7·50	262
do. (Sergoit) ..	90	373	4·14	165
do. (Sergoit) ..	305	520	1·70	305
do (Plateau) ..	60	150	2·50	240

It shows a range of from 8·58 bags per acre on a farm at Molo to a complete failure on a farm at Kitale. But the figures by referring only to the total crop reaped on the various farms mask the fact that some fields have yielded considerably over 8·58 bags to the acre. Even this yield therefore is not the maximum a grower can hope to secure.

The tabulation of the yields per acre district by district has not disclosed the fact that any one is outstandingly better for wheat production than any other. If it had been possible to deal with similar statistics over a series of years the fact would probably have emerged that, under existing conditions, the best yields are being obtained in the neighbourhood of Molo and Mau Summit and the least satisfactory in the Trans Nzoia. In the former, crop failures resulting in the depression of the average yields are exceptional whilst in the latter complete or partial failures are too common. The difference is not necessarily due to differences in soil fertility or climatic conditions. The two districts require different types of wheat and there is reason to hope that a type suitable for the conditions of the Trans Nzoia has now been secured. At present, though, there is little doubt that the highlands of Molo, Mau Summit and Londiani form on the whole the best wheat-producing area of the Colony. As their elevation above sea level is too great for the cultivation of other staple crops their natural line of agricultural development will be in this direction.

An increase in the average yield is to be expected. In the early years problems entirely unlike those of most wheat-growing countries had to be faced. Now the growers have learnt much by experience. The most favourable periods for sowing have been determined for each district, the seed rate appropriate for the conditions obtaining in Kenya is known and more or less suitable varieties of wheat have been obtained.

The rapid increase in the wheat area is not reflected in the returns of wheat imports. These are shown in Table III for the four-year period 1922-25.

TABLE III.

WHEAT AND WHEAT FLOUR IMPORTATIONS.

	Quantity. Cwts.	*Value.* £
1922 ...	59,817 ...	63,775
1923 ...	49,599 ...	40,362
1924 ...	48,474 ...	40,792
1925 ...	53,675 ...	56,494

WHEAT AND WHEAT IMPORTATIONS DURING THE PERIOD JANUARY TO SEPTEMBER, 1925, AND FOR SAME PERIOD OF 1926.

	1925.		1926.	
	Quantity Cwts.	Value. £	Quantity Cwts.	Value. £
JANUARY ..	..	..	5,771	6,447
FEBRUARY ..	..	..	4,862	5,194
MARCH ..	..	..	4,899	5,032
APRIL ..	28,209	29,772	4,610	4,519
MAY ..	..	..	5,017	4,837
JUNE	..	..	5,252	5,042
JULY	2,488	2,592	3,852	3,635
AUGUST ..	3,632	3,690	6,878	6,533
SEPTEMBER ..	4,478	4,635	4,751	4,601
TOTALS ..	38,807	40,689	45,892	45 740

During this some 50-60,000 cwts. have been imported yearly and, though complete figures are not available for 1926, it is clear that this rate of importation is not falling off, for the returns from January to September show that larger quantities were imported than in the corresponding part of 1925.

The increased crop has thus been absorbed locally and as the numerical increase in the white and Indian population is too small to have had any great effect on the consumption it is evident that the native population is beginning to make use of wheaten foodstuffs. Wheat is thus beginning to replace maize in the diet of the natives and if this continues, as from analogy with almost all other countries where a change over to this cereal is possible, a new and important factor will be introduced into the wheat position. It is impossible to estimate its ultimate effects but the fact is worth noting that if the produce of the current crop, which is by

far the largest yet grown in the Colony, were uniformly distributed it would barely provide two ounces of flour per head per week of the population. This quantity is almost negligible when compared with the 80 ounces required by the bread-eating population of W Europe.

From the point of view of the grower this position is satisfactory for with an increasing local market and the possibility of supplying adjacent countries there are no fears of producing more than can be absorbed.

SOIL AND CLIMATE.

The soils on which the wheat crop is grown are mainly of volcanic origin. There are several distinct types of them which are generally distinguished from one another by obvious colour differences. The descriptions " red soil," " chocolate loam," " black cotton soil " are in universal use throughout the Colony and they define the soil types with sufficient accuracy for ordinary agricultural purposes though to those who do not know the country they convey little information. No thorough examination of the physical and chemical properties of the various soils has been made yet. But a steadily accumulating body of experience is beginning to define the characteristics which are of most importance to those who cultivate them.

The red soils are as a rule easily worked and sufficiently porous to prevent water-logging even under conditions of heavy rainfall. These two features are favourable for wheat-growing. The soils vary considerably in their density and some of the lightest, found for instance in the Cherangani foothills, are more suitable for maize or barley than for wheat. Where sections are exposed these soils are often seen to be of great depth and the uniformity of their colour from the surface downwards is suggestive of a low humus content. They are, however, fertile and more than one instance was quoted where six successive crops of maize have failed to depreciate the acre yield.

Chocolate loams may for the time being be considered as a deep-coloured variant of the red soils for they have the same physical characteristics; wheat yields on these soils are generally somewhat higher than on red soil.

Where in previous times the red soils have carried scrub or forest which has been either destroyed by the natives or cleared for cultivation they are generally extremely fertile. Weather conditions interfere little with their working, they do not dry out

rapidly and, in the absence of rust, heavy crops on them can be relied on. Most of the heavy crops—that is, crops of the order of some 10 bags per acre—were seen on these " forest soils."

The term " black cotton soil " is less clearly defined and it undoubtedly covers a wide range of soils having as a character common to all a black colour. The texture varies greatly. When wet some of these soils are extraordinarily sticky and slimy and the earth roads through districts where they occur become almost impassable. Others do not retain water to such an extent and form soils of an open nature. Those of the former type are difficult to manage and they must be " caught right " in order to secure a tilth whilst those which are comparatively free from stickiness can be worked at almost any time. The lightest type of black cotton soil might be described as " grey." It contains small stones and disintegrated gneiss.

No deep sections of such soils were seen. But at Kilima Kiu a trial pit had been dug for our inspection which showed a black soil of some two and a half feet in depth resting on white disintegrated mica schist. These black cotton soils have been found to be fertile and even the most unkindly type is said to improve considerably and to work more easily after cultivation for a few seasons.

Some forty chemical analyses of Kenya soils were obtained partly from the Agricultural Department and partly from farmers who had sent soil samples home for analysis. Taken as a whole they indicate that the soils are distinctly deficient in phosphates and lime. From the point of view of crop production the former is the more serious deficiency. More than one grower had realized this fact and made experiments with phosphatic manures such as basic slag and Seychelles guano. Almost everywhere the results, especially with basic slag, have been satisfactory and there can be little doubt that as the practice extends the average yield of grain will rise substantially. The dressings employed are small, ranging from 70 to 120 lbs. per acre and costing on the field from 10/- to 14/-. At present prices, then, any crop increase in excess of half a bag per acre represents an additional profit. Whilst there is a general agreement amongst those who use basic slag that the yield of grain is markedly increased no reliable data could be obtained to show what the actual increases amounted to. Almost invariably in these trials the basic slag had been applied to the whole field and no part had been left untreated for comparison. The one exception met with where the crop was at a sufficiently advanced stage of growth to allow an estimate of a yield to be

made indicated that land normally producing about 2½ bags was, when slagged, capable of producing double that quantity. An accidental demonstration in the Lumbwa district was still more striking. Here basic slag had been broadcasted at the rate of a hundredweight per acre by natives whose wanderings over the field were clearly mapped in the crop. Their tracks were defined by a vigorous crop, possibly of 8 bags or so per acre, whilst the portions they had missed were hardly yielding 2 bags per acre. Growers experimenting with slag or any other artificial manures would be rendering a service to their neighbours by leaving an unmanured strip in each field on which trials are being made.

Climate.—The cultivation of wheat in Kenya is confined to the uplands from 5,000 to 10,000 feet above sea level. Thus, though the wheat-growing area is situated on the equator the climate is broadly speaking that of a temperate zone. Between these elevation limits the climate naturally varies considerably. But even at the lower levels the mid-day temperatures are not excessive for wheat. At the higher the night temperatures are low and possibly not altogether suitable for the fullest development of the grain even though the crop makes remarkably good growth.

The annual rainfall as shown by the data accumulated by the Department of Agriculture is, at first sight, high for the wheat crop. But the figures mean little from the plant's point of view for the soil drainage is generally good and evaporation is so rapid that drought is more likely to be harmful than excessive moisture. Throughout most of the wheat country the bulk of the rainfall occurs in two distinct periods known locally as the periods of the long and short rains. The long rains begin in most districts about the last week of March and continue through April and May. June and July are usually dryish months and August and July very dry ones. The short rains commence in October and are succeeded by a dry period in January. The precipitation is as a rule steady and torrential downpours, though not unknown, are exceptional.

The rainy periods differ somewhat in different districts and even in the same district the times at which the rains begin and end and also the amount that falls vary widely from year to year. On the whole it may be said of them that they are little uncertain and of the two periods that of the long rains can be relied upon more than that of the short. More than one grower indeed stated that he did not know what a normal year was or what weather he could reasonably expect at any given period.

Owing to this distribution of the rainfall in two fairly distinct periods the lower and consequently warmer parts of Kenya are able to ripen two crops of a rapidly maturing wheat in a single year. This opens up distinctly attractive possibilities. One is that a grower having 1,000 acres under plough can put 500 acres under wheat just before the long rains begin and fallow and clear the other 500 acres ready for sowing at the commencement of the short rains. The harvest operations can thus be spread over two periods and moreover the 1,000 acres can be worked with a 500 acre equipment.

The constancy of the temperature conditions leads, in some districts where there is an appreciable rainfall in the periods between the two rains, to a state of affairs which is unique amongst wheat-growing countries. In such, wheat can be sown at any time of the year. Thus on one farm visited early in December one field was being prepared for drilling, on another germination had just commenced, another carried a crop knee deep, another one coming into ear, whilst the stripper was at work in yet another. Here the harvest rush could be spread over the entire year.

In several respects then the conditions under which wheat is grown in Kenya are unlike those obtaining in any other important wheat-growing country and it has proved a difficult matter to find wheats which thrive sufficiently well under them to make the cultivation of the crop a successful venture. If Kenya is compared with other wheat producing countries in which the crop has been introduced in comparatively recent times, such countries for instance as Canada, the Argentine or the United States, the difficulties of establishing the crop become more evident. These latter countries soon found wheats suitable for their conditions owing largely to the wide area from which their immigrant populations were drawn. Russian and Italian peasants brought their local wheats with them and contributed greatly to stocking the United States and the Argentine with wheat whilst the lucky discovery of a wheat from Galicia made Canada a great producing country. The wheats brought out by English settlers, however, have proved utterly useless under Kenya conditions. They belong to the slow-maturing western European type and find no place in regions where rapid maturation is essential to avoid periods of excessive dryness. Trials have had to be made therefore of varieties from all parts of the world. This has been done in part by the Agricultural Department and partly by enthusiastic settlers. The hunt for suitable verieties is still being continued and so numerous are the varieties of wheat in existence that it is worth

continuing it on the chance of finding some sorts well fitted for Kenya conditions. Up to the present, though, it must be admitted that the results have not been particularly successful and no wheat outstandingly suitable for the country has been discovered. A comparison of the conditions under which the crops of the great wheat-growing countries are produced indicates the probable reason for this failure and suggests that better results might be obtained if wheats were introduced from some country with climatic conditions having more resemblence to those of Kenya. The nearest approach to such conditions is to be found in the neighbouring country of Abyssinia. Here wheat is grown at altitudes very similar to those of Kenya and as far as can be gathered under somewhat similar rainfall conditions. Though the majority of Abyssinian wheats do not belong to the group used for bread making a number of distinct types of bread wheats are grown there which certainly should be given a trial. Another unexploited source of possibly suitable wheats is to be found in the highlands of Northern India and Tibet.

But it is probable that the introduction of ready-made varieties will only meet the country's needs temporarily and in the future special wheats will almost certainly have to be built up by the plant-breeder much as they have had to be in Australia for instance or again of recent years in the Argentine.

RUST.

The first sustained attempts to grow wheat in Kenya showed that rust attacks would seriously limit the yield of the crop even if they did not make its production impracticable. One of the first varieties to be grown on an extensive scale was the Australian "Gluyas." For three seasons this cropped satisfactorily, in one season its yield being equal to the average yield obtained in England. The fourth year the crop was wiped out by rust. This experience has been common as new districts were opened up to all of the pioneer wheat-growers.

Gluyas was soon replaced by an Italian variety "Rietti" which was found to be less susceptible to rust though nevertheless it was liable to be seriously damaged in seasons when the epidemic was severe. Its introduction was the first step taken to solve the Kenya wheat-growers' chief problem, namely the avoidance of losses through the attacks of rust. As cultivation extended the problem proved to be a peculiarly complicated one for it gradually became clear that there was not one rust only to be dealt with, as in the case of most wheat-growing countries, but that three distinct species were present and moreover the virulence and constancy of their outbreaks showed that the conditions suited them well. Of the three species the most important is *Puccinia graminis* the "black" or "stem" rust. This may be found on the leaves, the ears or the straw of the plant but the symptoms shown on the straw are those recognizable with the greatest certainty. These are dark linear patches at first a deep rusty brown in colour and later becoming black. Each patch is surrounded, especially in the earlier stages of growth, by a white frill formed by the rupture of the skin of the plant as the small masses of rust-spores force their way to the surface. The attack generally begins as the crop comes into flower and if the conditions are favourable for the growth of the fungus the yield is either seriously depreciated or the formation of the grain may be almost entirely prevented.

Next, in order of importance is *Puccinia glumarum* the "yellow rust." This attacks the foliage at any stage of growth and also the ears. It is readily distinguished by its bright yellow colour and by the densely crowded pustules. It has not the killing power of the black rust and crops infected at an early stage of growth may grow away from it and give a satisfactory yield. When, however, the ears are attacked and yellow masses of spores are to be found within the chaff serious losses of grain may be anticipated.

The third species, *Puccinia triticina*, "brown" or "leaf" rust, though occuring on other parts of the plant is generally most obvious on the foliage. Its colour marks it off from either of the preceding species. Fortunately it appears to do comparatively little damage in Kenya and so far there are no records of its having destroyed a wheat crop. But it undoubtedly reduces the yield to an appreciable, if unknown, extent each season.

The observations of W. J. Dowson and especially of G. J. L. Burton have shown that these three species differ in their distribution and that two are confined to more or less definite zones whilst the third is more or less uniformly to be found throughout the wheat-growing districts. The black rust is the prevalent species in districts at an altitude of from 4,500 to 6,500 feet; above 7,500 feet its place is taken by the yellow rust and the brown rust is found at any elevation where wheat is grown.

At about the 7,000-foot level the black and yellow rust overlap so that in this zone all three species may be present. It was recognized that these zones were not clearly defined and that the various factors affecting the distribution of the rusts which are grouped

together under the term " climate " could not be definitely limited by contour lines only. But it was clear that for high and low elevations respectively wheats were required which would resist either the yellow or the black rust, whilst for intermediate elevations resistance against both species was desirable.

The opportunity for checking these observations was taken during November and December under what appeared to be exceptionally favourable conditions, for in all the districts visited the rust attacks were said to be exceptionally severe. It was found that, broadly speaking, the generalization as to the distribution of the various rusts in zones was a sound one. But here and there the black rust was met with at elevations of 8,000 feet on varieties believed to be exceptionally susceptible to its attacks whilst the yellow rust was only found above the 7,000-foot contour. At this elevation (7-8,000 feet) the attacks of the latter were comparatively slight and if, normally, they are no worse than in 1926 then, in this zone, wheats resistant to black rust only could be grown without too great a risk of loss through yellow rust.

Whilst following out the distribution of the rust species an attempt was made to estimate the losses for which they are responsible. The method used was a rough and ready one at the best. It depended on two estimates—one the growers' which it was assumed would automatically allow for rust losses, the other the observer's which was based on the experience of what a crop of similar thickness and ear-size would yield if no rust were present. Doubts exist as to the trustworthiness of the data which make it inadvizable to discuss the observations in detail but they indicate that half of the potential crop is lost through rust attacks. In many districts the severity of the attacks was amazing and crops were seen repeatedly which had been almost completely ruined. Where this occurred growers stated that the result was not unusual. In others the losses were small and growers with six years' experience or even more had never had a crop failure through the attacks of the rust. Two factors account for this difference. One is the locality, the other the variety of wheat grown

Above the 8,000-foot contour where the crop is exposed to the attacks of the yellow rust complete or even serious losses are the exception and wheat-growing is a reasonably safe commercial proposition. Below this only a variety which is outstandingly resistant to black rust can be grown with reasonably good chances of securing a crop. The importance of this rust resistance was

especially clear in the districts round Njoro and Nakuru. Here crop after crop of rusted wheat was seen which would only produce some two bags per acre whilst others were completely destroyed by the black rust which had attacked them just as they came into ear. Yet in this area where the epidemic was more severe than in any other seen during the investigation healthy crops capable of yielding from 6 to 8 bags per acre were present. These good crops, without exception, were crops of the new variety Kenya Governor. Had it not been for the existence of these crops the conclusion drawn from the examination of the wheat fields in this area would have been that wheat-growing was too risky to be a commercial proposition. In view of the healthiness and the yielding capacity of the crops of Kenya Governor, however, it was clear that wheat could be grown here with a considerable measure of success, provided always that nothing but varieties capable of withstanding the attacks of black rust were grown. The future of wheat-growing in districts where the black rust epidemic is normally severe is so bound up with rust resistance that the behaviour of Kenya Governor under various conditions of soil and climate is worthy of a detailed description. In all, nineteen crops were examined in detail, 17 personally and two by Mr. Burton. The crops chosen for the purpose were for the most part ripe or nearly so, so that the rust had had every opportunity for infecting them. Crops at an earlier stage of growth of which a number were seen were not included in this part of the investigation on the ground that if rust free then rust might attack them before they matured. Three of the crops were growing alongside crops of Droop wheat. The latter were completely destroyed by black rust whilst the Kenya Governor in each case was perfectly healthy and the most a thorough examination disclosed was a rust pustule or two on green immature side tillers. The other fourteen crops seen on the Uasin Gishu Plateau and in Trans-Nzoia did not allow of a comparison being made between resistant and susceptible varieties growing under the same conditions. Again, however, either no trace of rust or the merest signs of it could be found in them. The two crops seen by Mr. Burton were in the Rongai and both of these were lightly attacked.

In the course of the enquiry two reports of rust damage to Kenya Governor were received and the cases were investigated as fully as possible. One report was found to be due to a mistaken diagnosis, for the crop was rust free; the other could not be cleared up satisfactorily. The crop said to have been rusted was grown in 1925 in the Trans-Nzoia when the rust outbreak was an exceptionally severe one. But if attacked it was clear that little

damage was done for whilst other varieties failed more or less completely Kenya Governor produced a crop of over six bags to the acre.

The only other variety in general cultivation in Kenya which is capable of standing up to the attacks of black rust is a durum wheat known as Golden Ball (Groot Korn). The rust attacks the straw, often severely, yet in spite of this good yields of grain are obtained.

The other varieties now grown in the black rust zone are various strains of Droop wheat, Cross 11 and Cross 15. Their cultivation below the 8,000-foot level should be abandoned for though they may occasionally be fairly free from rust the chances of a severe attack are too great to make it economically sound.

In the wheat-growing areas above 7,500 feet the most generally grown sort is Equator. This possesses a considerable degree of resistance to the yellow rust—how great is hardly realized until the presence of a rust-coated bearded rogue usually to be found in small quantities in the crop shows how a susceptible variety behaves under similar conditions. The Canadian wheat Marquis is also grown at and above this elevation. Crops of this variety seen at various stages of growth indicate that it is a more susceptible variety than Equator and several partial failures led to the conclusion that until the wheat has been more thoroughly tested out in the zone between 7,000 and 9,000 feet its extended cultivation was not to be recommended. It should not be grown below 7,000 feet on account of its susceptibility to the attacks of black rust.

VARIETIES.

Equator is grown extensively above the 7,500-foot level. Its most useful features are to be found in its freedom of stooling, the toughness of its ears and chaff which prevents the grain from being shed even when the crop is over-ripe, and a degree of rust resistance sufficient to ensure a satisfactory crop under suitable conditions. The deep red grain is of fair quality and well suited for blending with other wheats but milled alone it does not produce a good bread-making flour.

The wheat known as K.T. resembles Equator too closely to be considered a distinct variety.

Marquis.—Under Kenya conditions is a free-stooling wheat which produces an over-abundance of straw and lodges badly in unfavourable weather conditions. The samples of grain examined lacked the clean translucent appearance of the wheat as it is

grown in Canada and were badly finished. This was particularly true of those grown above the 8,500-foot level. It may possibly be associated with a too prolonged ripening period. Under favourable conditions it crops well and several fields promising to yield up to 10 bags per acre were seen. On the other hand some wretchedly poor crops, doubtfully worth harvesting, were met with.

Golden Ball and Groot Korn.—Whether these names represent two distinct wheats or whether either name is indiscriminately used for a single sort is not clear. As the specimens seen were of one sort only it is provisionally assumed that the latter alternative is correct. The wheat is a durum variety—that is, it is suitable primarily for the manufacture of macaroni and not for bread-making. It has large, strongly bearded, light-chaffed ears carried on stiff straw. Though susceptible to black rust it is comparatively little damaged by it. It yields well and is probably the most reliable cropper in the country at present. The best crops were estimated at over 10 bags per acre whilst the worst looked as if they would yield about 5 bags. Were it only more suitable for bread-making there would be no hesitation about recommending its cultivation on a more extensive scale. But until the possibilities of the market for atta, for which it is well suited, are better known this is impracticable. It should be tried experimentally in some of the drier districts bordering the Athi Plain for it is undoubtedly more drought resistant than the bread wheats.

Kenya Governor.—The outstanding merit of this wheat is to be found in its resistance to the attacks of black rust. It is a fair cropper on black cotton soil, red soil and the greyish soil of the Njoro district. The best yield recorded so far appears to be 10½ bags per acre. The grain is large, translucent and of good quality. Several excellent grain samples were seen and one bag exhibited at the Nakuru Show was an outstandingly good sample.

Two reports of lodged crops indicate a possible weakness of the straw but all of the crops examined were standing well. The type is perfectly fixed

Droop Wheats.—Various strains of Droop wheat are in cultivation particularly in the districts round Njoro, Nakuru and on the Uasin Gishu Plateau.

They are reasonably true to type and differ chiefly in their time of ripening and their cropping capacity. Until 1924 they were considered to be distinctly rust-resistant but later experience

has shown that their degree of resistance is insufficient to warrant large-scale cultivation in districts where the attacks of black rust are particularly virulent.

Cross XI is a widely distributed variety found in almost all of the districts visited. The type is beardless but a bearded form occurs with it in some quantity. The grain is narrow, long, white and apparently of good quality. At low levels it ripens in from four to four and a half months whilst at 9,000 feet it may take as long as six months. At elevations of 5,000 to 7,500 feet it is too susceptible to black rust to be grown with any certainty of securing a grood crop. Above 7,500 feet it appears to be reasonably resistant to "yellow rust."

Cross XIII is again a mixed type the predominant form being bearded and red grained. The best crops were seen on the Uasin Gishu Plateau but where comparisons could be made they were inferior to the crops of Equator. It is apt to shatter when dead ripe and its capacity to resist black rust is inadequate.

These are the only varieties in general cultivation in the country but on one or two farms especially on the Plateau a number of other sorts, mainly from the United States and Australia, were being tried experimentally. None of these appeared to be of any great promise.

QUALITY.

The unusual climatic conditions under which wheat is grown in Kenya make the question of the quality of the crop an important one. It is often assumed that rapidly grown wheats have good milling and baking qualities. If this is generally true—and there is no particularly good evidence that it is so—then the local wheats should yield good flour for bread-making purposes. Little is known, however, of the effects of intense sunlight, of the low night temperatures occurring at high elevations or of excessive vegetative development on the development of the grain and so sensitive is quality to the effects of the environment that it was impossible to form any *a priori* conclusions as to the character of the loaf produced from Kenya flour.

It was realized that definite data on the subject would be difficult to obtain and that the ordinary standards of judgment, based on the appearance of the grain, were not to be trusted under these unknown conditions. The final method of determining the quality of wheat is to convert the grain into flour and bake this against a standard flour. This was unfortunately impracticable

but thanks to the interest of the manager of the Unga Flour Mills and to some of the bakers in Nairobi it was possible to obtain some fairly conclusive data on the commercial value of Kenya wheat.

The Unga Mills at Njoro and the mill at Nairobi are now dependent almost entirely on wheat grown in the country. In fact at the time the enquiries were being made the lack of external supplies was being felt and owing to the unusual lateness of the harvest the Unga mill was running short of supplies whilst that at Nairobi had had to cease running temporarily. Normally both mills blend all of the wheats available in proportions which experience has shown to give satisfactory results. The predominant wheat in the blend at present is Equator. The milling process is similar in most respects to that carried out in well equipped mills in England and it need not be described in detail. It is sufficient to say that the blends mill well, that the bran dresses off readily and that consequently the yield of flour and its colour are satisfactory. In fact considering that much of the grain which has to be handled is rust-shrivelled and that Equator is often a very dark-skinned wheat the results are surprisingly good.

The flour makes up into a somewhat soft dough which an English baker considers difficult to handle. But the local bakers have become accustomed to this peculiarity and find no serious fault with it. As handled in Nairobi it produces loaves of good colour, texture and flavour and considering that no constant supply of yeast is available and fermentations to produce it have to be started up daily, the quality of the bread from day to day is fairly uniform. Many housewives, however, complain that local flour will not produce good bread but in view of the fact that others can place on their tables bread fully equal to the best of that sold in Nairobi it would seem that the baking processes are to be blamed more than the flour. Another complaint, and this a universal one, was that the local flour was not suitable for pastry making. This is true for the time being and even the skilled bakers of Nairobi make use of Bombay flour for this purpose.

Judging by the usual English standards it was clear that the different varieties of wheat used in the blends differed considerably in quality. An opportunity of comparing them was provided by the Manager of the Unga Mills who went to the trouble of milling a number of them separately for this purpose. From the resulting flours equal weights were taken, the gluten separated by washing and its quantity and physical properties compared. These two features more than any others determine the baking properties of flour. The gluten separated from the flour of Equator wheat was

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but thanks to the interest of the manager of the Unga Flour Mills and to some of the bakers in Nairobi it was possible to obtain some fairly conclusive data on the commercial value of Kenya wheat.

The Unga Mills at Njoro and the mill at Nairobi are now dependent almost entirely on wheat grown in the country. In fact at the time the enquiries were being made the lack of external supplies was being felt and owing to the unusual lateness of the harvest the Unga mill was running short of supplies whilst that at Nairobi had had to cease running temporarily. Normally both mills blend all of the wheats available in proportions which experience has shown to give satisfactory results. The predominant wheat in the blend at present is Equator. The milling process is similar in most respects to that carried out in well equipped mills in England and it need not be described in detail. It is sufficient to say that the blends mill well, that the bran dresses off readily and that consequently the yield of flour and its colour are satisfactory. In fact considering that much of the grain which has to be handled is rust-shrivelled and that Equator is often a very dark-skinned wheat the results are surprisingly good.

The flour makes up into a somewhat soft dough which an English baker considers difficult to handle. But the local bakers have become accustomed to this peculiarity and find no serious fault with it. As handled in Nairobi it produces loaves of good colour, texture and flavour and considering that no constant supply of yeast is available and fermentations to produce it have to be started up daily, the quality of the bread from day to day is fairly uniform. Many housewives, however, complain that local flour will not produce good bread but in view of the fact that others can place on their tables bread fully equal to the best of that sold in Nairobi it would seem that the baking processes are to be blamed more than the flour. Another complaint, and this a universal one, was that the local flour was not suitable for pastry making. This is true for the time being and even the skilled bakers of Nairobi make use of Bombay flour for this purpose.

Judging by the usual English standards it was clear that the different varieties of wheat used in the blends differed considerably in quality. An opportunity of comparing them was provided by the Manager of the Unga Mills who went to the trouble of milling a number of them separately for this purpose. From the resulting flours equal weights were taken, the gluten separated by washing and its quantity and physical properties compared. These two features more than any others determine the baking properties of flour. The gluten separated from the flour of Equator wheat was

abundant in quantity. It was soft and slightly sticky and when moulded into a sphere it soon began to lose its shape and flatten out; evidently then it was the Equator component of the blends which accounted for the comparative lack of stability noted in the doughs in the bakehouses at Nairobi. That from Kenya Governor was similar in quantity but very different in character. It was tough, elastic, free from stickiness and it retained the shape into which it was moulded. As a tough gluten holds the gas formed during the fermentation of the dough better than a soft inelastic gluten it produces a lighter, better aerated loaf. Flour from Kenya Governor should therefore give very satisfactory loaves and as this variety becomes more widely grown still better bread should be available and probably flour suitable for pastry making.

The gluten moreover was so singularly like that of Red Fife wheat that it seems probable that this wheat, known to have been used for crossing purposes by Evans and Dowson, was one of the parents of Kenya Governor.

Marquis wheat as grown in Canada or in England gives a similar tough gluten. The sample of flour from Kenya-grown Marquis was, however, deficient in the quantity of gluten and its physical properties were poor compared with those of Kenya Governor. It would not have produced a saleable loaf whereas Marquis flour from Canadian or English crops is of excellent quality. But the wheat from which the flour was milled was an under-average lot and probably it was not typical of what the country generally grows.

Golden Ball.—The flour from this durum wheat was less yellow in colour than was anticipated and a small percentage of it, say from 5 to 10%, could be blended with the ordinary bread wheats without affecting the colour of the flour seriously. The gluten was of the usual durum type, namely, soft and lacking in stability.

CULTIVATION.

The cultivation of the crop except on comparatively few farms still leaves much to be desired. It is naturally best where the growers have had several years' experience and have found that they can rely on securing a fair return for their expenditure. More attention to the growing crop has then been given, better crops have been secured and by putting part of the profits into machinery the cost of such operations as cleaning and harvesting has been reduced.

In newly developing districts the general tendency appears to be to break up as large an area as possible and get it sown with wheat. Too much is often attempted with the result that parts of the land are inadequately cleaned and an indifferent tilth obtained. The average return from the first crop is thus often unsatisfactory and that of the succeeding crop, though sown under better tilth conditions, is reduced by the over-abundance of weeds. A less extensive scale to begin with and a steady increase in the area might save disappointments and prove advantageous in the long run.

The methods of first breaking the land in general use would repay closer investigation than was possible during the enquiry. The commonest procedure is to use disc ploughs drawn by oxen to turn the grass under. The work is often very ragged: patches are missed, ploughed unnecessarily deeply or merely skimmed and much of the sod falls back into its original position. The crops sown on land so broken are invariably patchy and their ripening is so uneven that the use of a stripper or a combined harvester-thresher is almost out of the question. The grass would be more effectively killed and a more uniform tilth obtained by the use of motor-drawn mould-board ploughs.

With successive crops the land, even if originally studded with ant-hills, becomes more uniform and easily worked. Concurrently there is the danger of its becoming overrun with weeds and signs are not wanting that this will provide the wheat-grower with one of his most serious problems. A well-broken piece of land is generally free from the seeds of those weeds which thrive under arable conditions except possibly in the case of old boma land. It is sound economy to keep it as free from weeds as possible and in this the grower is aided by the unusually dense "stand" of wheat so commonly seen in the country which tends to shade and crowd out a large proportion. To keep down the vigorous weed flora the land produces naturally every opportunity should be taken, both before and after planting, of stirring the surface soil to encourage first the growth and then the destruction of seedlings. Incidentally such cultivation has the advantage that it conserves soil moisture and in the drier districts harrowing, even for this purpose alone, would often be advantageous.

An excellent series of experiments designed to investigate the best methods of coping with weeds was seen at Kilima Kiu but it was too early in the season to form any estimate as to which of the systems being tried would prove the best. These test plots should be kept under observation by the Department of Agriculture.

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Spraying the young wheat with a two per cent. solution of copper sulphate or even with a strong brine solution should also be tried experimentally as this has proved to be a cheap and satisfactory method of diminishing the weed flora without injuring the crop.

Further comparative trials of the value of phosphatic manures should be made. A comparison of the effects of basic slag and Seychelles guano on the yield of grain could probably be made in the current year on fields already treated or to be treated with these manures and small-scale trials, simply of alternating treated and untreated strips, should be undertaken with Ephos and other rock phosphates.

DISTRICTS VISITED.

Northern and Western Kenya.

Hitherto the distance of these districts from the railway has stood in the way of arable farming and so far very little land has been broken. The approach of the railway has, however, led to a good deal of interest being taken in the possibilities of wheat-growing and a start has been made on several farms near Narro Moru and Nanyuki. These farms are at an elevation of 6,000—6,500 feet and from a climatic point of view they appear to be suitable for the purpose. The rainfall is some 30-40 inches and it is so well distributed that two crops a year can be grown. The great open stretches of grass-land or land so lightly covered with thorn bush that clearing presents no difficulties are well suited for large-scale cultivation. Practically all of the land seen under the plough was black cotton soil. The difficulty of getting through the tracks traversing it in wet weather suggested that it was not an ideal soil for cultivation but locally it was said to become an easy, free working soil after cultivation for a season or two, provided that it was ploughed at the right period. Easily worked red soils also occur in both districts. The yields reported, chiefly from the immediate neighbourhood of Nanyuki, were very variable. Several crops had proved failures either through sowing at the wrong period or through the attacks of rust, whilst the successful crops ranged from two and a half to eight bags per acre. The crops seen were all at too early a stage of growth to estimate what their fields were likely to be but it seemed probable that, in the absence of a rust outbreak, they would be satisfactory. But not only did the information obtained locally indicate that such outbreaks were not improbable but proof that black rust occurred in the district was found on wheat straw which had been used for thatching.

As was only to be expected under the circumstances there was a general lack of experience of the technique of arable farming and owing to the lack of suitable implements much of the breaking of the grass-land had been indifferently carried out. A farm run by an experienced arable land farmer would be a great asset in these districts.

Gilgil and Thomson's Falls Districts.

The farms visited in these districts were for the most part situated at elevations of from 8,000 to 9,000 feet above sea level. At these heights wheat grows and matures comparatively slowly and the crops sown in July were when seen in November only just coming into ear. They were vigorous and more or less free from yellow rust though at this stage of growth there was still a possibility of its putting in an appearance. This freedom was definitely due to the resisting capacity of the wheats grown for here and there in the crops was a bearded rogue the foliage and ears of which were yellow with rust. The crops were standing unexpectedly well considering the length of the straw and the heavy rainfall then being experienced. The average yield was said to be about 5 bags per acre and failures were said to be exceptional. Judging from the appearance of the crops the estimate was a conservative one. Grain samples of the previous season's growth were satisfactory.

Both the climate and the soil are suitable for wheat-growing. But the country is, on the whole, undulating or hilly and level patches over 50 acres in extent are not often met with. Extensive cultivation is thus impracticable but a large area composed of many comparatively small ones is available for breaking. Most of this is under grass and no clearing is necessary. The area under wheat has increased steadily and the local growers were looking forward to planting a large additional acreage in the coming season.

Most of the wheat grown was Equator and Marquis. A careful search was made for black rust on these high-lying farms but no signs of it were found except on one at the 8,000-foot level where a crop of one of the Pusa wheats, which is evidently very susceptible to its attacks, was found to be badly damaged. The numerous experimental plots on Patten's farm in this district provided a good opportunity for such observations and also for further observations on the incidence of yellow rust. Here some of the wheats susceptible to yellow rust were severely attacked whilst some of the hybrids were completely rust free. If this

freedom from rust is maintained until ripening time these varieties should prove of considerable value for cultivation at and above the 8,000-foot level.

Nakuru and Njoro.

The first visit paid to this district showed how serious the difficulties were which wheat-growers had to face when attempting to produce a crop at such elevations and an opportunity was taken on returning from the Trans Nzoia to revisit it. Hitherto these districts have specialized in maize production and as wheat appeared to offer a useful alternative crop or a crop which could be put in when difficulties in planting up the whole of the ploughed land with maize had occurred its possibilities seemed to require a closer investigation. Consequently most of the land under wheat was inspected. This lies at elevations of 6,500 to 7,500 feet above sea level, that is to say in the zone where the attacks of both black and yellow rust may be expected. The rust attack was said to be unusually severe and certainly it could hardly have been worse for several hundred acres were so badly infected that they were not worth harvesting. When the rust epidemic is slight yields are satisfactory, the official average for 1926 being given as 3·85 bags per acre whilst local estimates ranged from 5 to 8 bags. But the too frequent occurrence of bad crops makes wheat-growing here somewhat of a lottery. One satisfactory feature was to be found, however, namely the general excellence of the crops of Kenya Governor, indicating that once the cultivation of this variety has become general this difficulty will disappear.

The soils of the district are derived from a light volcanic ash. They are fertile and readily worked and theoretically the rainfall is an ample one though crops have been known to fail through drought. The land is generally flat and large areas which have carried heavy crops of maize for some years without any appreciable loss of fertility are available for wheat-growing. Problems of transport by rail are for the most part simple and one of the two modern milling plants in the country is situated here.

Mau Summit and Londiani.

The farms visited at Mau Summit were some 200 to 500 feet above the level of the railway station (8,321 ft.). The fine, rolling, almost treeless country through which the railway passes north-west and south-east of Mau Summit station has deep, fairly fertile soils along the ridges but the wide, shallow valleys are considered to be more suitable for grazing than for arable purposes. The wheat crops here grow slowly and June sowings are not ready

for harvest until January and February. Those inspected had been sown from 8 to 24 weeks previously. They were all fairly free from yellow rust and no sign of black rust could be detected. The brown rust was, however, very abundant in some fields. Yields were obviously very variable, the local estimates ranging from 4 to 9 bags per acre. The worst crops were on newly broken land, the best on land broken 4 years previously and treated with basic slag, or old boma land.

The wheat most generally grown was Equator but trials of Marquis were being made. Where there were opportunities of comparing the two varieties the former seemed to be the better but the differences were not great. The few grain samples available for examination were good, the grain being well filled and obviously the produce of healthy crops.

The complete failure of the crop appears to be unknown in this district and once it has been established there is a reasonable certainty of its succeeding.

Towards Londiani the land falls and the farms visited in this neighbourhood were some 600 feet lower than those near Mau Summit station. In this neighbourhood some areas of woodland have been cleared for planting recently and there are also areas of one time forest land. The soils formerly carrying trees or scrub are still fairly rich in humus and carry good crops of wheat. The largest crop reported as having been grown was between 10 and 11 bags per acre. The crops of wheat seen were Equator, Marquis, Kenya Governor and Droop. They had been sown at various times from the third week of June until the last week of August. They were generally comparatively free from yellow rust and none could be found on the latest sowings which were then just coming into ear. But the earliest sowings had been rusted at an early stage of growth and had " grown away " from the disease. Whilst there was little to choose between the rust resistance of the different varieties Equator was the least and Droop the most susceptible. Traces of black rust were found on some new varieties under test for the first time in the district. But the attack was a harmless one the pustules only occurring on small late tillers of almost mature plants. Judging from experience in other parts of the country it is not probable that this rust will prove a serious pest here. Apart from these slight to moderate rust attacks the crops were healthy and promised to yield well with the possible exception of a single field of Marquis on which much of the foliage had died off prematurely. On one farm some of the land had carried four wheat crops in succession and a

vigorous weed flora had established itself with disastrous results. As a demonstration of the effects of weeds on the crop two adjacent pieces of wheat should prove of value locally for on one so thick were the weeds that it was difficult to believe that wheat had ever been sown and on the other was a crop of about 6 bags per acre.

One farm was visited in the Lumbwa District on which some 1,100 acres of wheat were being grown. The various fields were from 7,500 to 8,000 feet above sea level and the general climatic conditions were similar to those nearer Londiani. Its rainfall was a well distributed one of 40-50 inches with a dry period for harvesting from the middle of December until March. The sowing dates ranged from May until August so that the crop was seen at various stages of growth. The crops were fairly free from yellow rust, black rust could only be found after careful searching and brown rust was moderately abundant on the later sown crops. Yields promised to be good and on two fields there was a good prospect of obtaining some 8 or 9 bags per acre. The " all over " average appeared to be about 5 bags. Moreover wheat had been grown here for five seasons without any failures having occurred.

The effects of basic slag were being followed carefully here and conclusive evidence of its value was available. Various wheats had been grown from time to time and those found to be most satisfactory were Equator, Droop II and one of Pusa wheats. The last was lightly attacked by black rust.

At another farm near Equator station wheat was being grown on the same extensive scale. Here the fields were at a still higher level ranging from 8,500 to 9,200 feet and earlier sowings, from the middle of April until the middle of July, were necessary to bring the harvest into the dry period between December and March. At the most the crops were very slightly attacked by yellow rust, brown rust was present in moderation, particularly on a crop on newly broken land and no signs of black rust could be found. The wheat throughout stood thickly and promised to average at least 5 bags per acre with on one field the probability of a crop of 9 to 10 bags.

Again basic slag was being used on a large scale and dressings of 80 to 100 lbs. were being found to give very satisfactory results. Although some of the land had been under wheat for four seasons it was far freer from weeds than is usually the case where no system of crop rotation is practised. The technique used was to follow the harvester with the plough. The ground then dries out and the crop of seedlings brought up by the first rain is destroyed

by harrowing. A second ploughing, followed if found advisable by another harrowing, is given before seeding. Any seedlings appearing subsequently have to face the intense competition of a strongly growing crop and have a poor chance of establishing themselves.

Most of the wheat on the farm was Equator. Other sorts were being tested but heavy rains prevented any detailed examination of them being made.

Similar conditions of soil and climate are to be found round Timboroa if one may judge from the soil sections exposed in the railway cuttings and from the general flora and it is probable that the clearing of some of the more lightly forested land would make available still richer soils. But neither from the railway nor the roads were any crops seen.

The last of the localities where wheat is grown at a high level was Mau Narok. The highest field here is at an elevation of some 10,300 feet. At this height the crop grows vigorously giving a stand comparable with that of the wheat-fields of western Europe. But growth is comparatively slow and even a rapidly maturing variety such as Marquis takes about six and a half months between sowing and harvesting. The climatic conditions allow of sowings being made at almost any time of the year and a series of fields varying from the seedling up to the mature stage were available for examination. On one in which the plants were from six to eight inches high no rust whatever could be found, there was a small quantity of yellow rust in a field just coming into ear and in another which was almost ready for cutting this rust was rather abundant within the chaff. The brown rust was present in small quantity but the black appeared to be entirely absent. Yields promised to be high with a maximum of 10 to 11 bags per acre and a minimum of 3 to 4 bags. But one almost complete failure, noteworthy as being the only one met with above the 8,000-foot contour, was seen on a neighbouring farm, where many acres of a crop were not worth cutting and that then being harvested did not appear to exceed 2 bags per acre. A badly drained soil was primarily responsible for this.

Practically all of the wheat at Mau Narok was Marquis.

The Uasin Gishu Plateau.

The area under wheat on the Plateau is the largest in the Colony. According to the statistics of the Agricultural Department, 13,600 acres were harvested there in 1925-1926 with an average output of about 2½ bags per acre. As the crop had been grown for a longer time and on a larger scale than in any other

district it was considered advisable to spend some time in collecting the accumulated experience of growers and seeing the results of their work.

The soil conditions of the Plateau are rather variable. Over a large area the soils are comparatively thin, and even on the ridges rock comes to the surface whilst the slopes of the valleys are frequently unploughable owing to rocky outcrops. But there are still extensive areas of flat grass-land suitable for breaking. The soil on these is for the most part a red free-working friable loam on which the grass is easily killed. Here and there particularly fertile areas occur. The climatic conditions are suitable for wheat-growing. The annual rainfall at Eldoret is about 42 inches, at Sergoit 38 and at Soy 47 and over the whole district there are two well defined rainy periods, immediately before either of which sowing should be carried out. The climatic conditions of the year 1926 were considered to be entirely abnormal for there was a serious drought in April and from then onwards the rainfall was excessive. As a consequence the crops were said to be under-average and it was universally agreed that the rust epidemic was exceptionally bad. Most of the farms visited were at an elevation of 6,500– 7,000 feet that is to say they are situated in the black rust zone.

Much slovenly cultivation was seen and as a result many wretchedly poor crops. Weeds, especially black-jack were so abundant that from the distance wheat fields could be picked out from the surrounding veldt by their black colour. But where the cultivation was good the crops grew very satisfactorily though the yields were often sadly depreciated by the attack of black rust. More varieties of wheat are grown in this district than in any other part of Kenya. A collection of them had been got together by Dr. Forbes, of Eldoret, which was of interest in as much as it enabled comparisons to be made of the same wheats grown on different parts of the Plateau. A second collection was seen growing on Mr. Dry's farm containing not only the wheats of the district but also a number of imported varieties. A particularly interesting feature of this was a series of successional sowings of Equator made at weekly intervals from the end of March until the end of May. One sowing only, that made during the first week of April, was attacked by a fungoid pest (a Phoma?) which has appeared recently in the district and was already widely distributed there. Some evidence was found to indicate that the intensity of the rust epidemic was dependent on climatic conditions also for the crops sown in May were excessively attacked whilst those sown in June and July were comparatively slightly affected.

The wheat most generally grown was again Equator. A large area in the aggregate was also under Golden Ball (Groot Korn). Many of the crops of the latter stood thinly but no failures were seen and the yield promised to average out at the rate of 5 bags to the acre. Only a few small fields of Kenya Governor were seen which were being grown to provide seed for the next crops. They proved to be rust free. If this characteristic is retained unimpaired, there can be little doubt that this variety will soon replace all others and that given better farming on the whole and the use of phosphatic manures the Plateau will become an important wheat producing area.

Trans Nzoia.

Along the road between Eldoret and Kitale marked changes in the vegetation are noticeable and beyond Soy the soils of the Plateau apparently become poorer. On crossing the Nzoia River the country improves almost suddenly. Rich red soils again occur and the openness of their texture is made evident where rain has effected a mechanical analysis and filled the roadside holes with coarse grit and sand. Cultivation which has been wanting for miles previously now begins again and the heavy crops of maize point unmistakably to the richness of the land.

In 1926 there was little wheat being grown in the district Though newly settled it has already acquired the reputation of being unusually bad for black rust and after a disastrous experience in 1925 settlers were naturally chary of planting on anything more than a small scale. But the wheat seen was, as a rule, comparatively free from disease and the intensity of the attack was certainly no greater than on the Plateau and distinctly less than that around Njoro and Nakuru. The yield per acre of the ripening crops also promised to be satisfactory though not as high as one was led to expect from the huge crops of maize. It is doubtful whether the time has arrived yet for wheat-growing on an extensive scale except on the farms on which it has already proved to be successful. Trial sowings should, however, be made generally. On the plains between Eldoret and Mount Elgon much of the land is too liable to be water-logged to be suitable for wheat and towards the Cherangani foothills much of the land is so light that in a dry season the chances of crop failure would be considerable. On the foothills of Mount Elgon there is a large area suitable for wheat-growing. It lies above the danger level as far as black rust is concerned and the fertility of the soil should ensure high yields. But the prospective grower will have to consider the ques-

tion of transporting the crop to railhead at Kitale for the main road runs through vley land and is practically impassable in wet weather.

The experience of those who first attempted to grow wheat in Kenya soon indicated that the successful establishment of the crop in the country was dependent on the production of varieties suitable for its special conditions. The growers of maize, sisal and coffee found, ready made, varieties which throve under Kenya conditions but the crops of the wheat-grower were uncertain and all too frequently destroyed, chiefly by the attacks of rusts. The repeated failures to secure suitable varieties by importing seed from the chief wheat-growing countries led the Agricultural Department to employ the services of a plant-breeder in the early days of its history.

The first to be appointed, Mr. Evans, after a hurried training in Cambridge, began investigating the possibility of raising rust-resistant wheats at Kabete. A few years later the necessity for economies in Government expenditure led to the suppression of the post of plant-breeder. But, fortunately, the work was not abandoned. Lord Delamere realizing its importance to the country took Evans into his employment and provided facilities for continuing it. On the death of Evans it came, temporarily, to an end. No detailed records of his work are available now. But it is known that as a source of rust-resistance he made use mainly of Rietti and Bobs, the best wheats available at the time. He further made use of Red Fife as a parent wheat on account of its excellent milling and baking qualities. The hybrids he raised have, to a considerable extent, provided the basis for subsequent plant-breeding investigations. They have been of economic value too. One, " Bobs x Rietti," is still grown successfully here and there in the Uasin Gishu Plateau and the Burnt Forest whilst another, " Equator," is now the staple variety in most of the higher wheat-growing areas. It is a curious fact that this latter variety, which possesses a considerable degree of resistance to the attacks of yellow rust, was bred and selected out in an area where the black stem rust is particularly prevalent.

Evans' hybrids were ultimately handed over to Mr. W. J. Dowson, the Government Mycologist. The fact was recognized that he had had no experience of this highly specialized work but, at the time, no one else with any botanical training was available. It was, however, a fortunate move, for Dowson had paid a great deal of attention to the distribution of the various rust species in the Colony and was thoroughly familiar with their distribution and

their effects on the wheat crop. The technique of breeding for disease resistance too was then better understood and the way was fairly clear for producing the wheats the country needed. He soon set himself the difficult task of raising varieties resistant to both the black stem and the yellow rust, knowing that a variety possessing this double resistance could be grown with safety at any elevation. Dowson's tenure of the dual post was unfortunately a short one. Though again no detailed records of his work are available, it is clear that good progress was made with this ambitious task.

Some five years ago the present Government Plant Breeder (Mr. G. J. L. Burton) was appointed, and he inherited the mass of material raised in the course of the two previous investigations. He wisely concentrated on fixing and thoroughly testing the numerous types available and only made fresh crosses when experience indicated the advisability of doing so. The work has been carried out on a comprehensive scale with great thoroughness and each year many thousands of separate plants have been kept under observation at the Scott Agricultural Laboratories, Njoro and Gilgil.

The results of these patient investigations are now becoming evident. The first is to be seen in the recently distributed wheat " Kenya Governor " which is a variety more capable of withstanding the attacks of the black stem rust than any other in cultivation in Kenya at present and is moreover of excellent milling and baking quality.

Of more importance in the immediate future, though, are a series of hybrid wheats, now properly fixed and true to type which have been under test at Njoro for the past three seasons. A number of these appear to be extremely resistant to the attacks of both black stem and yellow rust for though both these pests were present in abundance on adjacent plots no signs of either could be found on them after thoroughly critical examination on two separate occasions. The multiplication of these varieties for further testing in different localities and ultimately for distribution should be pushed forward as rapidly as possible. In addition to these hybrids a wheat known as " Red Egyptian " has been found which may prove to be really immune to the attacks of black stem rust, for five successive crops grown under conditions extremely favourable for infection have been found to be entirely rust free. Whether the variety is suitable for field cultivation remains to be proved. Even if it is not in the hands of a plant-breeder it is a valuable find.

The progress made justifies a further extension of the work and makes the hope that Kenya will supply its own increasing needs and those of neighbouring countries as well a feasible one.

As a first step an additional plant-breeder should be appointed to secure complete continuity in the investigations. Under the present conditions each period of leave checks the normal progress of the plant-breeder's work. In his absence the wheats have to be grown on. But with the best will in the world his colleagues in the Agricultural Department cannot make the continuous records necessary from the beginning to the end of a rust epidemic neither can they be expected to possess that critical faculty which enables the specialist to select out the types worthy of further propagation. The efforts they have made in the immediate past to keep the investigations running are most praiseworthy and it is no small tribute for a critic to say that they have met with some measure of success. But experience derived from handling similar problems shows that in all probability useful information and material have been lost.

Another feature making the appointment of an assistant plant breeder necessary is the large scale on which the work has to be conducted. Not only have large numbers (probably up to a hundred thousand) of individual plants to be kept under observation at the main station each season, but in order to cope with the different rust species similar observations are necessary at widely separated sub-stations. Moreover, trial plots of new varieties have to be grown in the various wheat producing areas and their suitability for the district determined. Even if access to the different places where the experimental wheats are grown were always easy it would be physically impossible for one man to visit them all and make the necessary observations from time to time. With a second man trained for the work both of these difficulties would be largely reduced.

The Government Plant Breeder and his assistant should work conjointly at the problem of breeding for simultaneous resistance to black stem and yellow rust so that in the absence of either the other could keep the investigations (reduced in scale, if found necessary) running with the minimum of interruption. But the stem rust problem should remain the special work of Mr Burton in view of the wide experience he has gained with it whilst his assistant should concentrate particularly on breeding yellow-rust resistant wheats for the higher parts of the country. The work on the trial plots of new varieties in different areas should be shared as soon as the assistant has become familiar with the local problems.

Owing to the differences in the times of sowing and harvesting in the country and the possibility in some parts of growing two crops in a year, observations on the behaviour of selected wheats, whether hybrids or varieties to be used as parents for further crosses, can be carried out with a thoroughness unequalled in any other wheat-growing country. The progress of the two plant-breeders should therefore be fairly rapid. But a word of warning is necessary lest results of economic value should be expected immediately. A wheat worthy of field cultivation and not merely a stepping stone to better types in the hands of the plant-breeder has not only to be resistant to the particular rust, or rusts, of the locality, it also has to be of good quality, to stand well, crop satisfactorily and ripen uniformly. All of these features are required in combination for if one is wanting the variety is a failure in practice. This means that comparatively few selections can be made from the huge numbers of hybrid plants which have to be kept under close observation. Experience has shown too that the plant-breeder is fortunate if in the fifth generation from the actual cross he secures and fixes the type he set out to breed. Then a period of testing follows for it may happen that a wheat which is satisfactory when grown on a small experimental scale is unsuitable for the more crowded conditions of field culture, and finally seed stocks for distribution have to be worked up.

To the grower awaiting better wheats such progress may seem slow and though two crops may be grown in a year some time must elapse before the produce of the latest crosses can be handed over to him. In the meanwhile in districts afflicted with the black stem rust the time gap can be bridged by Kenya Governor and where yellow rust is the dominant pest by Equator—both products of the Government plant-breeders.

THE PLANT-BREEDING STATIONS

At present the main plant-breeding station is at the Scott Agricultural Laboratories near Nairobi, and subsidiary stations have been established at Njoro and Gilgil.

The main station is at an elevation of some 5,700 feet above sea level. It consequently comes within the zone where the black stem rust is the dominant species and it is specially suitable for an attack on the problems of breeding for resistance against it.

That at Njoro is at an elevation of some 7,100 feet in a zone where both the black stem and the yellow rust occur. It thus offers opportunities for breeding for resistance (*a*) against both rusts conjointly, (*b*) against black rust, or (*c*) against yellow rust. But whilst a wheat possessing resistance to both rusts could be

safely propagated here in bulk for distribution a wheat resistant to black rust only might succumb to the attacks of yellow rust or conversely one resistant to yellow rust might be wiped out by black rust. Either of the two last types would consequently have to be sent elsewhere for further trials and multiplication. If this season's experience is a real criterion the black stem rust is the more serious pest.

The Gilgil station is about 8,300 feet above sea level and lies well within the zone where yellow rust is abundant. Breeding work here has to be confined to resistance against this species.

The location of the main station at the Scott Agricultural Laboratories is a natural one. It is near the administrative headquarters at Nairobi and a plant-breeder stationed there is in close touch with the other scientific members of the staff of the Agricultural Department. The station is on Government land, and buildings, implements, labour, etc., are all available for its use. Its nearness to the capital too makes it specially suitable as a demonstration centre where those interested in wheat production can see variety trials and tests carried out with the new wheats raised by the plant breeder. Moreover, the black stem rust epidemics are peculiarly severe here and any variety which stands up to them well for a season or two may be considered to possess a real power of resistance.

These are advantageous features which cannot be ignored. But as a site for the main work on wheat improvement it has two drawbacks. In the first place it is a long distance away from the wheat growing areas and consequently much time is wasted in visiting these and the two sub stations Njoro and Gilgil. In the next, climatic conditions only allow of wheats with a growing period of about four and a half months being grown here. Sowings are made at the end of March and harvesting generally begins early in August. By utilizing the short rains and sowing again in October it is possible to secure two crops in a year. But owing to the shortness of the rainy periods double cropping is attended with some risk.

The experience of the last few years has shown that the Njoro sub station has certain advantages over both the Scott Agricultural Laboratories and Gilgil. At present, however, it lacks adequate facilities for the proper study of the wheat grown there. The breeding cage is on private land and owing to the lack of a permanent staff on the site it has been difficult to keep the cultures grown in it in a suitably clean condition. Neither has it any facilities for storing the crop, which after harvesting has to be transported to the Scott Agricultural Laboratories for threshing

and for the final examination of such characteristics as grain quality, colour, etc. This involves the risk of errors creeping in owing to stray ears and grain finding a way into the numerous small sheaves harvested in the cage. The outstanding advantage of the Njoro site is to be found, as already indicated, in the fact that crops grown there are exposed to the attacks of both of the serious rusts of the country and that consequently there is the possibility of selecting from the second and third generations of the wheat crosses individual plants showing resistance to both simultaneously. Advantage has been taken of this fact and a number of these doubly resistant types are now under test at Njoro. Had financial and other considerations permitted the main station to have been there from the beginning and all of the earlier generations of the various wheat crosses grown there still better progress would have been made. As it is it has been impossible to give sufficient attention to the comparatively small number of hybrids grown there.

The sub-station on Patten's farm at Gilgil is in one respect a good one, for wheat grown there has every opportunity of becoming attacked by yellow rust. When visited in November the trial plots of wheat were in ear and the differences between the rust-susceptible and rust-resistant were most striking. The site, however, is very difficult of access and in the rainy season it is almost impossible to reach it. Moreover, it possesses no equipment beyond a roll of wire-netting surrounding the most important of the cultures. Everything grown there has consequently to be transported over difficult country for a final examination in the laboratories and grain carried back again for the next sowings. The sub-station should be abandoned and another at a similar elevation and easily accessible should carry on the work done there. The best site appears to be at Mau Summit which is not only easily reached by rail but is also the centre of a steadily increasing wheat area. Wheats bred here would find their places not only in the Gilgil and Thomson's Falls area but also in Molo, Mau Narok, Londiani, Timboroa and the Burnt Forest.

All three stations, the Scott Agricultural Laboratories, Njoro and Mau Summit are necessary for the production of the series of wheats needed to suit the wide range of conditions under which wheat can be grown in the country. Which, in the future, shall be the main station, must be determined by financial considerations.

From the plant breeder's point of view there are two possible programmes for improving the wheat crop. The first is to produce

a series of wheats resistant to both black stem and yellow rust. Such wheats could be grown anywhere in the country where the soil and climatic conditions were suitable.

The second is to produce wheats resistant to either the black stem or the yellow rust. The former would be suitable for districts of comparatively low elevations and the latter for the higher districts. But no provision would then be made for the large areas at a more or less intermediate level.

Concerning the first programme it must be said that, so far, nothing is known with regard to the commercial possibilities of producing doubly resistant varieties. Theoretically it is possible to do so and at Njoro there are actually a number of small plots of hybrid wheat on which neither of the rusts has yet been found though both are abundant on neighbouring plots. These still have to be tested on the field scale and until this has been done no final opinion is possible.

The second programme is the simpler and if, as seems probable from the examination made this season, the attacks of yellow rust are comparatively slight at intermediate elevations a series of wheats resistant to one or the other would meet immediate needs.

To carry out the first programme would involve making Njoro the main breeding station instead of the Scott Agricultural Laboratories. All of the crosses would be made there and a thoroughly critical examination of every wheat in the generation raised from cross-breds would be possible. Any plants found to be resisting the attacks of both rust species would then be grown on at Njoro in order to fix the types and further test them whilst the produce of plants resistant to one or the other rusts could be transferred either to the Scott Agricultural Laboratories or to the station at Mau Summit for further observation. With two plant-breeders more or less centrally placed at this main station the difficulties of examining the crops from time to time at the sub-stations, which have hitherto been so serious, would largely disappear.

The second programme requires three separate breeding stations, one for wheat resistant to the black stem rust at the Scott Agricultural Laboratories and the others at Mau Summit and Njoro for wheats resistant to the yellow rust, with a plant-breeder stationed more or less permanently at each. The former station is suggested in addition to Njoro in view of the fact that the attacks of black stem rust are particularly severe there and consequently the testing out of new varieties would, from the beginning, be thoroughly drastic. The necessary facilities for the

work exist there. During leave periods the investigations in progress at these stations could be kept running without much difficulty by sowing in March and harvesting in August at the Scott Agricultural Laboratories and sowing in June and harvesting in January at Mau Summit and Njoro.

Either programme requires the provision of buildings for the staff and for storage purposes. Before considering this, however, another side of the plant-breeder's work requires attention. This is the growing on and distributing of stocks of seed of the new types he has raised. Theoretically, once the plant-breeder is satisfied that a new wheat is thoroughly fixed, that it yields well, is resistant to the attacks of rust and is suitable for general cultivation it requires no further attention from him. Multiplication of the seed stock and distribution can therefore be carried on by a separate organisation as it is for instance at Svalof or Cambridge with the result that a considerable burden is taken from the shoulders of the scientific staff. But there is always the chance that in the early stages of multiplication the plant-breeder can obtain useful information, for until the field stage is reached all of his observations have been made on comparatively small hand-sown plots. Under the more crowded conditions of field cultivation such features as a slight weakness in the straw, small differences in the time of ripening of individual plants, habit of growth, etc., may become obvious. On the whole, then, in a country in which much attention has not been given to seed production it seems advisable that the plant-breeder should keep control of the work.

If the first programme is adopted, which is the course I most strongly recommend, Njoro would become the growing on and distributing centre as well as the breeding centre. For this purpose a minimum area of 100 acres is necessary, about 50 of which would be available each season for the production of seed corn. The following estimate shows the cost of staffing and equipping the stations to carry out both of these functions on the assumption that this area of township land at Njoro can be obtained rent free:—

PLANT-BREEDING SECTIONS

Personal Emoluments

	£	
1 Plant-Breeder ...	778	
1 Assistant Plant-Breeder ...	500	
1 African clerk	80	
Passages	90	
Travelling ...	350	
		1,798

Other Charges—Recurrent.

Upkeep of stations	500	
Labour	400	
Contingencies	50	
	——	950

Non-recurrent.

	£	
Two houses and office	2,300	
Laboratory and store	450	
Wheat breeding cages	100	
Quarters for labourers	150	
Farm buildings	100	
Oxen	200	
Implements, machinery and equipment	550	
Water supply	200	
Fencing	150	
	——	£4,200

A rough analysis shows that some £4,200 is a capital charge and £2,748 is recurrent expenditure.

The proceeds of the sales of seed-wheat should help to cover the recurrent expenditure each year.

The second programme requires three breeding and propagating stations, one of which is already in existence at the Scott Agricultural Laboratories. It has been suggested that the other two should be placed at Mau Summit and Njoro. At these, for the sake of economy, it is suggested that the multiplication of the new wheats should be carried out under the supervision of the Assistant Plant-Breeder on land hired for the purpose from the neighbouring wheat-grower who would undertake the sowing, cleaning and harvesting of the crop. The actual cost of the seed-wheat (say at 50% above the market price of wheat) would be recovered from the purchasers of the new wheats.

The area used for breeding need not exceed five acres at each point.

The following estimate shows approximately the cost of the necessary equipment:—

Buildings.

	£	
House, Assistant Plant-Breeder ...	1,100	
Laboratory and store	400	
2 wheat cages 100′ × 50′ ...	60	
Quarters for labourers	50	
Fencing	50	
Implements, machinery and equipment	270	
	——	1,930
Labour and upkeep	250	
Contingencies	50	
	——	300

plus the Personal Emoluments shewn in the first schedule.

April, 1927.

R. H. BIFFEN.

Other Charges—Recurrent.

Upkeep of stations	500	
Labour	400	
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Labour and upkeep	250	
Contingencies	50	
	——	300

plus the Personal Emoluments shewn in the first schedule.

April, 1927.

R. H. BIFFEN

Mr. Whitcombe 17/6/27

Mr. Jeffries 17/6

Mr.

Mr. E. J. Harding.

Sir C. Strachey.

Sir J. Shuckburgh.

Sir G. Grindle.

Sir C. Davis.

Sir S. Wilson.

Mr. Ormsby-Gore.

Lord Lovat.

Mr. Amery.

X 10230

27 Kenya

34

DRAFT.

Kenya.

No: 522

G. A. G.

To Sir R. Biffen (13) - 1 June

Fr. Sir R. Biffen (16) - 3 June

2 Dfts

22 June, 1927.

Sir,

In confirmation of my tel. of the 9th of June, I have etc. to inform you that I approve the appt. of Mr. R. J. Lashbury, Senior Supervisor, Agricultural Dept.

...appointment to fill the
... post of Assistant
Plant Breeder recommended
by Prof. ... Biffen
... his report on wheat
production ... salary
... £...

... selection
... for appt to this post.

(Signed). L. S. AMERY

I have etc.

X10230/27

Kenya

17.
35

Mr. Jeffries 9.6.27.
Mr. Bottomley 9 etc
Mr.
Mr. E. J. Harding.
[illegible] Strachey.
Sir J. Shuckburgh.
Sir . Grindle.
Sir C. Davis.
Sir S. Wilson. (12)
Mr Ormsby-Gore.
Earl of Clarendon.
Mr. Amery. for concurrence – Please see minute

Coded & sent 4.5 pm 9th June 27.

June

DRAFT. Tel. code

Governor
Nairobi

Recd.

Your tel. 28th May No. 191

Biffen supports proposal to appoint Lathbury on condition that he works directly with Burton for a season in order to become thoroughly familiar with local rust species and with grading of wheat samples. I approve

appointment on this basis

Siver

UNIVERSITY OF CAMBRIDGE.

16

SCHOOL OF AGRICULTURE,
CAMBRIDGE.

TELEPHONE 1885—2 LINES.

June 3rd 1927

RECEIVED
4 JUN 1927
COL OFFICE

Ref:- 0230/27

Dir

It is unfortunate that I did not realize that Mr. Lakbury might be a candidate for the post of Assistant Plant Breeder in the Agricultural Department of Kenya Colony had I done so I might have interviewed him.

I have looked up the records on our files and find, in addition to the information you have forwarded to me, that he was working in Tanganyika for about two years before being transferred to Kenya & that at present his work now lies for the most part in the native reserves.

He will therefore know the language, understand the management of native labour and be familiar with the general agriculture of the Colony. These are considerable assets especially for the starting up of the experimental station at Njoro. On the other hand he is probably out of touch with plant breeding

Ans. 22 JUN 1927
572

UNIVERSITY OF CAMBRIDGE.

SCHOOL OF AGRICULTURE,
CAMBRIDGE

TELEPHONE 1885—2 LINES

37

19

The work done by the Government Plant Breeder has however emphasized the wheat breeding problem and as far as can be foreseen the raising of new varieties suitable for the unusual conditions of the Colony will not be a particularly difficult task. The fact is will probably prove a matter more of routine than investigation.

I am prepared therefore to recommend Mr Lathbury for the post of Assistant Plant Breeder on the condition that he works directly with Mr Burton the Government Plant Breeder for a season in order to become thoroughly familiar with the local rust species and with the grading of wheat samples. If it is practicable he should spend a month or so at the Plant Breeding Institute here when next home on leave.

I am
Sir
Your obedient servant
R H Biffen

The Under Secretary of State
Colonial Office

X.10230/27 Kenya.

Mr. Seel 3 6.27.
Mr. Jeffries 3/6 J
Mr
Mr. E. J. Harding
Sir C. Strachey
Sir J. Shuckburgh
Sir G. Grindle
Sir C. Davis
Sir S. Wilson
Mr. Ormsby-Gore
Earl of Clarendon
Mr. Amery

DRAFT.

KENYA

Conf.

Downing Street,
~~May~~ 1927.
1927

Sir,

I have etc., ... to my

telegram of the ... (herewith)

...

... expenditure ... by the

Legislative Council ... the post

... 1927 ... the ~~application of~~

~~... Sir Edwin ...~~

~~recommendations~~ ... establishment of

...

... the ...

..., in accordance with the proposals indicated in para 6 of your Conf. desp No. 7 of the ...

which was ... with

that ... ~~...~~,

... les ...

... ...

3 Efts.

Recur to me on Tuesday 7th June
JJ
... 13/6/27

UNIVERSITY OF CAMBRIDGE.

SCHOOL OF AGRICULTURE,
CAMBRIDGE.

TELEPHONE 1885—2 LINES.

37

The work done by the Government Plant Breeder has however simplified the wheat breeding problem and so far as can be foreseen the raising of new varieties suitable for the unusual conditions of the Colony will not be a particularly difficult task. In fact it will probably prove a matter more of routine than investigation.

I am prepared therefore to recommend Mr. Lebbing for the post of assistant Plant Breeder on the condition that he works directly with Mr. Burton, the Government Plant Breeder, for a season in order to become thoroughly familiar with the local rust species and with the grading of wheat samples. If it is practicable he should attend a month or so at the Plant Breeding Institute here when next home on leave.

I am, Sir,
Your obedient servant
R.H. Biffen

The Under Secretary of State,
Colonial Office.

38

X.10230/27 Kenya.

15

Mr. Seel 3.6.27
Mr. Jeffries 3/6 [initials]
Mr.
Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.

DRAFT.

KENYA

Conf.

O.A.G.

Downing Street,

~~May~~, 1927.
8 JUN 1927

Sir,

I have etc., to refer to my telegram of the 4th June in which I intimated to you my approval of the additional expenditure voted by the Legislative Council to cover the cost in 1927 of the ~~application of~~ Professor Sir Rowland Biffen's ~~recommendations for the~~ establishment of plant breeding stations for the benefit of the wheat and maize industries, in accordance with the proposals described in para. 6 of your Conf. desp. No 29 of the 31st of March.

2. The memorandum by the Director of Agriculture which was enclosed ~~with~~ ~~your~~ that despatch, ~~under reference~~ dealing with the schemes in respect of which it is desired that application for financial assistance should be made to

Recirc to me on Tuesday 7th June [initials]

[initials] herewith

[initials] Recd 9/6/27

[initials]

the Empire Marketing Board, ~~has~~ will be ~~been~~ submitted to the Board for ~~its~~ consideration, and I shall address you at a later date when the decision of the Board on the various points has been given. With regard ~~to the~~ in particular to the expenditure on the wheat and maize breeding stations, I have approved the proposed expenditure on the understanding that in the event of the application to the Empire Marketing Board not being successful, the whole cost of this particular scheme will be met from the funds of the Colony, apart, of course, from the contributions which will be received from the Wheat Growers' Association and the Kenya Farmers' Association.

3. With regard to the recommendation in your telegram No.161

should be appointed Assistant Plant Breeder under the scheme recommended by ~~Professor~~ Sir Rowland Biffen, I am in communication with ~~Professor~~ Sir Rowland Biffen on this point, and I hope to be able to communicate his views to you by telegram at an early date.

I have, etc.,

(Signed) L. S. AMERY

13 40

Mr. Seel 30.5.27
Mr. Bottomley 30.5.27

Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.

DRAFT.

Professor Sir Rowland Biffen
FRS.

X.10230/27. Kenya.

Answered 16

1 JUN 1927

~~May 1927~~.

With reference to the letter from this Dept. of the 21st of April, on the subject of your report on Wheat Production in Kenya, I am directed to inform you that the Acting Governor has by telegram reported that Mr. R. J. Lathbury, a Senior Supervisor in the Agricultural Dept. of the Colony, wishes to be considered a candidate for the post of Assistant Plant Breeder recommended in section 9 of your report.

Copy to Sir S. 522 22 JUN 1927

for consideration.

Recd. for other action

has suggested that you should be consulted as to whether Mr Lathbury ~~[who, he states,~~ has studied ~~under you~~ would be a suitable officer for this post. In this connection I am to observe that Mr. Lathbury was at Emmanuel College, Cambridge, from 1912 to 1914 and from 1919 to 1920, and took the course for the agricultural diploma. The Acting Governor's telegram states that Mr Lathbury studied under yourself.

The scale of salary which ~~he~~ will be attached to this post is £ 480 a year, rising by annual increments of £20 to £600, and then by increments of £30 to £720.

Mr.
Mr.
Mr.
Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.

DRAFT.

being unable to recommend that ~~not considering~~ Mr Lathbury should be appointed to ~~a suitable candidate for~~ 41

the post, Mr Amery ~~will~~ would be glad to learn whether you are in a position to suggest the name of a suitable candidate.

2. I am to add that ~~the~~ the Acting Governor, in a further telegram, has stated that he would be grateful if the officer to fill this post could be selected at an early date, in view of the heavy preliminary work which will be required at the new plant breeding station. He pointed out in this telegram that if Mr. Lathbury were selected it would be possible to post him to the station

KENYA ADVISORY COMMITTEE

APPLICATION FOR GRANTS FROM EMPIRE MARKETING BOARD

MEMORANDUM BY DIRECTOR OF AGRICULTURE

The functions of the Empire Marketing Board are stated to be (1) Publicity and Education; (2) Research (3) the promotion of schemes for the improvement of production of foodstuffs in the Dominions and Colonies, and marketing in Great Britain, and the Board is charged with the administration of funds provided for these services within the Empire.

The Committee strongly recommends that Government should apply to the Empire Marketing Board, through appropriate channels, for grants in respect of the following services:

(1) PLANT BREEDING

The establishment of a wheat industry in this Colony is wholly dependent upon the raising of rust-resistant wheats. It is important that East Africa should be self-supporting in respect of its needs in wheat and wheat flour and Kenya is in the best position to supply the requirements, having regard to its farming conditions. With the increasing prosperity of the native peoples they will become users of wheat and wheat flour, and it is important that their nutrition should be improved by the addition of wheat flour to their food ration. Given rust-resistant wheats natives will be able to grow their own requirements in certain areas. Wheat production has steadily increased during recent years and in 1926 the increase in area was 40 per cent. over that of the previous year, and given rust-resistant wheats there are extensive areas in the Colony which could be used for wheat production and which would promote settlement.

Wheat breeding for the production of rust resisting varieties has received the attention of the Department of

of Agriculture, and Professor Sir Rowland Biffen has testified to the marked success already achieved in the following words "No country in the world has made such material progress in this matter as has Kenya." But it is seen that the work will require to be greatly extended at considerable cost, and as the result of his recent visit to this Colony Professor Sir Rowland Biffen recommended that a Central Plant-Breeding Station should be established at 7,000 feet level with two subsidiary stations at over 8,000 feet and at about 6,000 feet be established to deal with the three forms of rust which are prevalent, viz: Puccinia glumarum, Pucinia triticina, and Puccinia graminis. The estimated cost of this service is stated in his report as follows:

Personal emoluments:

1 Plant Breeder	£778
1 Assistant Plant Breeder	500
1 African clerk	80
Passages	90
Travelling	350
	1,798.

Other Charges - Recurrent.

Upkeep of stations	500
Labour	400
Contingencies	50
	950

Non-Recurrent.

Two houses and office	2,300
Laboratory and Store	450
Wheat breeding cages	100
Quarters for Labourers	150
Farm Buildings	100
Oxen	200
Implements, Machinery and Equipment	550
Water Supply	200
Fencing	150
	4,200

To the same organisation it is desired to add maize-breeding for the improvement of the Maize Industry. Kenya has already established an export trade in maize, and the present estimate of that trade (both European and Native grown) reaches 1,250000 bags for this season. The importance of maize production within the Empire to

supply the needs of Britain must be apparent and it is considered that improvement in yields brought about through breeding and selection and research work in other directions will stimulate production. For the maize service now under consideration a capital sum of £800 and a Recurrent expenditure of £1200 will be incurred.

The Capital cost of the scheme is therefore £5000 and Recurrent expenditure amounts to £4000 per annum. The Maize and Wheat Associations have shewn their interest in the work by promising contributions of £500 per annum each. It is recommended that the Empire Marketing Board should be asked for a grant on a 50-50 basis, i.e., a Capital Grant of £2500 and an Annual Grant of £1500 per annum, say for 5 years.

In support of this request and apart from the value of this work to East Africa it is urged that facilities exist in Kenya for a study of the rust problem in Wheat and for the breeding and raising of rust-resistant varieties which should prove to be of great value to other countries in the Empire.

(2) VETERINARY RESEARCH.

The Veterinary Research Laboratory at Kabete is recognised to be one of the best in the Empire, and it has already achieved great success in advancing Veterinary Science particularly in its knowledge of the diseases Rinderpest, East Coast Fever, and Pleuro-pneumonia. Other diseases of importance on the African Continent and elsewhere are under investigation and the claims of the Stock Industry for research work are ever insistent. Indeed it is no exaggeration to say that upon Veterinary Research and the application of the results obtained therefrom depends the existence of a Livestock Industry in these parts of His Majesty's possessions.

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Upon the institution at Kabete the Kenya Government has already spent a sum of £48,000, and the land upon which it stands is valued at £21,000. The Recurrent Expenditure stands at £21,000 and that is productive of a certain amount of revenue in the sale of serum and vaccines, etc.

The Conference of East African Governors recommended that a Central Veterinary Research Laboratory for East Africa should be established at Kabete. That scheme is now receiving further consideration and it is estimated that to establish and equip an institution of that kind a further capital expenditure of £50,000, spread over a period of years, will be incurred, also that the recurrent expenditure will be increased by about £10,000 per annum.

That Capital expenditure was estimated as follows:

(1)	Extension of Laboratory ...	£5,000
(2)	Laboratory Installations of permanent kind	5,000
(3)	Mine residences - Class B - @ £1600	16,200
(4)	Mine Residences - Class C - @ £1200 ...	10,800
(5)	Quarters for Native Employees 100 @ £35 ...	3,500
(6)	Stabling for animals under serum experiment and production	5,000
(7)	Water Supply ...	1,200
	Electric Power and Light Installation ...	2,500
		£49,200

and the additional Recurrent Expenditure would be required to cover the cost in salaries, etc., of 4 Veterinary Research Officers, 4 Laboratory Assistants, also Laboratory supplies and animals for experiment, etc.

The Institution could be used with great advantage for the post-graduate training in Tropical Veterinary Medicine/

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Medicine of Officers for the Crown Colony and other services.

It is recommended that the Empire Marketing Board should be asked for a grant on a 50-50 basis for the additional expenditure estimated to be incurred, i.e., a Capital Grant of £25,000 and an Annual Grant of £5,000 say for 5 years.

(3) LIVESTOCK INDUSTRY.

For the promotion of the Livestock Industry the appointment of a Livestock Officer in the Department of Agriculture is required, and it is desired to appoint a man technically trained and experienced particularlt in Dairy and Swine Husbandry.

In the 4th Report of the Imperial Economic Committee (para.128) a recommendation was made that a Dairy Officer should be appointed to the Department of Agriculture "to organise and promote the industry as well as to administer such legislation as may be passed for the grading of exported produce", and that financial assistance should be afforded on a 50-50 basis.

The immediate need is educational and experimental work in the breeding, management, and feeding of the dairy herds.

The development of the Pig Industry is linked up with that of dairying, and here the same remarks apply as to the kind of service which should be rendered at present. One Officer can cover the two subjects. It is calculated that the services of a Livestock Officer including salary, travelling and incidental expenses will cost £1000 to £1200 per annum, and it is recommended in accordance with the offer already made in respect of a Dairy Officer that the Empire Marketing Board should make a grant of £500 per annum for a period of 5 years towards the appointment of a Livestock Officer.

(4) [illegible]

(4) HORTICULTURE

There is evidence to show that extensive areas at the higher altitudes will grow plums, pears, and apples of good quality, and in other areas Citrus fruit thrives well under the natural soil and rainfall conditions. An experiment was made in the export of plums to the London Market with satisfactory results, and it is intended to forward an experimental consignment of citrus fruit this season. The provision of Cool Stores at the Port will remove difficulties which have previously existed. Cool Stores are provided on the ships calling at the Port of Mombasa for the carrying of fruit to English Ports.

But information is lacking as to the best methods to adopt in fruit culture, the most suitable areas, and the best varieties, and growers have also to be taught the proper methods of packing and preparation for export.

The development of a Fruit Industry would promote settlement, and the establishment of smaller holdings.

The immediate need is the services of a Horticulturist skilled and experienced in Fruit culture and packing, particularly of tropical and sub-tropical zones. His services and incidental expenses would cost about £1000 per annum, and it is therefore recommended that the Empire Marketing Board should be asked for a grant of £500 per annum for 5 years for this service.

(5) COOL STORES

Without Cool Stores at the Port an export trade in Dairy Produce, Bacon & Hams, Fruit, &c., could not be established, nor could production be brought to the export stage without producers being furnished with these facilities in advance. With a comparatively small output for a number of years private enterprise could not be expected to provide the service, therefore Government found it necessary to establish these Stores.

They have just been erected at a cost of about £15,000.

The Recurrent expenditure is estimated at £2,000 per annum and the revenue during the next few years is not expected to average more than £500 per annum.

The Railway Department has undertaken to provide the necessary Refrigeration Cars for this class of traffic.

In order to assist Government in maintaining an efficient service for the encouragement of production and marketing of export perishable produce it is recommended that the Empire Marketing Board should be asked to make a Grant in aid of any £750 per annum for a period of 5 years.

(6) LIVESTOCK FREIGHTS.

The Committee notes with gratification the statement in the first Report of the Empire Marketing Board, that the cost of freight on pure bred Live Stock is to be met from the Board's funds.

The position in Kenya is that the importation of pure bred cattle, sheep, pigs and poultry is essential for the improvement and grading up of the local stock in order to increase the productive capacity of the farm live stock. Without that stock farming is not an economic proposition. But herd and flock improvement has been impeded by the very heavy importation costs which now exist. It may be said that on an average transport charges and other expenses of importation represent nearly double the original cost of the animal.

At the present time cattle breeds other than Friesian are, for the most part, imported from England and Scotland, also Mutton breeds of sheep, and pigs, but Friesland cattle are commonly brought from South Africa and woolled sheep (Merino) both from Australia and South Africa.

It is suggested that inasmuch as the trade is within the Empire the offer might be extended to cover these

these countries.

It is estimated that the importations might amount, during the next few years, to 200 head of cattle, 500 Sheep and 50 Pigs per annum.

(7) GRANT TO FACTORIES, i.e. CREAMERIES &c.

At this stage of development financial assistance for the establishment of Creameries, Sugar Mills, &c. would prove to be of great value. Members of a Co-operative Creamery are not prepared to subscribe the Capital necessary and undertake the obligations of financing a Creamery while its output is small. It is understood that the Empire Marketing Board is in a position to make Grants in cases of that kind, but the Committee is not well informed in the matter.

As an example of an instance in which such assistance would be immediately advantageous the case of a Co-operative Creamery at Kamyuki, West Kenya may be quoted. There for the last two or three years farmers have been desirous of establishing a Creamery, but the supplies within sight have been insufficient to justify as a business proposition the initial Capital expenditure on a properly equipped Creamery, which even on a comparatively small scale costs about £10,000. The establishment of that Creamery was referred to in the Report of the Economic and Finance Committee dealing with Dairying, to which reference was made in the Report of the Imperial Economic Committee.

It is recommended that the Empire Marketing Board should be asked to consider favourably a Grant for purposes and in circumstances of that kind.

(8) These requests appear to fall entirely within the scope of the objects of the Imperial Economic Committee, also the powers and functions of the Empire Marketing Board as indicated in their reports, and the Kenya

Kenya Advisory Committee is confident that development, increased production and better marketing in Kenya Colony will follow assistance and support along the lines sought in this Memorandum.

Sd. ALEX HOLM.

3/2/27.

Original registered in 25589

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KENYA.

NO. 5' 29

CONFIDENTIAL.

31st March, 1927.

Sir,

I have the honour to refer to the correspondence terminating with your Confidential Circular despatch of the 21st December last, relating to the work of the Empire Marketing Board, and to inform you that Sir Edward Grigg entrusted to the Kenya Advisory Committee, the formation of which was dealt with in his despatch No.994 of the 18th November last, the task of investigating such local schemes as might be considered suitable for recommendation to you in respect of financial assistance from the grants under adjudication by the Empire Marketing Board.

2. I enclose copies of a memorandum by the Director of Agriculture on this subject. This memorandum was discussed by the Kenya Advisory Committee with Sir Sydney Henn, a member of the Imperial Economic Committee during his recent visit to this Colony. I am informed that the latter was of opinion that the applications were drafted on suitable lines to meet with a favourable reception, and the Committee formally adopted Mr. Holm's report for the purpose in view.

3. The report has now been considered in Executive Council and I agree, with their unanimous advice, that the proposals contained therein should be recommended to you most strongly for favourable consideration.

4. I desire in this connection to express this Government's appreciation of the sympathetic references

in /

THE RIGHT HONOURABLE
LIEUTENANT COLONEL L.C.M.S.AMERY, P.C., M.P.,

in the Reports of the Imperial Economic Committee to the possibilities of certain industries in this Colony and venture to hope that the schemes outlined in the enclosure will be regarded as meriting financial encouragement from Imperial funds. It will be observed that except in the application for a grant towards the establishment of Co-operative Creameries it is proposed that the necessary expenditure, both capital and recurrent, should be shared equally between the local Government and the marketing grant; further in the case of the wheat and maize proposals a certain measure of self-help is anticipated from the respective Growers' Associations, who contemplate the levying of cesses on produce marketed by their members.

5. Monetary provision to cover Professor Sir Rowland Biffen's recommendations was passed at the recent Session of Legislative Council but in other cases it has been decided to await the results of the applications before embarking on fresh financial commitments on new enterprises. It is hoped that this will be accepted as an indication that the services projected are eligible for a grant-in-aid, as they would not at present normally be met out of general revenue, and certainly could not be undertaken at present without such financial aid.

6. It will be best to deal with the individual schemes seriatim.

(1) WHEAT AND MAIZE BREEDING.

	Estimated cost of scheme.		Suggested grant from Empire Marketing Board.	
	Capital.	Recurrent.	Capital.	Recurrent. (for 5 years' grant.)
Wheat and Maize Breeding.	£5000	£4000	£2,500	£1,500

This application was foreshadowed in Kenya despatch No.115 of the 18th February, and you will have had the opportunity of perusing Section 9 of Professor Sir Rowland Biffen's report

on wheat production in Kenya. It is gratifying to read such a favourable report on the work hitherto achieved and the prospects which this eminent authority foresees for wheat production in Kenya. A token vote for promoting the recommendations contained in Sir Rowland Biffen's report was included in the 1927 Estimates; as was anticipated this proved inadequate and in accordance with the expressed intention of dealing with the Professor's proposals without further delay additional funds for these services were voted at the recent Session of Legislative Council sufficient to cover the necessary capital expenditure and recurrent charges involved for the remainder of this year. The report of the relative proceedings is enclosed and I trust that the expenditure will receive your approval. It will be noted that provision for benefiting the maize industry under the same organisation was included in this resolution, but I desire to make it clear that, following the advice of my Executive Council I only agreed to this additional expenditure on the understanding that the cess proposed by the Kenya Farmers' Association in respect of maize would be forthcoming and payable during 1927. That contribution is estimated at £500 per annum. It is hoped that a similar measure of co-operation will be available from the Wheat Growers' Association. As the 1927 Estimates contained a token vote for improving the wheat organisation the allocation for this purpose during the current year has not been made contingent upon financial assistance from the industry itself.

(2) VETERINARY RESEARCH.

	Estimated cost of scheme. Additional to present organisation		Suggested grant from Empire Marketing Board.	
	Capital.	Recurrent.	Capital.	Recurrent. (for 5 years' grant.)
Veterinary Research	£50,000	£10,000	£25,000	£5,000

This proposal follows upon the recommendation of the Conference of East African Governors for the establishment of a central Veterinary Research Laboratory at Kabete. The capital expenditure concerned has already formed the subject of application under the East African Guaranteed Loan, but has not been specifically allocated from that Loan for the reasons outlined in Section D of the Schuster Committee's Report. It is the case that under such a proposal the buildings and equipment would be utilised for the common services of the East African Dependencies. As a matter of policy it is desirable that Kenya should find the requisite capital expenditure for works in its own territory, the question of annual contributions by way of rental and in respect of recurrent expenditure from the neighbouring administrations being left over for future adjustment. I may explain that the Estimates of capital expenditure were prepared somewhat hurriedly in response to your telegram of 28th April, 1926. It is not opportune to make a more detailed examination of them until the organisation of this institution is dealt with, but it is believed that in respect of both capital and recurrent expenditure the Estimates now furnished will be found to be approximately correct. In this connection generally I would refer you to paragraph 6 of the late Lord Milner's despatch No.1129 of the 10th August, 1920, and the connected correspondence.

(3) DAIRYING INDUSTRY.

	Estimated cost of scheme.		Suggested grant from Empire Marketing Board.	
	Capital.	Recurrent.	Capital.	Recurrent. (for 5 years' grant.)
(a) Livestock Officer	--	£1,000	--	£500
(b) Livestock Assistant.	not estimated.			
(c) Co-operative Organisation.	not estimated.			

These requests follow suggestions tendered in paragraph 128 of the 4th Report of the Imperial Economic Committee on "Marketing and preparing for Market of foodstuffs produced in the Overseas Parts of the Empire". Information with regard to the dairying industry in this Colony was forwarded in the Director of Agriculture's memorandum and the report of the Economic and Finance Committee in 1924 which accompanied Kenya despatch No.615 of the 16th June last.

(a) The suggestion that the Livestock Officer should be technically trained and experienced particularly in Dairy and Swine Husbandry follows on the proposal referred to in correspondence terminating with your despatch No.216 of the 24th February, 1926.

(b) Assistance towards livestock freights has been dealt with in your despatch, Confidential (2), of the 17th February, and the relative preceding communications.

(c) The establishment of a creamery at Naivasha, - there was already a successful institution of this kind at Lumbwa - testifies to the increasing impetus towards co-operation amongst producers, the need for which was emphasised in the 2nd paragraph of your despatch No.156 of the 16th February, 1925. An offer of financial assistance in the establishment of a similar organisation for the North and West Kenya areas would certainly give material encouragement to the spread of this policy. I note from the second report of the Empire Marketing Board that a grant of £1,200 has been made to the Jamaica Producers' Associations and in the circumstances I venture to hope that this application may receive sympathetic consideration. If the request is likely to materialise I should be glad of early intimation so that further details of the capital likely to be available locally and the aggregate/

aggregate capital expenditure entailed may be ascertained. It is presumed that such an offer would be tentative in the first instance and the details for negotiations left open for discussion with the interested parties in Kenya.

I should be glad if the above observations and the accompanying application in respect of the dairying industry can be regarded as Government's reply to the enquiries contained in the first paragraph of your despatch No.938 of the 6th October last. I am awaiting the Director of Agriculture's comments on the subject of the supplementary report on Margarine before complying with the request in the second paragraph of that despatch.

(4) FRUIT CULTURE.

	Estimated cost of Scheme.		Suggested grant from Empire Marketing Board.	
	Capital.	Recurrent.	Capital.	Recurrent. (for 5 years' grant.)
Fruit Culture.	--	£1,000	--	£500.

This recommendation follows upon the suggestion submitted in paragraph 211 (page 67) of the report of the Imperial Economic Committee on Fruit marketing, as well as the undertaking given in your despatch No.601 of the 28th June last. As you are aware the appointment of a Horticulturist was previously put forward in the memorandum on fruit growing in Kenya Colony by the Director of Agriculture, which formed the enclosure in Kenya despatch No.1487 of the 26th November, 1926. This recommendation was supported in Sir Edward Grigg's despatch No.16 of the 7th January, 1926. In the present stage of the industry's development I am unable to formulate without expert advice concrete proposals in connection with the considerations mentioned in paragraph 13 of your [redacted] despatch of the 19th November last.

(5) /

(5) COOL STORES.

	Estimated cost of scheme.		Suggested grant from Empire Marketing Board.	
	Capital.	Recurrent.	Yearly Revenue anticipated.	Recurrent (for 5 years' grant)
Cool Stores.	£15,000 (already incurred)	£2,000	£500	£750

This application is self-explanatory and in view of previous correspondence need hardly be elaborated. The importance of Cool Stores for the development of the dairy industry is emphasised in paragraph 153 of the 4th report of the Imperial Economic Committee on Empire Marketing, and this application may be treated as this Government's reply to your request in your despatch No.938 of the 6th October last, for recommendations as to the means by which the Colony might avail itself of the assistance suggested by the Committee in connection with such a service. I might also refer you on this subject to the Director of Agriculture's remarks in paragraph 10 of his memorandum transmitted under cover of Kenya despatch No.615 of the 14th June last. The proposal is that the Empire Marketing Board might be asked to guarantee half the loss on the working of the existing Cool Stores - during the early years of that institution. The sum required will vary according to the relationship between revenue and expenditure in this service.

The existing position with regard to Railway and Port facilities is that the Railway has available a refrigerator van and two bogie refrigerator vans have been included in the list of rolling stock which it is proposed to order provided the funds asked for receive approval. It is considered that this provision amply meets requirements.

With regard to the Port, Cool Stores are already available. Provided therefore that ships come alongside the pier, there should be no difficulty as regards exports. The

situation is different, however, if the ships remain in the stream, as, so far as I am aware, the Lighterage Companies have no provision, either existing or contemplated, for refrigerator lighters.

7. It is noted from paragraph 8 of your circular despatch of the 10th November last that the Imperial Economic Committee attached considerable importance to the establishment of producers' organisations in the dependencies. As indicated in this despatch a certain degree of progress has been achieved in this respect during recent years in Kenya. The Maize industry has centralised its activities under the aegis of the Kenya Farmers' Association, Ltd., and similar steps are being followed in regard to wheat by the Kenya Wheat Growers' Association Ltd. Both of these Associations as stated above are contemplating the levying of contributions from their members for the improvement of their respective industries. The co-operation of coffee growers has proved more difficult but it is hoped that some degree of centralisation will be instituted through the Coffee Planters' Union.

8. Co-operative creameries have also been established at Lumbwa and Naivasha.

9. It must be realised that the development of a regular export trade is a question of time in the case of the commoner necessary foodstuffs as it is most desirable to stabilise the supply for the local markets before extending activities to regular overseas commitments.

10. Facilities for the extension of areas of cultivation are, however, available, and with scientific organisation and due encouragement such as the financial assistance contemplated in this despatch, little difficulty should be experienced in securing continuity of supply and regular marketable overseas

ed coffee and maize industries and with proper organisation should follow in the case of dairying and wheat production.

11. The fruit industry still requires organisation and development, indeed it is at present only in its infancy.

12. It is hoped in the circumstances that you will be prepared to accord your sympathetic support to the respective applications put forward under cover of this despatch.

I have the honour to be,

Sir,

Your most obedient, humble servant,

E. B. DENHAM.

ACTING GOVERNOR

LEGISLATIVE COUNCIL DEBATES.

PLANT BREEDING SERVICE.

The Hon. The Director of Agriculture (Mr. Holm):

Your Excellency, I beg to move:-

That this hon. Council approves of an additional expenditure on Plant Breeding Services of £1,694 under Head XXII, Agricultural Department; £700 under Head XXIIa, Agricultural Department Extraordinary; and £4,300 under Head XXX, Public Works Department Extraordinary, as shown in the following schedule:-

Head XXII - Agricultural Department.
Personal Emoluments.

		£	£	£
ø	1. 1 Assistant Plant Breeder (480 by £20 to £600 by 30 to £720).....	320		
X	X2. 1 Assistant Agricultural Officer £372 by £18 to £480 by £20 to £600.)	279		
X	X3. 1 African Clerk (£100)	75		
	Total Personal Emoluments ...			674.

ø (1) : Provision made for eight months

X (2) and (3) : Provision made for nine months.

Other Charges.

		£	£
ø	4. Upkeep of Stations.....	350	
ø	5. Labour	300	
	6. Purchase of Oxen	200	
	7. Implements, Machinery & Equipment	500	
	8. Passages	150	
	9. Travelling Allowances	80	
	10. Local Transport and Travelling ..	240	
		1,820	
	Less amount already voted under Item No.68	800	
	Total Other Charges ..		1,020
		Total...	£1,694

ø (4) and (5): Provision made for nine months.

Head XXIIa - Agricultural Department Extraordinary.

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Establishment of Plant Breeding Stations at Njoro and Mau Summit:

For Sheds, Wheat Breeding Cages, Quarters for Labourers, Water Supply & Fencing £700

Head XXX - Public Works Dept.
Extraordinary.

Establishment of Plant Breeding Station at Njoro:

For 3 houses for Staff	£3,400
Laboratory and Store	600
Office	150
Quarters for African Clerk	150
	£4,300

I hope that this hon. Council will be prepared to take the schedule as read.

Sir, when His Excellency the Governor in his address to this hon. Council at the end of last year, and in dealing with the Estimates for 1927, referred to plant breeding services, he informed Council that included in the vote of the Agricultural Department was a token vote of £800 for Plant Breeding Services, and it was further explained that that inclusion was merely to indicate to Members of Council that a sum of money was required for this service. It was further the intention - the desire - of Government that the scheme should not be submitted to Council until Government and the Council had the report of Professor Sir Rowland Biffen. May I say that I assume hon. Members are acquainted with that section of Professor Biffen's report in which his recommendations to Government with regard to plant breeding services in this country, particularly in regard to wheat-growing, were given, and may I say, at this stage, that I think it must be gratifying to this Colony that so favourable a report was received from Professor Biffen in regard to the prospects of wheat-growing in this country. At the same time, Sir Rowland Biffen pointed out that wheat could not be grown successfully in this country unless rust-resistant varieties were raised and produced, and that therein lay a considerable difficulty. He further pointed out that considerable progress had already been made in this Colony with regard to the raising of rust-resistant varieties. The motion before hon. Council, Sir, is, for all practical purposes, in regard to wheat-growing, a repetition of Sir Rowland Biffen's recommendations, but there is embraced in this service provision for the Department of Agriculture to carry out essential work for the benefit of the maize industry. After much consideration the conclusion was arrived at that it was advisable to embrace in one organisation services for the wheat industry and services for the maize industry, and for that reason there has been included in the estimate, as shown in the Motion before this House, an additional appointment of an Assistant Agricultural Officer with the consequential additional expenditure. I would explain that Professor Biffen, in his report on the wheat industry, did not feel called upon to deal with the maize industry, but I can inform hon. Members that I discussed this extended organisation with him and he agreed that in all the circumstances it would be a wise course to pursue to embrace the wheat and maize industries in one organisation. For this scheme there will be provided three technical officers, two plant breeders, and one agricultural officer, and I would stress the point that

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to the value of attaching an agricultural officer to this organisation, for the reason that these connected with the work of plant breeding will be greatly assisted in their work if they have someone possessing the qualifications of an agricultural officer to relieve them of the ordinary details of routine work. It is hoped that not only will the wheat industry receive much greater attention than it has been possible to give it hitherto, but that valuable work can be done for the maize industry also.

Now, Sir, I come to an interesting point in connection with the offers that have been made by organisations representing these industries in this country. The Kenya Farmers' Association, with which is now incorporated the Plateau Maize Growers' Association, have voluntarily offered to Government to contribute towards services of this kind for the benefit of the maize industry, at the rate of one cent per bag on all the maize that passes through their hands for a period of five years; and in accordance with your request, Sir, I am in negotiation with that Association at the moment with regard to the payment of the contribution for 1927. I had hoped that before this motion had come before this Council that I would have received a reply. There is one, I believe, on the way and I have reason to believe that the Kenya Farmers' Association will be prepared to make this contribution for 1927.

The Wheat Growers' Association also considered in what way they should contribute towards this service, and they passed a resolution in favour of contributing on a basis of 20 cents per bag to be collected through the wheat mills. Well, Sir, with regard to that contribution I would not care to give any assurance that it can be made available immediately because, as I see the case and having regard to the organisation of the Wheat Growers' Association itself, a contribution of this sort cannot be collected without legislation in some form or another. In any case it shows that there is a spirit of co-operation and desire equally on the part of these representative organisations of the maize and wheat industries to show their interest in work of this kind and to assist Government in carrying out these services both on the financial side and otherwise.

One more point which I should like to explain generally with regard to the scheme is this. In anticipation that this hon. Council would approve the motion, inquiries have been made with regard to suitable land and an area of just under 200 acres on the outskirts of the Township of Njoro is available and is considered to be highly suitable for the purpose. That is to be the central plant breeding station with substations at Mau Summit and at the Scott Agricultural Laboratory at Kabete. I do not wish to take up the time of this Council unduly in going into details about the scheme itself. Suffice it to say that the reason why Njoro was chosen by Sir Rowland Biffen, and supported by the Department as the central station 'puccinia graminis' is this, that there the two severe forms of rust in this country, 'puccinia graminis', or the black stem rust, and the 'puccinia glumarum', or the yellow rust, are prevalent. Then at Mau Summit it is intended to use that station - a small station of a few acres - for the breeding, testing, and raising of wheats resistant to glumarum. It has been proved that the Scott Laboratory Agricultural site is eminently suitable for the testing and raising of wheats to resist the black stem rust.

I hope, Sir, that I have said sufficient to justify this hon. Council in unanimously supporting the motion which I now submit to this House.

The Hon. The Treasurer (Mr. Grannum): Your Excellency, I beg to second the motion.

The Hon. Conway Harvey: Your Excellency, I am very pleased to be able to cordially and strongly support the motion as expressed on the Order paper, as I think, Sir, I am and always have been an ardent supporter of the principle of co-operation and far be it for me to suggest that members of the Kenya Farmers' Association, of whom I am one, and the wheat growers of the Colony should not do exactly as they please with their own. But I must, Sir, most strongly deprecate any suggestion of introducing insidiously a change in our fiscal system. I can think, Sir, of no principle of taxation more dangerous that the principle of sectional taxation, and I would ask the Government's financial advisers to very seriously consider to what extent this form of taxation will prejudice the ability of the public to subscribe to general revenue. I am perfectly certain, Sir, that this most dangerous suggestion of sectional taxation must inevitably prejudice the general revenue of the Colony and I do sincerely trust that Government will give most serious and protracted consideration to any proposal to introduce legislation on the lines indicated by the Hon. Mover.

The Hon. A.C. Freeman-Pannett: Your Excellency, I feel confident that we will all support this measure and vote in favour of it but I would like some further information. The Hon. the Director of Agriculture stated that there was a matter of 200 acres to be obtained in Njoro District. Is it the case that it is Crown Land and if it is not is the cost of that area included in this vote?

The Hon. T.J.O'Shea: Your Excellency, I also have the pleasure of supporting this motion which I take as an act of recognition by Government that the promotion of the agricultural industry as the most important industry of the country is one of the primary responsibilities of Government. Well, I do not take quite the same view on the taxation issue involved as my hon. colleague on my right (Hon. Conway Harvey) but I feel that the policy of endeavouring to split up the responsibility and the cost of a service for the agricultural industry is far from being a good one. I think that on the contrary the Government recognises that the agricultural industry of the Colony is the primary one and that it a sound principle to promote its development by the ordinary means of taxation. I refer to this motion because it shows that Government is steadily widening its recognition of the wheat industry in this country. I should like the Hon. the Director of Agriculture to give some more reasons as to why Mau Summit has been selected for a substation rather than the higher areas of the Uasin Gishu where the wheat industry has been established for many years and where, I believe, the largest proportion of the wheat produced in the country is raised.

The Hon. The Acting Colonial Secretary (Mr. Northcote): I should like to give the Hon. Member for the Lake the assurance asked for, that Government will give every consideration to the measure .... (Interruption). I would take this opportunity, Sir, of emphasising that the Director of Agriculture has already stated that the expenditure upon this maize service, which is additional to the recommendations of Sir Rowland Biffen, will of course be governed by the certitude that the contributions from the maize farmers will be forthcoming this year.

The Hon. The Director of Agriculture: Your Excellency, I think there is very little for me to reply to except perhaps to say in reply to the Hon. Member for the Lake, that I should

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Establishment of Plant Breeding Stations at Njoro and Mau Summit:

For Sheds, Wheat Breeding Cages, Quarters for Labourers, Water Supply & Fencing £700

Head XXX - Public Works Dept.
Extraordinary.

Establishment of Plant Breeding Station at Njoro:

For 3 houses for Staff	£3,400
Laboratory and Store	600
Office	150
Quarters for African Clerk	150
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I hope that this hon. Council will be prepared to take the schedule as read.

Sir, when His Excellency the Governor in his address to this hon. Council at the end of last year, and in dealing with the Estimates for 1927, referred to plant breeding services, he informed Council that included in the vote of the Agricultural Department was a token vote of £800 for Plant Breeding Services, and it was further explained that that inclusion was merely to indicate to Members of Council that a sum of money was required for this service. It was further the intention - the desire - of Government that the scheme should not be submitted to Council until Government and the Council had the report of Professor Sir Rowland Biffen. May I say that I assume hon. Members are acquainted with that section of Professor Biffen's report in which his recommendations to Government with regard to plant breeding services in this country, particularly in regard to wheat-growing, were given, and may I say, at this stage, that I think it must be gratifying to this Colony that so favourable a report was received from Professor Biffen in regard to the prospects of wheat-growing in this country. At the same time, Sir Rowland Biffen pointed out that wheat could not be grown successfully in this country unless rust-resistant varieties were raised and produced, and that therein lay a considerable difficulty. He further pointed out that considerable progress had already been made in this Colony with regard to the raising of rust-resistant varieties. The motion before hon. Council, Sir, is, for all practical purposes, in regard to wheat-growing, a repetition of Sir Rowland Biffen's recommendations, but there is embraced in this service provision for the Department of Agriculture to carry out essential work for the benefit of the maize industry. After much consideration the conclusion was arrived at that it was advisable to embrace in one organisation services for the wheat industry and services for the maize industry, and for that reason there has been included in the estimate, as shown in the Motion before this House, an additional appointment of an Assistant Agricultural Officer with the consequential additional expenditure. I would explain that Professor Biffen, in his report on the wheat industry, did not feel called upon to deal with the maize industry, but I can inform hon. Members that I discussed this extended organisation with him and he agreed that in all the circumstances it would be a wise course to pursue to embrace the wheat and maize industries in one organisation. For this scheme there will be provided three technical officers, two plant breeders, and one agricultural officer, and I would stress the point as

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to the value of attaching an agricultural officer to this organisation, for the reason that those connected with the work of plant breeding will be greatly assisted in their work if they have someone possessing the qualifications of an agricultural officer to relieve them of the ordinary details of routine work. It is hoped that not only will the wheat industry receive much greater attention than it has been possible to give it hitherto, but that valuable work can be done for the maize industry also.

Now, Sir, I come to an interesting point in connection with the offers that have been made by organisations representing these industries in this country The Kenya Farmers' Association, with which is now incorporated the Plateau Maize Growers' Association, have voluntarily offered to Government to contribute towards services of this kind for the benefit of the maize industry, at the rate of one cent per bag on all the maize that passes through their hands for a period of five years; and in accordance with your request, Sir, I am in negotiation with that Association at the moment with regard to the payment of the contribution for 1927. I had hoped that before this motion had come before this Council that I would have received a reply. There is one, I believe, on the way and I have reason to believe that the Kenya Farmers' Association will be prepared to make this contribution for 1927.

The Wheat Growers' Association also considered in what way they should contribute towards this service, and they passed a resolution in favour of contributing on a basis of 20 cents per bag to be collected through the wheat mills. Well, Sir, with regard to that contribution I would not care to give any assurance that it can be made available immediately because, as I see the case and having regard to the organisation of the Wheat Growers' Association itself, a contribution of this sort cannot be collected without legislation in some form or another. In any case it shows that there is a spirit of co-operation and desire equally on the part of these representative organisations of the maize and wheat industries to show their interest in work of this kind and to assist Government in carrying out these services both on the financial side and otherwise.

One more point which I should like to explain generally with regard to the scheme is this. In anticipation that this hon. Council would approve the motion, inquiries have been made with regard to suitable land and an area of just under 200 acres on the outskirts of the Township of Njoro is available and is considered to be highly suitable for the purpose. That is to be the central plant breeding station with substations at Mau Summit and at the Scott Agricultural Laboratory at Kabete. I do not wish to take up the time of this Council unduly in going into details about the scheme itself. Suffice it to say that the reason why Njoro was chosen by Sir Rowland Biffen, and supported by the Department as the central station 'puccinia graminis' is the, that there the two severe forms of rust in this country, 'puccinia graminis', or the black stem rust, and the 'puccinia glumarum', or the yellow rust, are prevalent. Then at Mau Summit it is intended to use that station - a small station of a few acres - for the breeding, testing, and raising of wheats resistant to glumarum. It has been proved that the Scott Laboratory Agricultural site is eminently suitable for the testing and raising of wheats to resist the black stem rust.

I hope, Sir, that I have said sufficient to justify this hon. Council in unanimously supporting the motion which I now submit to this House.

The Hon. The Treasurer (Mr. Grannum): Your Excellency, I beg to second the motion.

The Hon. Conway Harvey: Your Excellency, I am very pleased to be able to cordially and strongly support the motion as expressed on the Order paper, as I think, Sir, I am and always have been an ardent supporter of the principle of co-operation and far be it for me to suggest that members of the Kenya Farmers' Association, of whom I am one, and the wheat growers of the Colony should not do exactly as they please with their own. But I must, Sir, most strongly deprecate any suggestion of introducing insidiously a change in our fiscal system. I can think, Sir, of no principle of taxation more dangerous that the principle of sectional taxation, and I would ask the Government's financial advisers to very seriously consider to what extent this form of taxation will prejudice the ability of the public to subscribe to general revenue. I am perfectly certain, Sir, that this most dangerous suggestion of sectional taxation must inevitably prejudice the general revenue of the Colony and I do sincerely trust that Government will give most serious and protracted consideration to any proposal to introduce legislation on the lines indicated by the Hon Mover

The Hon. A.C. Freeman-Pannett: Your Excellency, I feel confident that we will all support this measure and vote in favour of it but I would like some further information. The Hon. the Director of Agriculture stated that there was a matter of 800 acres to be obtained in Njoro District. Is it the case that it is Crown Land and if it is not is the cost of that area included in this vote?

The Hon. T.J. O'Shea: Your Excellency, I also have the pleasure of supporting this motion which I take as an act of recognition by Government that the promotion of the agricultural industry as the most important industry of the country is one of the primary responsibilities of Government. Well, I do not take quite the same view on the taxation issue involved as my hon. colleague on my right (Hon. Conway Harvey, but I feel that the policy of endeavouring to split up the responsibility and the cost of a service for the agricultural industry is far from being a good one. I think that on the contrary the Government recognises that the agricultural industry of the Colony is the primary one and that it a sound principle to promote its development by the ordinary means of taxation. I refer to this motion because it shows that Government is steadily widening its recognition of the wheat industry in this country. I should like the Hon. the Director of Agriculture to give some more reasons as to why Mau Summit has been selected for a substation rather than the higher areas of the Uasin Gishu where the wheat industry has been established for many years and where, I believe, the largest proportion of the wheat produced in the country is raised.

The Hon. The Acting Colonial Secretary (Mr. Northcote): ... should like to give the Hon. Member for the Lake the assurance asked for, that Government will give every consideration to the measure .... (Interruption). I would take this opportunity, Sir, of emphasising what the Director of Agriculture has already stated that the expenditure upon this maize service, which is additional to the recommendations of Sir Rowland Biffen, will of course be governed by the certitude that the contributions from the maize farmers will be forthcoming this year.

The Hon. The Director of Agriculture: Your Excellency, I think there is very little for me to reply to except perhaps to say in reply to the Hon. Member for the Lake, that I should

never be a party to anything being done insidiously (Laughter), and I regret very much, if I may put it this way, Sir, that this question of fiscal policy and the method of taxation, should be introduced when a motion of this kind is before this hon. Council, and I would just dispose of my own feelings in the matter by saying that it does not seem to me that politics and research work mix very well together. With regard to the question put to me by the Hon.Member for the Coast there will be no cost in respect of land. It is Crown land which was at one time included in the Njoro township and is no longer required for that purpose.

With regard to the question put by the Hon.Member for Plateau South, it is the case that in the neighbourhood of Mau Summit, puccinia glumarum, the yellow rust, is particularly prevalent, more prevalent than in most other parts of the country at a high altitude, and that was one reason why Sir Rowland Biffen chose that place as the centre for one of the substations. An additional reason was that it was within accessible distance of Njoro itself and although hon.Members may not be disposed to believe it without further proof, the Agricultural Department is always very careful to consider how and when at any time economy can be effected in travelling (Laughter). It is obvious that it would cost a great deal more to control and work a substation, say, situated in the Uasin Gishu Plateau, a very considerable distance from the central station than it would by making it at Mau Summit which is reasonably accessible.

I would express the appreciation of the Department to hon. Members on the other side of the House for the support they have given this motion.

The question was put and carried.

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Telegram from the Officer Administering the Government of Kenya to the Secretary of State for the Colonies.

Dated 13th April, 1927.

(Received Colonial Office 6.55 p.m. 13th April, 1927)

RECEIVED
14 APR 1927
COLONIAL OFFICE

No.126 13th April My despatch of 18th February No.115 Legislative Council have passed additional expenditure for plant breeding services this year recurrent £1694 extraordinary £5000. Details have been communicated by despatch Confidential No.29 of 31st March but in the meantime would be glad of approval to the necessary extraordinary expenditure and appointment of one assistant plant breeder. If so glad if you will consult Biffen and select suitable candidate earliest possible. Additional expenditure to that already communicated mainly in respect of maize services which are best combined in the same organisation. Estimate of contributions from maize growers is £375. I consider this adequate as appointment will only cover portion of the year.

6/66

UNIVERSITY OF CAMBRIDGE.

SCHOOL OF AGRICULTURE,
CAMBRIDGE

TELEPHONE 1885—2 LINES.

April 9th 1927

Ref:- 10230/27

RECEIVED
11 APR 1927
COL. OFFICE

Sir,

I beg to enclose a copy of the Report dealing with Wheat Production in Kenya Colony referred to in your letter of March 28th

Copies have now been despatched to Government House, Nairobi

I am Sir
Your obedient servant,
W.H. Griffin

The Under Secretary of State

Received 21 APR 1927

REPORT ON WHEAT PRODUCTION IN KENYA COLONY

At a meeting of the Economic and Financial Committee in March 1926 a recommendation was made that I should be invited to report on "The wheat industry of the Colony with particular reference to the methods of plant-breeding now in progress and the organisation of an extended service in the future".

The University of Cambridge granted my request for leave of absence in order to undertake the enquiry and I was able to arrive in the Colony at the end of September 1926. Before my arrival a comprehensive tour of the wheat-growing areas had been planned by the Department of Agriculture and arrangements made at several centres for meeting growers and discussing their problems. Though the difficulties of travelling during the period of the short rains interrupted the carrying out of the programme occasionally none of these meetings were missed and all of the districts were visited. The months of November and December were devoted to the work. The time chosen proved to be a peculiarly suitable one for in most districts the wheat crops were seen at various stages of growth and an unexpectedly clear insight obtained into the problems peculiar to Kenya. I am indebted further to the staff of the Agricultural Department for placing at my disposal information with regard to the climatic conditions of various districts and statistics with regard to acreage and yields and especially to the Government Botanist who accompanied me on most of the tour. My thanks too are due to wheat growers in all parts of the country not only for their kindly care and hospitality but also for the information they placed so freely at my disposal.

§ 2. The information collected by the Statistical Branch of the Department of Agriculture makes it possible to give a reasonably complete survey of the present position of wheat growing in the colony. A summary analysis of the data it has collected is shown in Table I which gives the area under the crop during the past eight years and the average yield for six of these.

[Table I]

It shows that the area increased steadily from 1921 to 1926 the average yearly increase, namely some 5000 acres, being approximately equal to the whole area under wheat in the first year to which the statistics refer. The current year's crop covers some 45000 acres that is 15000 acres more than in the previous year. The apparently normal growth rate has thus been trebled in a single year. The great increase in the area has not been brought about at the expense of any other crop and it is due almost entirely to the breaking of fresh land. This has entailed the provision of either more teams of oxen or tractors, ploughs, harrows and harvesting machinery the costs of which have been spread over the comparatively small number of settlers who now grow the crop. A further increase of the area has been made possible by the extension of the railway system.

The average yield per acre over the whole country has remained constant for six years at about two and a half bags of 200 lbs weight per acre. The average is a low one and it is clear that a considerable percentage of growers have either lost on the crop and/or only just made its cultivation pay its way. Yields vary widely and

TABLE I

COMPARATIVE STATEMENT OF WHEAT AREAS AND AVERAGE YIELDS FOR THE YEARS 1920 TO 1926

	AREAS UNDER WHEAT (ACRES)							Area sown as at 31st July, 1926 but not reaped.	AVERAGE YIELD PER ACRE (Bags of 200 lbs)						
	1920	1921	1922	1923	1924	1925	1926	Acres	1920	1921	1922	1923	1924	1925	1926
KENYA COLONY	4615	4999	10,895	15,156	19,899	23,996	29,749	48,564		2·58	2·69	2·86	2·85	2·69	2·86
PROVINCE - KISUMU Kisumu Nyanza	87	52	7	197	362	680	1,097	1,814		1·94	3·00	2·01	3·84	3·79	1·98
PROVINCE - KIKUYU North Kikuyu (including Embu and Meru)	15	34	27	20	5	5	4	121		2·88	0·79	1·19	2·00	2·00	2·75
Kiambu	48	117	83	80	61	19	9	234		1·79	0·75	2·30	2·08	2·88	1·11
PROVINCE - NYANZA Kericho	10	280	407	448	57	18	24	22		2·55	1·80	2·44	2·65	2·55	2·25
Nandi	0	19	150	1	0	0	0	0		4·21	1·85	7·00	-	-	-
PROVINCE - ULAMBA Kitui and Machakos	127	464	646	982	1,217	1,394	1,890	951		2·16	0·75	1·65	2·05	2·58	2·25
RIFT PROVINCIAL DISTRICTS Kisumu-Londiani	2	100	184	616	751	1,441	1,405	2,440		2·48	4·02	1·49	2·64	2·05	2·06
Laikipia	0	4	21	49	138	297	341	697		7·28	4·21	1·84	2·89	2·26	1·24
Naivasha	873	42	150	554	885	2,401	3,054	2,977		2·19	1·21	2·48	2·68	2·45	2·64
Nakuru	1010	2222	3439	3548	3696	3,306	3,303	9,878		2·21	2·29	2·47	4·04	2·80	2·25
Nyeri North	56	57	97	111	55	86	56	157		2·16	1·77	1·29	2·26	2·75	2·77
Trans Nzoia	341	125	464	2012	2172	3,469	3,248	3,951		2·75	2·76	2·78	2·80	2·44	1·25
Uasin Gishu	2106	1498	4886	6803	10227	11,478	15,150	22,262		2·27	2·15	2·20	2·24	1·78	2·24

NOTE. As the Agricultural Census for 1926 is not quite complete, the figures shown for that year are subject to slight adjustment.

in the course of the enquiry the fact was established that some growers counted on securing at least double this average yearly. The yield variation is brought out clearly in Table II which shows the results secured on a random sample of farms scattered over the whole of the wheat growing area.

[Table II]

It shows a range of from 8·58 bags per acre on a farm at Molo to a complete failure on a farm at Kitale. But the figures by referring only to the total crop reaped on the various farms mask the fact that some fields have yielded considerably over 8·58 bags to the acre. Even this yield therefore is not the maximum a grower can hope to secure.

The tabulation of the yields per acre district by district has not disclosed the fact that any one is outstandingly better for wheat production than any other. If it had been possible to deal with similar statistics over a series of years the fact would probably have emerged that, under existing conditions, the best yields are being obtained in the neighbourhood of Molo and Mau Summit and the least satisfactory in the Trans Nzoia. In the former crop failures resulting in the depression of the average yields are exceptional whilst in the latter complete or partial failures are too common. The difference is not necessarily due to differences in soil fertility or climatic conditions. The two districts require different types of wheat and there is reason to hope that a type suitable for the conditions of the Trans Nzoia has now been secured. At present though there is little doubt that the highlands of Molo, Mau Summit and Londiani form

STATEMENT SHEWING ACREAGES AND ACTUAL YIELDS OF WHEAT FROM EXAMPLES TAKEN AT RANDOM FROM FARMS OF VARYING ACREAGES AND CONDITIONS.

DISTRICT	Area harvested between 1st Aug.'25 and 31st July 1926.	Actual Quantity reaped	Average yield per acre	Acreage sown as at 31st July/26
	Acres	Bags of 200 lbs		Acres
Kidoma Ravine (Equator)	800	1967	2·45	900
Machakos (Mua Foothills)	210	790	3·75	100
Machakos (Ulu)	215	1042	4·89	195
Machakos	280	740	2·64	-
Machakos (Magadi Junction)	188	658	3·36	25
Machakos (Magadi Junction)	90	180	2·00	60
Kisumu-Londiani (Lumbwa)	180	865	4·54	140
do. (Lumbwa)	105	225	2·12	110
do. (Lumbwa)	560	1720	3·07	1200
do. (Londiani)	150	509	3·39	150
do. (Lumbwa)	20	129	6·45	30
do. (Londiani)	90	250	2·77	250
Laikipia	60	168	2·80	60
do.	55	70	1·27	57
Naivasha (Ol Belessat)	80	230	2·87	70
do. do.	350	1750	5·00	220
do. (Kinankop)	140	700	5·00	200
do. (Syndicate)	70	170	2·45	70
Naivasha	556	1000	3·00	200
do. (Gilgil)	100	275	2·75	57
do. (Kinankop)	85	260	3.06	155
do. (Gilgil)	100	376	3.76	-
do. (do.)	105	354	3·37	90
do. (do.)	65	358	5·60	61
do. (do.)	200	750	3·75	20
do. (do.).	72	244	3·38	154
Nakuru (Elmenteita)	697	4527	6.5	655
do. (Pipeline)	100	264	2.64	138
do. (Man Summit)	300	1008	3.35	350
Nakuru	300	1200	4·00	1000
do.	130	370	2·09	350
do. (Thomsons Falls)	78	457	5·86	180
do. (Molo)	250	865	3·46	250

on the whole, the best wheat-producing area of the Colony. As their elevation above sea level is too great for the cultivation of the other staple crops their natural line of agricultural development will be in this direction.

An increase in the average yield is to be expected. In the early years problems entirely unlike those of most wheat-growing countries had to be faced. Now the growers have learnt much by experience. The most favourable periods for sowing have been determined for each district, the seed rate appropriate for the conditions obtaining in Kenya is known and more or less suitable varieties of wheat have been obtained.

The rapid increase in the wheat area is not reflected in the returns of wheat imports. These are shown in Table III for the four year period 1922-25.

[Table III]

During this some 50-60000 cwts have been imported yearly and though complete figures are not available for 1926 it is clear that this rate of importation is not falling off for the returns from January to September show that larger quantities were imported than in the corresponding part of 1925.

The increased crop has thus been absorbed locally and as the numerical increase in the white and Indian population is too small to have had any great effect on the consumption it is evident that the native population is beginning to make use of wheaten foodstuffs. Wheat is thus beginning to replace maize in the diet of the

cereal is possible, a new and important factor will be introduced into the wheat position. It is impossible to estimate its ultimate effects but the fact is worth noting that if the produce of the current crop, which is by far the largest yet grown in the colony, were uniformly distributed it would barely provide two ounces of flour per head per week of the population. This quantity is almost negligible when compared with the 80 ounces required by the bread eating population of W. Europe.

From the point of view of the grower this position is satisfactory for with an increasing local market and the possibility of supplying adjacent countries there are no fears of producing more than can be absorbed.

TABLE III

WHEAT AND WHEAT FLOUR IMPORTATIONS

	QUANTITY Cwts	VALUE £
1922 ...	59,817 ...	63,775
1923 ...	49,599 ...	40,362
1924 ...	48,474 ...	40,792
1925 ...	53,675 ...	56,494

WHEAT AND WHEAT IMPORTATIONS DURING THE PERIOD JANUARY TO SEPTEMBER 1925, AND FOR SAME PERIOD OF 1926.

	1925		1926	
	Quantity - Cwts	Value £	Quantity - Cwts	Value £
January ...			5,771	6,447
February ...			4,462	5,194
March ...			4,899	5,032
April ...	28,209	29,772	4,610	4,519
May ...			5,017	4,837
June ...			5,252	5,042
July ...	2,488	2,592	3,852	3,635
August ...	3,632	3,690	6,878	6,533
September ...	4,478	4,635	4,751	4,501
TOTALS	38,807	40,689	45,892	45,740

8. Soil and Climate.

The soils on which the wheat crop is grown are mainly of volcanic origin. There are several distinct types of them which are generally distinguished from one another by obvious colour differences. The descriptions "red soil", "chocolate loam," "black cotton soil" are in universal use throughout the Colony and they define the soil types with sufficient accuracy for ordinary Agricultural purposes though to those who do not know the country they convey little information. No thorough examination of the physical and chemical properties of the various soils has been made yet. But a steadily accumulating body of experience is beginning to define the characteristics which are of most importance to those who cultivate them.

The red soils are as a rule easily worked and sufficiently porus to prevent water-logging even under conditions of heavy rainfall. These two features are favourable for wheat-growing. The soils vary considerably in their density and some of the lightest, found for instance in the Cherangani foothills, are more suitable for maize or barley than for wheat. Where sections are exposed these soils are often seen to be of great depth and the uniformity of their colour from the surface downwards is suggestive of a low humus content. They are however fertile and more than one instance was quoted where six successive crops of maize have failed to depreciate the acre yield.

Chocolate loams, may, for the time being be considered as a deep coloured variant of the red soils for they have the same physical characteristics; wheat yields on these soils are generally somewhat higher than on red soil.

Where in previous times the red soils have carried scrub or forest which has been either destroyed by the

natives or cleared for cultivation they are generally extremely fertile. Weather conditions interfere little with their working, they do not dry out rapidly and, in the absence of rust, heavy crops on them can be relied on. Most of the heavy crops - that is crops of the order of some 10 bags per acre - were seen on these "forest soils".

The term "black cotton soil" is less clearly defined and it undoubtedly covers a wide range of soils having as a character common to all a black colour. The texture varies greatly. When wet some of these soils are extraordinarily sticky and slimy and the earth roads through districts where they occur become almost impassable. Others do not retain water to such an extent and form soils of an open nature. Those of the former type are difficult to manage and they must be "caught right" in order to secure a tilth whilst those which are comparatively free from stickiness can be worked at almost any time. The lightest type of "black cotton soil" might be described as "grey". It contains small stones and disintegrated gneiss.

No deep sections of such soils were seen. But at Kilimakiu a trial pit had been dug for our inspection which showed a black soil of some two and a half feet in depth resting on white disintegrated mica schist. These black cotton soils have been found to be fertile and even the most unkindly type is said to improve considerably and to work more easily after cultivation for a few seasons.

Some forty chemical analyses of Kenya soils were obtained partly from the Agricultural Department and partly from farmers who had sent soil samples home for analysis. Taken as a whole they indicate that the soils are distinctly deficient in phosphates and lime. From the point of view of crop production the former is the more serious deficiency.

More than one grower had realized this fact and made experiments with phosphatic manures such as basic slag and Seychelles guano. Almost everywhere the results, especially with basic slag, have been satisfactory and there can be little doubt that as the practice extends the average yield of grain will rise substantially. The dressings employed are small ranging from 7[illegible] to 12[illegible] lbs per acre and costing on the field from 10/- to 14/- At present prices then any crop increase in excess of half a bag per acre represents an additional profit. Whilst there is a general agreement amongst those who use basic slag that the yield of grain is markedly increased no reliable data could be obtained to show what the actual increases amounted to. Almost invariably in these trials the basic slag had been applied to the whole field and no part had been left untreated for comparison. The one exception met with where the crop was at a sufficiently advanced stage of growth to allow an estimate of yield to be made indicated that land normally producing about 2½ bags was, when slagged capable of producing double that quantity. An accidental demonstration in the Lumbwa district was still more striking. Here basic slag had been broadcasted at the rate of a hundred weight per acre by natives whose wanderings over the field were clearly mapped in the crop. Their tracks were defined by a vigorous crop, possibly of 6 bags or so per acre, whilst the portions they had missed were hardly yielding 2 bags per acre. Growers experimenting with slag or any other artificial manures would be rendering a service to their neighbours by leaving an unmanured strip on each field on which trials are being made.

Climate

The cultivation of wheat in Kenya is confined to the uplands from 5000 to 10000 feet above sea level. Thus though the wheat growing area is situated on the equator the climate is broadly speaking that of a temperate zone. Between these elevation limits the climate naturally varies considerably. But even at the lower levels the mid-day temperatures are not excessive for wheat. At the higher the night temperatures are low and possibly not altogether suitable for the fullest development of the grain even though the crop makes remarkably good growth.

The annual rainfall as shown by the data accumulated by the Department of Agriculture is at first sight, high for the wheat crop. But the figures mean little from the plants point of view for the soil drainage is generally good and evaporation is so rapid that drought is more likely to be harmful than excessive moisture. Throughout most of the wheat country the bulk of the rainfall occurs in two distinct periods known locally as the periods of the long and short rains. The long rains begin in most districts about the last week of March and continue through April and May, June and July are usually dryish months and August and July very dry ones. The short rains commence in October and are succeeded by a dry period in January. The precipitation is as a rule steady and torrential downpours, though not unknown, are exceptional.

The rainy periods differ somewhat in different districts and even in the same district the times at which the rains begin and end and also the amount that falls vary widely from year to year. On the whole it may be said of them that they are a little uncertain and of the two periods

that of the long rains can be relied upon more than that of the short. More than one grower indeed stated that he did not know what a normal year was or what weather he could reasonably expect at any given period.

Owing to this distribution of the rainfall in two fairly distinct periods the lower and consequently warmer parts of Kenya are able to ripen two crops of a rapidly maturing wheat in a single year. This opens up distinctly attractive possibilities. One is that a grower having a 1000 acres under the plough can put 500 acres under wheat just before the long rains begin and fallow and clear the other 500 acres ready for sowing at the commencement of the short rains. The harvest operations can thus be spread over two periods and moreover the 1000 acres can be worked with a 500 acre equipment.

The constancy of the temperature conditions leads in some districts where there is an appreciable rainfall in the periods between the two rains to a state of affairs which is unique amongst wheat growing countries. In such wheat can be sown at any time of the year. Thus on one farm visited early in December one field was being prepared for drilling on another germination had just commenced, another carried a crop knee deep another one coming into ear whilst the stripper was at work in yet another. Here the harvest rush could be spread over the entire year.

In several respects then the conditions under which wheat is grown in Kenya are unlike those obtaining in any other important wheat growing country and it has proved a difficult matter to find wheats which thrive sufficiently well under them to make the cultivation of the crop a successful venture. If Kenya is compared with other wheat

producing countries in which the crop has been introduced in comparatively recent times, such countries for instance as Canada, the Argentine or the United States the difficulties of establishing the crop become more evident. These latter countries soon found wheats suitable for their conditions owing largely to the wide area from which their immigrant populations were drawn. Russian and Italian peasants brought their local wheats with them and contributed greatly to stocking the United States and the Argentine with wheat whilst the lucky discovery of a wheat from Galicia made Canada a great producing country. The wheats brought out by English settlers however have proved utterly useless under Kenya conditions. They belong to the slow-maturing western European type and find no place in regions where rapid maturation is essential to avoid periods of excessive dryness. Trials have had to be made therefore of varieties from all parts of the world. This has been done in part by the Agricultural Department and partly by enthusiastic settlers. The hunt for suitable varieties is still being continued and so numerous are the varieties of wheat in existence that it is worth continuing it on the chance of finding some sorts well fitted for Kenya conditions. Up to the present though it must be admitted that the results have not been particularly successful and no wheat outstandingly suitable for the country has been discovered. A comparison of the conditions under which the crops of the great wheat growing countries are produced indicates the probable reason for this failure and suggests that better results might be obtained if wheats were introduced from some country with climatic conditions having more resemblance to those of Kenya. The nearest approach to such conditions is to be found in the neighbouring country

of Abyssinia. Here wheat is grown at altitudes very similar to those of Kenya and as far as can be gathered under somewhat similar rainfall conditions. Though the majority of Abyssinian wheats do not belong to the group used for bread making a number of distinct types of bread wheats are grown there which certainly should be given a trial. Another unexploited source of possibly suitable wheats is to be found in the highlands of Northern India and [illegible]

But it is probable that the introduction of ready made varieties will only meet the country's needs temporarily and in the future special wheats will almost certainly have to be built up by the plant breeder much as they have had to be in Australia for instance or again of recent years in the Argentine.

§ 4. Rust.

The first sustained attempts to grow wheat in Kenya showed that rust attacks would seriously limit the yield of the crop even if they did not make its production impracticable. One of the first varieties to be grown on an extensive scale was the Australian "Gluyas". For three seasons this cropped satisfactorily, in one season its yield being equal to the average yield obtained in England. The fourth year the crop was wiped out by rust. This experience has been common as new districts were opened up to all of the pioneer wheat growers.

Gluyas was soon replaced by an Italian variety "Rietti" which was found to be less susceptible to rust though nevertheless it was liable to be seriously damaged in seasons when the epidemic was severe. Its introduction was the first step taken to solve the Kenya wheat growers' chief problem namely the avoidance of losses through the attacks of rust. As cultivation extended the problem proved to be a peculiarly complicated one for it gradually became clear that there was not one rust only to be dealt with, as in the case of most wheat-growing countries, but that three distinct species were present and moreover the virulence and constancy of their outbreaks showed that the conditions suited them well. Of the three species the most important is Puccinia graminis the "black" or "stem" rust. This may be found on the leaves, the ears or the straw of the plant but the symptoms shown on the straw are those recognizable with the greatest certainty. These are dark linear patches at first a deep rusty brown in colour and later becoming black. Each patch is surrounded, especially in the earlier stages of growth, by a white frill formed by the rupture of the skin of the plant as the small masses of rust-spores force their way to the

surface. The attack generally begins as the crop comes into flower and if the conditions are favourable for the growth of the fungus the yield is either seriously depreciated or the formation of the grain may be almost entirely prevented.

Next, in order of importance is Puccinia glumarum the "yellow rust". This attacks the foliage at any stage of growth and also the ears. It is readily distinguished by its bright yellow colour and by the densely crowded pustules. It has not the killing power of the black rust and crops infected at an early stage of growth may grow away from it and give a satisfactory yield. When however the ears are attacked and yellow masses of spores are to be found within the chaff serious losses of grain may be anticipated.

The third species Puccinia triticina "brown" or "leaf" rust though occurring on other parts of the plant is generally most obvious on the foliage. Its colour marks it off from either of the preceding species. Fortunately it appears to do comparatively little damage in Kenya and so far there are no records of its having destroyed a wheat crop. But it undoubtedly reduces the yield to an appreciable, if unknown, extent each season.

The observations of E.J. Bowson and especially of G.J.L.Burton have shown that these three species differ in their distribution and that two are confined to more or less definite zones whilst the third is more or less uniformly to be found throughout the wheat growing districts. The black rust is the prevalent species in districts at an altitude of from 4500 to 6500 feet, above 7000 feet its place is taken by the yellow rust and the brown rust is found at any elevation where wheat is grown.

At about the 7000 foot level the black and yellow rust overlap so that in this zone all three species may be

present. It was recognized that these zones were not clearly defined and that the various factors affecting the distribution of the rusts which are grouped together under the term "climate" could not be definitely limited by contour lines only. But it was clear that for high and low elevations respectively wheats were required which would resist either the yellow or the black rust, whilst for intermediate elevations resistance against both species was desirable.

The opportunity for checking these observations was taken during November and December under what appeared to be exceptionally favourable conditions, for in all the districts visited the rust attacks were said to be exceptionally severe. It was found that, broadly speaking, the generalization as to the distribution of the various rusts in zones was a sound one. But here and there the black rust was met with at elevations of 8000 feet on varieties believed to be exceptionally susceptible to its attacks whilst the yellow rust was only found above the 7000 foot contour. At this elevation the attacks of the latter were comparatively slight and if, normally, they are no worse than in 1926 then, in this zone, wheats resistant to black rust only could be grown without too great a risk of loss through yellow rust.

Whilst following out the distribution of the rust species an attempt was made to estimate the losses for which they are responsible. The method used was a rough and ready one at the best. It depended on two estimates - one the growers' which it was assumed would automatically allow for rust losses, the other the observer's which was based on the experience of what a crop of similar thickness and ear-size would yield if no rust were present. Doubts

exist as to the trustworthiness of the data which make it inadvizable to discuss the observations in detail but they indicate that half of the potential crop is lost through rust attacks. In many districts the severity of the attacks was amazing and crops were seen repeatedly which had been almost completely ruined. Where this occurred growers stated that the result was not unusual. In others the losses were small and growers with six years' experience or even more had never had a crop failure through the attacks of the rust. Two factors account for this difference. One is the locality the other the variety of wheat grown.

Above the 8000 foot contour where the crop is exposed to the attacks of the yellow rust complete or even serious losses are the exception and wheat growing is a reasonably safe commercial proposition. Below this only a variety which is outstandingly resistant to black rust can be grown with reasonably good chances of securing a crop. The importance of this rust resistance was especially clear in the districts round Njoro and Nakuru. Here crop after crop of rusted wheat was seen which would only produce some two bags per acre whilst others were completely destroyed by the black rust which had attacked them just as they came into ear. Yet in this area where the epidemic was more severe than in any other seen during the investigation healthy crops capable of yielding from 6 to 8 bags per acre were present. These good crops, without exception, were crops of the new variety Kenya Governor. Had it not been for the existence of these crops the conclusion drawn from the examination of the wheat fields in this area would have been that wheat growing was too risky to be a commercial proposition. In view of the healthiness and the yielding

capacity of the crops of Kenya Governor however it was clear that wheat could be grown here with a considerable measure of success provided always that nothing but varieties capable of withstanding the attacks of black rust were grown. The future of wheat growing in districts where the black rust epidemic is normally severe is so bound up with rust resistance that the behaviour of Kenya Governor under various conditions of soil and climate is worthy of a detailed description. In all nineteen crops were examined in detail, 17 personally and two by Mr Burton. The crops chosen for the purpose were for the most part ripe or nearly so so that the rust had had every opportunity for infecting them. Crops at an earlier stage of growth of which a number were seen were not included in this part of the investigation on the ground that if rust free then rust might attack them before they matured. Three of the crops were growing alongside crops of Droop wheat. The latter were completely destroyed by "black" rust whilst the Kenya Governor in each case was perfectly healthy and the most a thorough examination disclosed was a rust pustule or two on green immature side tillers. The other fourteen crops seen on the Uasin Gishu Plateau and in Trans-Nzoia did not allow of a comparison being made between resistant and susceptible varieties growing under the same conditions. Again however either no trace of rust or the merest signs of it could be found in them. The two crops seen by Mr Burton were in the Rongai and both of these were lightly attacked.

In the course of the enquiry two reports of rust damage to Kenya Governor were received and the cases were investigated as fully as possible. One report was found to be due to a mistaken diagnosis for the crop was rust

free; the other could not be cleared up satisfactorily. The crop said to have been rusted was grown in 1925 in the Trans Nzoia when the rust outbreak was an exceptionally severe one. But if attacked it was clear that little damage was done for whilst other varieties failed more or less completely Kenya Governor produced a crop of over six bags to the acre.

The only other variety in general cultivation in Kenya which is capable of standing up to the attacks of black rust is a durum wheat known as Golden Ball (Groot korn). The rust attacks the straw, often severely, yet in spite of this good yields of grain are obtained.

The other varieties now grown in the black rust zone are various strains of Droop wheat, Cross 11 and Cross 16. Their cultivation below the 8000 foot level should be abandoned for though they may occasionally be fairly free from rust the chances of a severe attack are too great to make it economically sound.

In the wheat growing areas above 7500 feet the most generally grown sort in Equator. This possesses a considerable degree of resistance to the yellow rust - how great is hardly realized until the presense of a rust-coated bearded rogue usually to be found in small quantities in the crop shows how a susceptible variety behaves under similar conditions. The Canadian wheat Marquis is also grown at and above this elevation. Crops of this variety seen at various stages of growth indicate that it is a more susceptible variety than Equator and several partial failures led to the conclusion that until the wheat has been more thoroughly tested out in the zone between 7000 and 9000 feet its extended cultivation was not to be recommended. It should not be grown below 7000 feet on account of its susceptibility to the attacks of black rust.

§5. Varieties

Equator is grown extensively above the 7500 foot level. Its most useful features are to be found in its freedom of stooling, the toughness of its ears and chaff which prevents the grain from being shed even when the crop is over-ripe, and a degree of rust resistance sufficient to ensure a satisfactory crop under suitable conditions. The deep red grain is of fair quality and well suited for blending with other wheats but milled alone it does not produce a good bread-making flour.

The wheat known as E.T. resembles Equator too closely to be considered a distinct variety.

Marquis. Under Kenya conditions is a free-stooling wheat which produces an over abundance of straw and lodges badly in unfavourable weather conditions. The samples of grain examined lacked the clean translucent appearance of the wheat as it is grown in Canada and were badly finished. This was particularly true of those grown above the 8500 foot level. It may possibly be associated with a too prolonged ripening period. Under favourable conditions it crops well and several fields promising to yield up to ten bags per acre were seen. On the other hand some wretchedly poor crops, doubtfully worth harvesting, were met with.

Golden Ball and Groot Korn. Whether these names represent two distinct wheats or whether either name is indiscriminately used for a single sort is not clear. As the specimens seen were of one sort only it is provisionally assumed that the latter alternative is correct. The wheat is a durum variety - that is it is suitable primarily for the manufacture of macaroni and not for bread-making. It has large, strongly bearded, light-chaffed ears carried on stiff straw. Though susceptible to black rust it is comparatively little damaged by it. It yields well and is probably the most reliable cropper in the country at present.

The best crops were estimated at over ten bags per acre whilst the worst looked as if they would yield about five bags. Were it only more suitable for bread-making there would be no hesitation about recommending its cultivation on a more extensive scale. But until the possibilities of the market for atta, for which it is well suited are better known this is impracticable. It should be tried experimentally in some of the drier districts bordering the Athi Plain for it is undoubtedly more drought resistant than the bread wheats.

Kenya Governor. The outstanding merit of this wheat is to be found in its resistance to the attacks of black rust. It is a fair cropper on black cotton soil, red soil and the greyish soil of the Njoro district. The best yield recorded so far appears to be 10½ bags per acre. The grain is large, translucent and of good quality. Several excellent grain samples were seen and one bag exhibited at the Nakuru show was an outstandingly good sample.

Two reports of lodged crops indicate a possible weakness of the straw but all of the crops examined were standing well. The type is perfectly fixed.

Droop Wheats. Various strains of Droop wheat are in cultivation particularly in the districts round Njoro, Nakuru and on the Uasin Gishu Plateau.

They are reasonably true to type and differ chiefly in their time of ripening and their cropping capacity. Until 1924 they were considered to be distinctly rust-resistant but later experience has shown that their degree of resistance is insufficient to warrant large scale cultivation in districts where the attacks of black rust are particularly virulent.

Cross XI, is a widely distributed variety found in almost all of the districts visited. The type is beardless but a bearded form occurs with it in some quantity. The grain is narrow, long, white and apparently of good quality. At low levels it ripens in from four to four and half months whilst at 9000 feet it may take as long as six months. At elevations of 8000 to 7500 feet it is too susceptible to black rust to be grown with any certainty of securing a good crop. Above 7500 feet it appears to be reasonably resistant to "yellow" rust.

Cross XIII 5 is again a mixed type the predominant form being bearded and red grained. The best crops were seen on the Uasin Gishu Plateau but where comparisons could be made they were inferior to the crops of equator. It is apt to shatter when dead ripe and its capacity to resist black rust is inadequate.

These are the only varieties in general cultivation in the country but on one or two farms especially on the Plateau a number of other sorts, mainly from the United States and Australia, were being tried experimentally. None of these appeared to be of any great promise.

§ 6. Quality.

The unusual climatic conditions under which wheat is grown in Kenya make the question of the quality of the crop an important one. It is often assumed that rapidly grown wheats have good milling and baking qualities. If this is generally true - and there is no particularly good evidence that it is so - then the local wheats should yield good flour for bread making purposes. Little is known however of the effects of intense sunlight, of the low night temperatures occurring at high elevations or of excessive vegetative development on the development of the grain and so sensitive is quality to the effects of the environment that it was impossible to form any a priori conclusions as to the character of the loaf produced from Kenya flour.

It was realized that definite data on the subject would be difficult to obtain and that the ordinary standards of judgment, based on the appearance of the grain, were not to be trusted under these unknown conditions. The final method of determining the quality of wheat is to convert the grain into flour and base this against a standard flour. This was unfortunately impracticable but thanks to the interest of the manager of the Unga flour mills and to some of the bakers in Nairobi it was possible to obtain some fairly conclusive data on the commercial value of Kenya wheat.

The Unga mills at Njoro and the mill at Nairobi are now dependent almost entirely on wheat grown in the country. In fact at the time the enquiries were being made the lack of external supplies was being felt and owing to the unusual lateness of the harvest the Unga mill was running short of supplies whilst that at Nairobi had had to cease running temporarily. Normally both mills blend all of the wheats available in proportions which experience has shown to give

satisfactory results. The predominant wheat in the blend at present is Equator. The milling process is similar in most respects to that carried out in well equipped mills in England and it need not be described in detail. It is sufficient to say that the blends mill well, that the bran dresses off readily and that consequently the yield of flour and its colour are satisfactory. In fact considering that much of the grain which has to be handled is rust-shrivelled and that Equator is often a very dark skinned wheat the results are surprisingly good.

The flour makes up into a somewhat soft dough which an English baker would consider difficult to handle. But the local bakers have become accustomed to this peculiarity and find no serious fault with it. As handled in Nairobi it produces loaves of good colour, texture and flavour and considering that no constant supply of yeast is available and fermentations to produce it have to be started up daily the quality of the bread from day to day is fairly uniform. Many housewives however complain that local flour will not produce good bread but in view of the fact that others can place on their tables bread fully equal to the best of that sold in Nairobi it would seem that the baking processes are to be blamed more than the flour. Another complaint, and this a universal one, was that the local flour was not suitable for pastry making. This is true for the time being and even the skilled bakers of Nairobi make use of Bombay flour for this purpose.

Judging by the usual English standards it was clear that the different varieties of wheat used in the blends differed considerably in quality. An opportunity of comparing them was provided by the Manager of the Unga mills

who went to the trouble of milling a number of them separately for this purpose. From the resulting flours equal weights were taken, the gluten separated by washing and its quantity and physical properties compared. These two features more than any others determine the baking properties of flour. The gluten separated from the flour of Equator wheat was abundant in quantity. It was soft and slightly sticky and when moulded into a sphere it soon began to lose its shape and flatten out, evidently then it was the Equator component of the blends which accounted for the comparative lack of stability noted in the doughs in the bakehouses at Nairobi. That from Kenya Governor was similar in quantity but very different in character. It was tough, elastic, free from stickiness and it retained the shape into which it was moulded. As a tough gluten holds the gas formed during the fermentation of the dough better than a soft inelastic gluten it produces a lighter, better aerated loaf. Flour from Kenya Governor should therefore give very satisfactory loaves and as this variety becomes more widely grown still better bread should be available and probably flour suitable for pastry making.

The gluten moreover was so singularly like that of Red Fife wheat that it seems probable that this wheat known to have been used for crossing purposes by Evans and Dowson was one of the parents of Kenya Governor.

Marquis wheat as grown in Canada or in England gives a similar tough gluten. The sample of flour from Kenya-grown Marquis was however deficient in the quantity of gluten and its physical properties were poor compared with those of Kenya Governor. It would not have produced a

saleable loaf whereas Marquis flour from Canadian or English crops is of excellent quality. But the wheat from which the flour was milled was an underaverage lot and probably it was not typical of what the country generally grows.

Golden Ball. The flour from this durum wheat was less yellow in colour than was anticipated and a small percentage of it, say from 5 to 10%, could be blended with the ordinary bread wheats without affecting the colour of the flour seriously. The gluten was of the usual durum type namely soft and lacking in stability.

§ 7. Cultivation.

The cultivation of the crop except in comparatively few farms still leaves much to be desired. It is naturally best where the growers have had several years' experience and have found that they can rely on securing a fair return for their expenditure. More attention to the growing crop has then been given, better crops have been secured and by putting part of the profits into machinery the cost of such operations as cleaning and harvesting has been reduced.

In newly developing districts the general tendency appears to be to break up as large an area as possible and get it sown with wheat. Too much is often attempted with the result that parts of the land are inadequately cleaned and an indifferent tilth obtained. The average return from the first crop is thus often unsatisfactory and that of the succeeding crop, though sown under better tilth conditions, is reduced by an over-abundance of weeds. A less extensive scale to begin with and a steady increase in the area might save disappointments and prove advantageous in the long run.

The methods of first breaking the land in general use would repay closer investigation than was possible during the enquiry. The commonest procedure is to use disc ploughs drawn by oxen to turn the grass under. The work is often very ragged: patches are missed, ploughed unnecessarily deeply or merely skimmed and much of the sod falls back into its original position. The crops sown on land so broken are invariably patchy and their ripening is so uneven that the use of a stripper or a combined harvester-thresher is almost out of the question. The grass would be more effectively killed and a more uniform tilth obtained by the use of motor drawn mould board ploughs.

With successive crops the land, even if originally studded with ant-hills, becomes more uniform and easily worked. Concurrently there is the danger of its becoming over-run with weeds and signs are not wanting that this will provide the wheat grower with one of his most serious problems. A well-broken piece of land is generally free from the seeds of those weeds which thrive under arable conditions except possibly in the case of old boma land. It is sound economy to keep it as free from weeds as possible and in this the grower is aided by the unusually dense "stand" of wheat so commonly seen in the country which tends to shade and crowd out a large proportion. To keep down the vigorous weed flora the land produces naturally every opportunity should be taken, both before and after planting, of stirring the surface soil to encourage first the growth and then the destruction of seedlings. Incidentally such cultivation has the advantage that it conserves soil moisture and in the drier districts harrowing, even for this purpose alone, would often be advantageous.

An excellent series of experiments designed to investigate the best methods of coping with weeds was seen at Kilima Kiu but it was too early in the season to form any estimate as to which of the systems being tried would prove the best. These test plots should be kept under observation by the Department of Agriculture. Spraying the young wheat with a two per cent solution of copper sulphate or even with a strong brine solution should also be tried experimentally as this has proved to be a cheap and satisfactory method of diminishing the weed flora without injuring the crop.

Further comparative trials of the value of phosphatic manures should be made. A comparison of the effects of basic slag and Seychelles guano on the yield of grain could probably be made in the current year on fields already

treated or to be treated with these manures and small scale trials, simply of alternating treated and untreated strips, should be undertaken with Ephos and other rock phosphates.

§ 8. **Districts Visited:-**

Northern and Western Kenya.

Hitherto the distance of these districts from the railway has stood in the way of arable farming and so far very little land has been broken. The approach of the railway has however led to a good deal of interest being taken in the possibilities of wheat growing and a start has been made on several farms near Narro Moru and Nanyuki. These farms are at an elevation of 6000 - 6500 feet and from a climatic point of view they appear to be suitable for the purpose. The rainfall is some 30-40 inches and it is so well distributed that two crops a year can be grown. The great open stretches of grassland or land so lightly covered with thorn bush that clearing presents no difficulties are well suited for large scale cultivation. Practically all of the land seen under the plough was black cotton soil. The difficulty of getting through the tracks traversing it in wet weather suggested that it was not an ideal soil for cultivation but locally it was said to become an easy, free working soil after cultivation for a season or two provided that it was ploughed at the right period. Easily worked red soils also occur in both districts. The yields reported, chiefly from the immediate neighbourhood of Nanyuki, were very variable. Several crops had proved failures either through sowing at the wrong period or through the attacks of rust, whilst the successful crops ranged from two and a half to eight bags per acre. The crops seen were all at too early a stage of growth to estimate what their yields were likely to be but it seemed probable that, in the absence of a rust outbreak, they

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would be satisfactory. But not only did the information obtained locally indicate that such outbreaks were not improbable but proof that black rust occurred in the district was found on wheat straw which had been used for thatching.

As was only to be expected under the circumstances there was a general lack of experience of the technique of arable farming and owing to the lack of suitable implements much of the breaking of the grass land had been indifferently carried out. A farm run by an experienced arable land farmer would be a great asset in these districts.

Gilgil and Thomson's Falls districts.

The farms visited in these districts were for the most part situated at elevations of from 8000 to 9000 feet above sea level. At these heights wheat grows and matures comparatively slowly and the crops sown in July, were, when seen in November only just coming into ear. They were vigorous and more or less free from yellow rust though at this stage of growth there was still a possibility of its putting in an appearance. This freedom was definitely due to the resisting capacity of the wheats grown for here and there in the crops was a bearded rogue the foliage and ear of which were yellow with rust. The crops were standing unexpectedly well considering the length of the straw and the heavy rainfall then being experienced. The average yield was said to be about five bags per acre and failures were said to be exceptional. Judging from the appearance of the crops the estimate was a conservative one. Grain samples of the previous season's growth were satisfactory.

Both the climate and the soil are suitable for wheat growing. But the country is, on the whole, undulating or

hilly and level patches over 50 acres in extent are not often met with. Extensive cultivation is thus impracticable but a large area composed of many comparatively small ones is available for breaking. Most of this is under grass and no clearing is necessary. The area under wheat has increased steadily and the local growers were looking forward to planting a large additional acreage in the coming season.

Most of the wheat grown was Equator and Marquis. A careful search was made for black rust on these high-lying farms but no signs of it were found except on one at the 8000 foot level where a crop of one of the Pusa wheats, which is evidently very susceptible to its attacks, was found to be badly damaged. The numerous experimental plots on Patten's Farm in this district provided a good opportunity for such observations and also for further observations on the incidence of yellow rust. Here some of the wheats susceptible to yellow rust were severely attacked whilst some of the hybrids were completely rust-free. If this freedom from rust is maintained until ripening time these varieties should prove of considerable value for cultivation at and above the 8000 foot level.

Nakuru and Njoro.

The first visit paid to this district showed how serious the difficulties were which wheat growers had to face when attempting to produce a crop at such elevations and an opportunity was taken on returning from the Trans-Nzoia to revisit it. Hitherto these districts have specialized in maize production and as wheat appeared to offer a useful alternative crop or a crop which could be put in when difficulties in planting up the whole of the ploughed land with maize had occurred its possibilities seemed to require a closer investigation. Consequently most of the land under wheat was inspected. This lies at

elevations of 6500 to 7500 feet above sea level, that is to say in the zone where the attacks of both black and yellow rust may be expected. The rust attack was said to be unusually severe and certainly it could hardly have been worse for several hundred acres were so badly infected that they were not worth harvesting. When the rust epidemic is slight yields are satisfactory, the official average for 1926 being given as 3·85 bags per acre whilst local estimates ranged from five to eight bags. But the too frequent occurrence of bad crops makes wheat growing here somewhat of a lottery. One satisfactory feature was to be found however, namely the general excellence of the crops of Kenya Governor indicating that, once the cultivation of this variety has become general this difficulty will disappear.

The soils of the district are derived from a light volanic ash. They are fertile and readily worked and theoretically the rainfall is an ample one though crops have been known to fail through drought. The land is generally flat and large areas which have carried heavy crops of maize for some years without any appreciable loss of fertility are available for wheat growing. Problems of transport by rail are for the most part simple and one of the two modern milling plants in the country is situated here.

Mau Summit and Londiani

The farms visited at Mau Summit were some 2[illegible] to 500 feet above the level of the railway station (8321 ft). The fine, rolling, almost treeless country through which the railway passes north-west and south-east of Mau Summit station has deep, fairly fertile soils along the ridges but the wide, shallow valleys are considered to be more

suitable for grazing than for arable purposes. The wheat crops here grow slowly and June sowings are not ready for harvest until January and February. Those inspected had been sown from 8 to 24 weeks previously. They were all fairly free from yellow rust and no sign of black rust could be detected. The brown rust was however very abundant in some fields. Yields were obviously very variable, the local estimates ranging from four to nine bags per acre. The worst crops were on newly broken land, the best on land broken four years previously and treated with basic slag or on old boma land.

The wheat most generally grown was Equator but trials of Marquis were being made. Where there were opportunities of comparing the two varieties the former seemed to be the better but the differences were not great. The few grain samples available for examination were good, the grain being well filled and obviously the produce of healthy crops.

The complete failure of the crop appears to be unknown in this district and once it has been established there is a reasonable certainty of its succeeding.

Towards Londiani the land falls and the farms visited in this neighbourhood were some 600 feet lower than those near Mau Summit station. In this neighbourhood some areas of woodland have been cleared for planting recently and there are also areas of one time forest land. The soils formerly carrying trees or scrub are still fairly rich in humus and carry good crops of wheat. The largest crop reported as having been grown was between 10 and 11 bags per acre. The crops of wheat seen were Equator, Marquis, Kenya Governor and Droop. They had been sown at various times from the third week of June until the last week of August. They were generally comparatively free from yellow

rust and none could be found on the latest sowings which were then just coming into ear. But the earliest sowings had been rusted at an early stage of growth and had "grown away" from the disease. Whilst there was little to choose between the rust resistance of the different varieties Equator was the least and Droop the most susceptible. Traces of black rust were found on some new varieties under test for the first time in the district. But the attack was a harmless one the pustules only occurring on small late tillers of almost mature plants. Judging from experience in other parts of the country it is not probable that this rust will prove a serious pest here. Apart from these slight to moderate rust attacks the crops were healthy and promised to yield well with the possible exception of a single field of Marquis on which much of the foliage had died off permaturely. On one farm some of the land had carried four wheat crops in succession and a vigorous weed flora had established itself with disastrous results. As a demonstration of the effects of weeds on the crop two adjacent pieces of wheat should prove of value locally for on one so thick were the weeds that it was difficult to believe that wheat had ever been sown and on the other was a crop of about six bags per acre.

One farm was visited in the Lumbwa district on which some 1100 acres of wheat were being grown. The various fields were from 7500 to 8000 feet above sea level and the general climatic conditions were similar to those nearer Londiani. Its rainfall was a well distributed one of 40-50 inches with a dry period for harvesting from the middle of December until March. The sowing dates ranged from May until August so that the crops were seen at various stages of growth. The crops were fairly free from yellow

rust, black rust could only be found after careful searching and brown rust was moderately abundant on the later sown crops. Yields promised to be good and on two fields there was a good prospect of obtaining some eight or nine bags per acre. The "all over" average appeared to be about five bags. Moreover wheat had been grown here for five seasons without any failures having occurred.

The effects of basic slag were being followed carefully here and conclusive evidence of its value was available. Various wheats had been grown from time to time and those found to be most satisfactory were Equator, Droop II and one of Pusa wheats. The last was lightly attacked by black rust.

At another farm near Equator station wheat was being grown on the same extensive scale. Here the fields were at a still higher level ranging from 8800 to 9200 feet and earlier sowings, from the middle of April until the middle of July, were necessary to bring the harvest into the dry period between December and March. At the most the crops were very slightly attacked by yellow rust, brown rust was present in moderation, particularly on a crop on newly broke land and no signs of black rust could be found. The wheat throughout stood thickly and promised to average at least five bags per acre with on one field the probability of a crop of nine to ten bags.

Again basic slag was being used on a large scale and dressings of 80 to 100 lbs were being found to give very satisfactory results. Although some of the land had been under wheat for four seasons it was far freer from weeds than is usually the case where no system of crop rotation is practised. The technique used was to follow the

harvester with the plough. The ground then dries out and the crop of seedlings brought up by the first rain is destroyed by harrowing. A second ploughing, followed if found advisable by another harrowing, is given before seeding. Any seedlings appearing subsequently have to face the intense competition of a strongly growing crop and have a poor chance of establishing themselves.

Most of the wheat on the farm was Equator. Other sorts were being tested but heavy rains prevented any detailed examination of them being made.

Similar conditions of soil and climate are to be found round Timboroa if one may judge from the soil sections exposed in the railway cuttings and from the general flora and it is probable that the clearing of some of the more lightly forested land would make available still richer soils. But neither from the railway or the roads were any crops seen.

The last of the localities where wheat is grown at a high level was Mau Narok. The highest field here is at an elevation of some 10800 feet. At this height the crop grows vigorously giving a stand comparable with that of the wheat-fields of Western Europe. But growth is comparatively slow and even a rapidly maturing variety such as Marquis takes about six and a half months between sowing and harvesting. The climatic conditions allow of sowings being made at almost any time of the year and a series of fields varying from the seedling up to the mature stage were available for examination. On one in which the plants were from six to eight inches high no rust whatever could be found, there was a small quantity of yellow rust in a field just coming into ear and in another which was almost ready for cutting this rust was rather abundant within the chaff.

The brown rust was present in small quantity but the black appeared to be entirely absent. Yields promised to be high with a maximum of 10 to 11 bags per acre and a minimum of 3-4 bags. But one almost complete failure, noteworthy as being the only one met with above the 8000 foot contour, was seen on a neighbouring farm, where many acres of a crop were not worth cutting and that then being harvested did not appear to exceed two bags per acre. A badly drained soil was primarily responsible for this.

Practically all of the wheat at Mau Narok was Marquis.

The Uasin Gishu Plateau. The area under wheat on the Plateau is the largest in the Colony. According to the statistics of the Agricultural Department 13600 acres were harvested there in 1925-1926 with an average output of about two and a half bags per acre. As the crop had been grown for a longer time and on a larger scale than in any other district it was considered advisable to spend some time in collecting the accumulated experience of growers and seeing the results of their work.

The soil conditions of the Plateau are rather variable. Over a large area the soils are comparatively thin and even on the ridges rock comes to the surface whilst the slopes of the valleys are frequently unploughable owing to rocky outcrops. But there are still extensive areas of flat grassland suitable for breaking. The soil on these is for the most part a red free-working friable loam on which the grass is easily killed. Here and there particularly fertile areas occur. The climatic conditions are suitable for wheat growing. The annual rainfall at Kitoret is about 42 inches, at Sergoit 38 and at Soy 47 and over the whole

district there are two well defined rainy periods immediately before either of which sowing should be carried out. The climatic conditions of the year 1926 were considered to be entirely abnormal for there was a serious drought in April and from then onwards the rainfall was excessive. As a consequence the crops were said to be under-average and it was universally agreed that the rust epidemic was exceptionally bad. Most of the farms visited were at an elevation of 6500 - 7000 feet that is to say they are situated in the black rust zone.

Much slovenly cultivation was seen and as a result many wretchedly poor crops. Weeds, especially black-jack were so abundant that from the distance wheat fields could be picked out from the surrounding veldt by their black colour. But where the cultivation was good the crops grew very satisfactorily though the yields were often sadly depreciated by the attack of black rust. More varieties of wheat are grown in this district than in any other part of Kenya. A collection of them had been got together by Dr Forbes of Eldoret which was of interest in as much as it enabled comparisons to be made of the same wheats grown on different parts of the Plateau. A second collection was seen growing on Mr Dry's farm containing not only the wheats of the district but also a number of imported varieties. A particularly interesting feature of this was a series of successional sowings of Equator made at weekly intervals from the end of March until the end of May. One sowing only, that made during the first week of April, was attacked by a fungoid pest (a Phoma ?) which has appeared recently in the district and was already widely distributed there. Some evidence was found to indicate that the

intensity of the rust epidemic was dependent on climatic conditions also for the crops sown in May were excessively attacked whilst those sown in June and July were comparatively slightly affected.

The wheat most generally grown was again Equator. A large area in the aggregate was also under Golden Ball (Groot Korn). Many of the crops of the latter stood thinly but no failures were seen and the yield promised to average out at the rate of five bags to the acre. Only a few small fields of Kenya Governor were seen which were being grown to provide seed for the next crops. They proved to be rust free. If this characteristic is retained unimpaired there can be little doubt that this variety will soon replace all others and that given better farming on the whole and the use of phosphatic manures the Plateau will become an important wheat producing area.

Trans Nzoia. Along the road between Eldoret and Kitale marked changes in the vegetation are noticeable and beyond Soy the soils of the Plateau apparently become poorer. On crossing the Nzoia river the country improves almost suddenly. Rich red soils again occur and the openness of their texture is made evident where rain has effected a mechanical analysis and filled the roadside holes with coarse grit and sand. Cultivation which has been wanting for miles previously now begins again and the heavy crops of maize point unmistakably to the richness of the land.

In 1926 there was little wheat being grown in the district. Though newly settled it has already acquired the reputation of being unusually bad for "black" rust and after a disastrous experience in 1925 settlers were naturally

chary of planting on anything more than a small scale. But the wheat seen was, as a rule, comparatively free from disease and the intensity of the attack was certainly no greater than on the Plateau and distinctly less than that around Njoro and Nakuru. The yield per acre of the ripening crops also promised to be satisfactory though not as high as one was led to expect from the huge crops of maize. It is doubtful whether the time has arrived yet for wheat-growing on an extensive scale except on the farms on which it has already proved to be successful. Trial sowings should however be made generally. On the plains between Eldoret and Mount Elgon much of the land is too liable to be waterlogged to be suitable for wheat and towards the Cherangani foothills much of the land is so light that in a dry season the chances of crop failure would be considerable. On the foothills of Mount Elgon there is a large area suitable for wheat growing. It lies above the danger level as far as black rust is concerned and the fertility of the soil should ensure high yields. But the prospective grower will have to consider the question of transporting the crop to railhead at Kitale for the main road runs through Vley land and is practically impassable in wet weather.

§ 9. The experience of those who first attempted to grow wheat in Kenya soon indicated that the successful establishment of the crop in the country was dependent on the production of varieties suitable for its special conditions. The growers of maize, sisal and coffee found, ready made, varieties which thrive under Kenya conditions but the crops of the wheat grower were uncertain and all too frequently destroyed, chiefly by the attacks of rusts. The repeated failures to secure suitable varieties by importing seed from the chief Wheat growing countries led the Agricultural Department to employ the services of a Plant-breeder in the early days of its history.

The first to be appointed, Mr Evans, after a hurried training in Cambridge, began investigating the possibility of raising rust-resistant wheats at Kabete. A few years later the necessity for economies in Government expenditure led to the suppression of the post of Plant Breeder. But, fortunately, the work was not abandoned. Lord Delamere realizing its importance to the country took Evans into his employment and provided facilities for continuing it. On the death of Evans it came, temporarily, to an end. No detailed records of his work are available now. But it is known that as a source of rust-resistance he made use mainly of Rietti and Bobs, the best wheats available at the time. He further made use of Red Fife as a parent wheat on account of its excellent milling and baking qualities. The hybrids he raised have, to a considerable extent, provided the basis for subsequent plant breeding investigations. They have been of economic value too. One "Bobs x Rietti" is still grown successfully here and there in the Uasin Gishu Plateau and the Burnt Forest

whilst another, "Equator" is now the staple variety in most of the higher wheat growing areas. It is a curious fact that this latter variety, which possesses a considerable degree of resistance to the attacks of yellow rust, was bred and selected out in an area where the black stem rust is particularly prevalent.

Evans' hybrids were ultimately handed over to Mr W.J. Dowson, the Government Mycologist. The fact was recognized that he had had no experience of this highly specialized work but, at the time, no one else with any botanical training was available. It was, however, a fortunate move for Dowson had paid a great deal of attention to the distribution of the various rust species in the Colony and was thoroughly familiar with their distribution and their effects on the wheat crop. The technique of breeding for disease resistance too was then better understood and the way was fairly clear for producing the wheats the country needed. He soon set himself the difficult task of raising varieties resistant to both the black stem and the yellow rust, knowing that a variety possessing this double resistance could be grown with safety at any elevation. Dowson's tenure of the dual post was unfortunately a short one. Though again no detailed records of his work are available, it is clear that good progress was made with this ambitious task.

Some five years ago the present Government Plant Breeder (Mr G.J.L.Burton) was appointed, and he inherited the mass of material raised in the course of the two previous investigations. He wisely concentrated on fixing and thoroughly testing the numerous types available and only made fresh crosses when experience indicated the advisability of doing so. The work has been carried out on a comprehensive scale with great thoroughness and each year many

thousands of separate plants have been kept under observation at the Scott Agricultural Laboratories, Njoro and Gilgil.

The results of these patient investigations are now becoming evident. The first is to be seen in the recently distributed wheat " Kenya Governor" which is a variety more capable of withstanding the attacks of the black stem rust than any other in cultivation in Kenya at present and is moreover of excellent milling and baking quality.

Of more importance in the immediate future though are a series of hybrid wheats, now properly fixed and true to type which have been under test at Njoro for the past three seasons. A number of these appear to be extremely resistant to the attacks of both black stem and yellow rust for though both these pests were present in abundance on adjacent plots no signs of either could be found on them after thoroughly critical examination on two separate occasions. The multiplication of these varieties for further testing in different localities and ultimately for distribution should be pushed forward as rapidly as possible. In addition to these hybrids a wheat known as "Red Egyptian" has been found which may prove to be really immune to the attacks of black stem rust for five successive crops grown under conditions extremely favourable for infection have been found to be entirely rust free. Whether the variety is suitable for field cultivation remains to be proved. Even if it is not in the hands of a plant breeder it is a valuable find.

The progress made justifies a further extension of the work and makes the hope that Kenya will supply its own increasing needs and those of neighbouring countries as well a feasible one.

As a first step an additional plant breeder should be appointed to secure complete continuity in the investigations. Under the present conditions each period of leave checks the normal progress of the plant-breeder's work. In his absence the wheats have to be grown on. But with the best will in the world his colleagues in the Agricultural Department cannot make the continuous records necessary from the beginning to the end of a rust epidemic neither can they be expected to possess that critical faculty which enables the specialist to select out the types worthy of further propagation. The efforts they have made in the immediate past to keep the investigations running are most praiseworthy and it is no small tribute for a critic to say that they have met with some measure of success. But experience derived from handling similar problems shows that, in all probability useful information and material have been lost.

Another feature making the appointment of an assistant plant breeder necessary is the large scale on which the work has to be conducted. Not only have large numbers (probably up to a hundred thousand) of individual plants to be kept under observation at the main station each season, but in order to cope with the different rust species similar observations are necessary at widely separated sub-stations. Moreover, trial plots of new varieties have to be grown in the various wheat producing areas and their suitability for the district determined. Even if access to the different places where the experimental wheats are grown were always easy it would be physically impossible for one man to visit them all and make the necessary observations from time to time. With a second man trained for the work both of these difficulties would be largely reduced.

The Government plant-breeder and his assistant should work conjointly at the problem of breeding for simultaneous resistance to black stem and yellow rust so that in the absence of either the other could keep the investigations (reduced in scale, if found necessary) running with the minimum of interruption. But the stem rust problem should remain the special work of Mr Burton in view of the wide experience he has gained with it whilst his assistant should concentrate particularly on breeding yellow-rust resistant wheats for the higher parts of the country. The work on the trial plots of new varieties in different areas should be shared as soon as the assistant has become familiar with the local problems.

Owing to the differences in the times of sowing and harvesting in the country and the possibility in some parts of growing two crops in a year, observations on the behaviour of selected wheats, whether hybrids or varieties to be used as parents for further crosses, can be carried out with a thoroughness unequalled in any other wheat growing country. The progress of the two plant breeders should therefore be fairly rapid. But a word of warning is necessary lest results of economic value should be expected immediately. A wheat worthy of field cultivation and not merely a stepping stone to better types in the hands of the plant breeder has not only to be resistant to the particular rust, or rusts, of the locality it also has to be of good quality, to stand well, crop satisfactorily and ripen uniformly. All of these features are required in combination for if one is wanting the variety is a failure in practice. This means that comparatively few selections can be made from the huge numbers of hybrid plants which have to be kept under close observation. Experience has shown too that the plant breeder is fortunate

if in the fifth generation from the actual cross he secures and fixes the type he set out to breed. Then a period of testing follows for it may happen that a wheat which is satisfactory when grown on a small experimental scale is unsuitable for the more crowded conditions of field culture, and finally seed stocks for distribution have to be worked up.

To the grower awaiting better wheats such progress may seem slow and though two crops may be grown in a year some time must elapse before the produce of the latest crosses can be handed over to him. In the meanwhile in districts afflicted with the black stem rust the time gap can be bridged by Kenya Governor and where yellow rust is the dominant pest by Equator - both products of the Government Plant Breeders.

THE PLANT BREEDING STATIONS

At present the main plant breeding station is at the Scott Agricultural Laboratories near Nairobi, and subsidiary stations have been established at Njoro and Gilgil.

The main station is at an elevation of some 5,700 feet above sea level. It consequently comes within the zone where the black stem rust is the dominant species and it is specially suitable for an attack on the problems of breeding for resistance against it.

That at Njoro is at an elevation of some 7,100 ft. in a zone where both the black stem and the yellow rust occur. It thus offers opportunities for breeding for resistance (a) against both rusts conjointly, (b) against black rust, or (c) against yellow rust. But whilst a wheat possessing resistance to both rusts could be safely

propagated here in bulk for distribution a wheat resistant to black rust only might succumb to the attacks of yellow rust or conversely one resistant to yellow rust might be wiped out by black rust. Either of the two last types would consequently have to be sent elsewhere for further trials and multiplication. If this season's experience is a real criterion the black stem rust is the more serious pest.

The Gilgil station is about 8,300 feet above sea level and lies well within the zone where yellow rust is abundant. Breeding work here has to be confined to resistance against this species.

The location of the main Station at the Scott Agricultural Laboratories is a natural one. It is near the administrative headquarters at Nairobi and a plant breeder stationed there is in close touch with the other scientific members of the staff of the Agricultural Department. The station is on Government land, and buildings, implements, labour, etc., are all available for its use. Its nearness to the capital too makes it specially suitable as a demonstration centre where those interested in wheat production can see variety trials and tests carried out with the new wheats raised by the plant-breeder. Moreover, the black stem rust epidemics are peculiarly severe here and any variety which stands up to them well for a season or two may be considered to possess a real power of resistance.

These are advantageous features which cannot be ignored. But as a site for the main work on wheat improvement it has two drawbacks. In the first place it is a long distance away from the wheat growing areas and consequently much time is wasted in visiting these and the two substations Njoro and Gilgil. In the next, climatic conditions only

allow of wheat with a growing period of about four and a half months being grown here. Sowings are made at the end of March and harvesting generally begins early in August. By utilising the short rains and sowing again in October it is possible to secure two crops in a year. But owing to the shortness of the rainy periods double cropping is attended with some risk.

The experience of the last few years has shown that the Njoro substation has certain advantages over both the Scott Agricultural Laboratories and Gilgil. At present, however, it lacks adequate facilities for the proper study of the wheat grown there. The breeding crop is on private land and owing to the lack of a permanent staff on the site it has been difficult to keep the cultures grown in it in a suitably clean condition. Neither has it any facilities for storing the crop, which after harvest has to be transported to the Scott Agricultural Laboratories for threshing and for the final examination of such characteristics as grain quality, colour etc. This involves the risk of errors creeping in owing to stray ears and grain finding a way into the numerous small sheaves harvested in the crop. The out-standing advantage of the Njoro site is to be found, as already indicated, in the fact that crops grown there are exposed to the attacks of both of the serious rusts of the country and that consequently there is the possibility of selecting from the second and third generations of the wheat crosses individual plants showing resistance to both simultaneously. Advantage has been taken of this fact and a number of these doubly-resistant types are now under test at Njoro. But financial and other considerations permitted the main station to have been there from the beginning and all of the earlier generations of the various wheat crosses grown there still better progress

would have been made. As it is it has been impossible to give sufficient attention to the comparatively small number of hybrids grown there.

The substation on Rotton's farm at Gilgil is in one respect a good one for wheat grown there has every opportunity of becoming attacked by yellow rust. When visited in November the trial plots of wheat were in ear and the differences between the rust-susceptible and rust-resistant were most striking. The site, however, is very difficult of access and in the rainy season it is almost impossible to reach it. Moreover it possesses no equipment beyond a roll of wire-netting surrounding the most important of the cultures. Everything grown there has consequently to be transported over difficult country for a final examination in the laboratories and grain carried back again for the next sowings. The substation should be abandoned and another at a similar elevation and easily accessible should carry on the work done there. The best site appears to be at Mau Summit which is not only easily reached by rail but is also the centre of a steadily increasing wheat area. Wheats bred here would find their places not only in the Gilgil and Thomson's Falls area but also in Molo, Mau Narok, Londiani, Timboroa and the Burnt Forest.

All three stations, the Scott Agricultural Laboratories, Njoro and Mau Summit are necessary for the production of the series of wheats needed to suit the wide range of conditions under which wheat can be grown in the country. Which, in the future, shall be the main station, must be determined by financial considerations.

From the plant breeder's point of view there are two possible programmes for improving the wheat crop. The first is to produce a number of wheats resistant to both black stem and yellow rust. Such wheats could be grown

anywhere in the country where the soil and climatic conditions were suitable.

The second is to produce wheats resistant to either the black stem or the yellow rust. The former would be suitable for districts of comparatively low elevations and the latter for the higher districts. But no provision would then be made for the large areas at a more or less intermediate level.

Concerning the first programme it must be said that, so far, nothing is known with regard to the commercial possibilities of producing doubly resistant varieties. Theoretically it is possible to do so and at Njoro there are actually a number of small plots of hybrid wheat on which neither of the rusts have yet been found though both are abundant on neighbouring plots. These still have to be tested on the field scale and until this has been done no final opinion is possible.

The second programme is the simpler and if, as seems probable from the examination made this season, the attacks of yellow rust are comparatively slight at intermediate elevations a series of wheats resistant to one or the other would meet immediate needs.

To carry out the first programme would involve making Njoro the main breeding station instead of the Scott Agricultural Laboratories. All of the crosses would be made there and a thoroughly critical examination of every wheat in the generation raised from cross-breds would be possible. Any plants found to be resisting the attacks of both rust species would then be grown on at Njoro in order to fix the types and further test them whilst the produce of plants resistant to one or the other rusts could be transferred either to the Scott Agricultural Laboratories or to the station at Mau Summit for further observation. With two plant-breeders [illegible] [illegible] plots at this main station the difficulties of examining the crops

from time to time at the substations, which have hitherto been so serious, would largely disappear.

The second programme requires three separate breeding stations, one for wheat resistant to the black stem rust at the Scott Agricultural Laboratories and the others at Mau Summit and Njoro for wheats resistant to the yellow rust with a plant-breeder stationed more or less permanently at each. The former station is suggested in addition to Njoro in view of the fact that the attacks of black stem rust are particularly severe there and consequently the testing out of new varieties would, from the beginning, be thoroughly drastic. The necessary facilities for the work exist there. During leave periods the investigations in progress at these stations could be kept running without much difficulty by sowing in March and harvesting in August at the Scott Agricultural Laboratories and sowing in June and harvesting in January at Mau Summit and Njoro.

Either programme requires the provision of buildings for the staff and for storage purposes. Before considering this, however, another side of the plant-breeder's work requires attention. This is the growing on and distributing of stocks of seed of the new types he has raised. Theoretically once the plant-breeder is satisfied that a new wheat is thoroughly fixed, that it yields well, is resistant to the attacks of rust and is suitable for general cultivation it requires no further attention from him. Multiplication of the seed stock and distribution can therefore be carried on by a separate organisation as it is for instance at Svalof or Cambridge with the result that a considerable burden is taken from the shoulders of the Scientific staff. But there is always the chance that in the early stages of multiplication the plant-breeder can

obtain useful information, for until the field stage is reached all of his observations have been made on comparatively small hand-sown plots. Under the more crowded conditions of field cultivation such features as a slight weakness in the straw, small differences in the time of ripening of individual plants, habit of growth, etc. may become obvious. On the whole, then, in a country in which much attention has not been given to seed production it seems advisable that the plant-breeder should keep control of the work.

If the first programme is adopted, which is the course I most strongly recommend, Njoro would become the growing on and distributing centre as well as the breeding centre. For this purpose a minimum area of 100 acres is necessary, about 80 of which would be available each season for the production of seed corn. The following estimate shows the cost of staffing and equipping the stations to carry out both of these functions on the assumption that this area of Township land at Njoro can be obtained rent free:

Plant-breeding Sections:

		£	
Personal Emoluments			
1 Plant Breeder	...	775	
1 Assistant Plant Breeder	...	500	
1 African Clerk	...	80	
Passages	...	90	
Travelling	...	350	
			1,795
Other Charges - Recurrent			
Upkeep of Stations	...	500	
Labour	...	400	
Contingencies	...	50	
			950

Non-recurrent

		£
Two houses and Office	...	2,500
Laboratory and Store	...	450
Wheat breeding cages	...	100
Quarters for Labourers	...	150
Farm Buildings	...	100
Grain	...	200
Implements, Machinery and Equipment	...	550
Water supply	...	200
Fencing	...	150
		£4,200

A rough analysis shows that some £4,200 is a Capital charge and £2,748 is Recurrent expenditure.

The proceeds of the sales of seed wheat should help to cover the recurrent expenditure each year.

The second programme requires three breeding and propagating stations, one of which is already in existence at the Scott Agricultural Laboratories. It has been suggested that the other two should be placed at Mau Summit and Njoro. At these, for the sake of economy, it is suggested that the multiplication of the new wheats should be carried out under the supervision of the Assistant Plant-breeder on land hired for the purpose from the neighbouring wheat grower who would undertake the sowing, cleaning and harvesting of the crop. The actual cost of the seed wheat (say at 50% above the market price of wheat) would be recovered from the purchasers of the new wheats.

The area used for breeding need not exceed five acres at each point.

The following estimate shows approximately the cost of the necessary equipment:

Engle, Asst.Plant Breeder	...	£1,100
Laboratory and Store	...	400
2 Wheat Cages 100' x 50'	...	80
Quarters for Labourers	...	50
Fencing	...	80
Implements, Machinery and Equipment	...	270
		1,980
Labour and Upkeep	...	250
Contingencies	...	50
		300

plus the Personal Emoluments shown in the first schedule.

R.H.Biffen
April. 1927

KENYA.

No. 115

GOVERNMENT HOUSE,
NAIROBI,
KENYA.

RECEIVED
12 MAR 1927
COL. OFFICE

8th February, 1927.

Sir,

I have the honour to transmit a copy of Section 9 of the Report on Wheat Production in Kenya Colony by Professor Sir Rowland Biffen.

2. Provision for the measures suggested in this section of the Report and for any other proposals that may be put forward in connection with it will be considered at a meeting of Executive Council to be held on the 18th February.

3. It is expected that the local Maize and Wheat Associations will each contribute £500 per annum towards the cost of carrying out such measures as may be finally approved. The assistance of the Empire Marketing Board will also be sought.

4. The complete Report containing the information upon which Sir Rowland Biffen's recommendations are based is in course of preparation in England but I should be grateful if you would convey my thanks to him for his valuable advice and assistance to the Wheat Industry during his recent visit.

I have the honour to be,

Sir,

Your most obedient, humble servant,

ACTING GOVERNOR.

THE RIGHT HONOURABLE
LIEUT.COL. L.C.M.S. AMERY, P.C., M.P.,
SECRETARY OF STATE FOR THE COLONIES,
DOWNING STREET, L O N D O N, S.W.

REPORT ON WHEAT PRODUCTION IN KENYA COLONY.

SECTION 9.

PLANT BREEDING IN KENYA.

The experience of those who first attempted to grow wheat in Kenya soon indicated that the successful establishment of the crop in the country was dependent on the production of varieties suitable for its special conditions. The growers of maize, sisal and coffee found, ready made, varieties which throve under Kenya conditions but the crops of the wheat grower were uncertain and all too frequently destroyed, chiefly by the attacks of rusts. The repeated failures to secure suitable varieties by importing seed from the chief Wheat growing countries led the Agricultural Department to employ the services of a Plant-breeder in the early days of its history.

The first to be appointed, Mr. Evans, after a hurried training in Cambridge, began investigating the possibility of raising rust-resistant wheats at Kabete. A few years later the necessity for economies in Government expenditure led to the suppression of the post of Plant Breeder. But, fortunately, the work was not abandoned. Lord Delamere realising its importance to the country took Evans into his employment and provided facilities for continuing it. On the death of Evans it came, temporarily, to an end. No detailed records of his work are available now. But it is known that as a source of rust-resistance he made use mainly of Rietti and Bobs, the best wheats available at the time. He further made use of Red Fife as a parent wheat on account of its excellent milling and baking qualities. The hybrids he raised have, to a considerable extent, provided the basis for subsequent plant breeding investigations. They have been of economic value too. One "Bobs x Rietti" is still grown successfully here and there in the Uasin Gishu Plateau and

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Evans' hybrids were ultimately handed over to Mr.W.J?Dowson, the Government Mycologist. The fact was recognized that he had had no experience of this highly specialized work but, at the time, no one else with any botanical training was available. It was, however, a fortunate move for Dowson had paid a great deal of attention to the distribution of the various rust species in the Colony and was thoroughly familiar with their distribution and their effects on the wheat crop. The technique of breeding for disease resistance too was then better understood and the way was fairly clear for producing the wheats the country needed. He soon set himself the difficult task of raising varieties resistant to both the black stem and the yellow rust, knowing that a variety possessing this double resistance could be grown with safety at any elevation. Bowson's tenure of the dual post was unfortunately a short one. Though again no detailed records of his work are available, it is clear that good progress was made with this ambitious task.

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The work/

The work has been carried out on a comprehensive scale withagreat thoroughness and each year many thousands of separate plants have been kept under observation at the Scott Agricultural Laboratories, Njoro and Gilgil.

The results of these patient investigations are now becoming evident. The first is to be seen in the recently distributed wheat "Kenya Governor" which is a variety more capable of withstanding the attacks of the black stem rust than any other in cultivation in Kenya at present and is moreover of excellent milling and baking quality.

Of more importance in the immediate future though are a series of hybrid wheats, now preperly fixed and true to type which have been under test at Njoro for the past three seasons. A number of these appear to be extremely resistant to the attacks of both black stem and yellow rust for though both these pests were present in abundance on adjacent plots no signs of either could be found on them after thoroughly critical examination on two separate occasions. The multiplication of these varieties for further testing in different localities and ultimately for distribution should be pushed forward as rapidly as possible. In addition to these hybrids a wheat known as "Red Egyptian" has been found which may prove to be really immune to the attacks of black stem rust for five successive crops grown under conditions extremely favourable for infection have been found to be entirely rust free. Whether the variety is suitable for field cultivation remains to be proved. Even if it is not in the hands of a plant breeder it is a valuable find.

The progress made justifies a further extension of the work and makes the hope that Kenya will supply its own increasing needs and those of neighbouring countries as well

as well a feasable one.

As a first step an additional plant breeder should be appointed to secure complete continuity in the investigations. Under the present conditions each period of leave checks the normal progress of the plant-breeder's work. In his absence the wheats have to be grown on. But with the best will in the world his colleagues in the Agricultural Department cannot make the continuous records necessary from the beginning to the end of a rust epidemic neither can they be expected to possess that critical faculty which enables the specialist to select out the types worthy of further propagation. The efforts they have made in the immediate past to keep the investigations running are most praiseworthy and it is no small tribute for a critic to say that they have met with some measure of success. But experience derived from handling similar problems shows that, in all probability useful information and material has been lost.

Another feature making the appointment of an assistant plant breeder necessary is the large scale on which the work has to be conducted. Not only have large numbers (probably up to a hundred thousand) of individual plants to be kept under observation at the main station each season, but in order to cope with the different rust species similar observations are necessary at widely separated sub-stations. Moreover, trial plots of new varieties have to be grown in the various wheat producing areas and their suitability for the district determined. Even if access to the different places where the experimental wheats are grown were always easy it would be physically impossible for one man to visit them all and make the necessary observations from time to time. With a second man trained for the work both of these difficulties/

difficulties would be largely reduced.

The Government plant-breeder and his assistant should work conjointly at the problem of breeding for simultaneous resistance to black stem and yellow rust so that in the absence of either the other could keep the investigations (reduced in scale, if found necessary) running with the minimum of interruption. But the stem rust problem should remain the special work of Mr.Burton in view of the wide experience he has gained with it whilst his assistant should concentrate particularly on breeding yellow-rust-resistant wheats for the higher parts of the country. The work on the trial plots of new varieties in different areas should be shared as soon as the assistant has become familiar with the local problems.

Owing to the differences in the times of sowing and harvesting in the country and the possibility in some parts of the country of growing two crops in a year, observations on the behaviour of selected wheats, whether hybrids or varieties to be used as parents for further crosses, can be carried out with a thoroughness unequalled in any other wheat growing country. The progress of the two plant breeders should therefore be fairly rapid. But a word of warning is necessary lest results of economic value should be expected immediately. A wheat worthy of field cultivation and not merely a stepping stone to better types in the hands of the plant breeder has not only to be resistant to the particular rust, or rusts, of the locality it also has to be of good quality, to stand well, crop satisfactorily and ripen uniformly. All of these features are required in combination for if one is wanting the variety is a failure in practice. This means that comparatively few selections can be made from the huge numbers of hybrid plants which have to be

kept under close observation. Experience has shown too that the plant breeder is fortunate if in the fifth generation from the actual cross he secures and fixes the type he set out to breed. Then a period of testing follows for it may happen that a wheat which is satisfactory when grown on a small experimental scale is unsuitable for the more crowded conditions of field culture, and finally seed stocks for distribution have to be worked up.

To the grower awaiting better wheats such progress maymseem slow and though two crops may be grown in a year some time must elapse before the produce of the latest crosses can be handed over to him. In the meantime in districts afflicted with the black stem rust the time gap can be bridged by Kenya Governor and where yellow rust is the dominant pest by Equator - both products of the Government Plant Breeder.

THE PLANT BREEDING STATIONS.

At present the main plant breeding station is at the Scott Agricultural Laboratories near Nairobi, and subsidiary stations have been established at Njoro and Gilgil.

The main station is at an elevation of some 5,700 feet above sea level. It consequently comes within the zone where the black stem rust is the dominant species and it is specially suitable for an attack on the problemsof breeding for resistance against it.

That at Njoro is at an elevation of some 7,100 ft. in a zone where both the black stem and the yellow rust occur. It thus offers opportunities for breeding for resistance (a) against both rusts conjointly, (b) against black rust, or (c) against yellow rust. But whilst a wheat possessing resistance to both

rusts/

rusts could be safely propagated in bulk for distribution here a wheat resistant to black rust only might succumb to the attacks of yellow rust or conversely one resistant to yellow rust might be wiped out by black rust. Either of the two last types would consequently have to be sent elsewhere for further trials and multiplication. If this season's experience is a real criterion the black stem rust is the more serious pest.

The Gilgil station is about 8,300 feet above sea level and lies well within the zone where yellow rust is abundant. Breeding work here has to be confined to resistance against this species.

The location of the main Station at the Scott Agricultural Laboratories is a natural one. It is near the administrative headquarters at Nairobi and a plant breeder stationed there is in close touch with the other scientific members of the staff of the Agricultural Department. The station is on Government land, and buildings, implements, labour, etc., are all available for its use. Its nearness to the capital too makes it specially suitable as a demonstration centre where those interested in wheat production can see variety trials and tests carried out with the new wheats raised by the plant-breeder. Moreover, the black stem rust epidemics are peculiarly severe here and any variety which stands up to them well for a season or two may be considered to possess a real power of resistance.

These are advantageous features which cannot be ignored. But as a site for the main work on wheat improvement it has two drawbacks. In the first place it is a long distance away from the wheat growing areas and consequently much time is wasted in visiting these and the two substations Njoro and Gilgil. In the next, climatic conditions only allow of wheats with a growing

period of about four and a half months being grown here. Sowings are made at the end of March and harvesting generally begins early in August. By utilising the short rains and sowing again in October it is possible to secure two crops in a year. But owing to the shortness of the rainy periods double cropping is attended with some risk.

The experience of the last few years has shown that the Njoro substation has certain advantages over both the Scott Agricultural Laboratories and Gilgil. At present, however, it lacks adequate facilities for the proper study of the wheat grown there. The breeding cage is on private land and owing to the lack of a permanent staff on the site it has been difficult to keep the cultures grown in it in a suitably clean condition. Neither has it any facilities for storing the crop, which after harvest has to be transported to the Scott Agricultural Laboratories for threshing and for the final examination of such characteristics as grain quality, colour etc. This involves the risk of errors creeping in owing to stray ears and grain finding a way into the numerous small sheaves harvested in the cage. The out-standing advantage of the Njoro site is to be found, as already indicated, in the fact that crops grown there are exposed to the attacks of both of the serious rusts of the country and that consequently there is the possibility of selecting from the second and third generations of the wheat crosses individual plants showing resistance to both simultaneously Advantage has been taken of this fact and a number of these doubly-resistant types are now under test at Njoro. Had financial and other considerations permitted the main station to have been there from the beginning and all of the earlier generations of the various wheat crosses grown there still better progress would have been made. As it is it has been impossible - - - - - - - - - - - - - - - - - -

impossible to give sufficient attention to the comparatively small number of hybrids grown there.

The sub-station on Patten's farm at Gilgil is in one respect a good one for wheat grown there has every opportunity of becoming attacked by yellow rust. When visited in November the trial plots of wheat were in ear and the differences between the rust-susceptible and rust-resistant were most striking. The site, however, is very difficult of access and in the rainy season it is almost impossible to reach it. Moreover it possesses no equipment beyond a roll of wire-netting surrounding the most important of the cultures. Everything grown there has consequently to be transported over difficult country for a final examination in the laboratories and grain carried back again for the next sowings. The substation should be abandoned and another at a similar elevation and easily accessable should carry on the work done there. The best site appears to be at Mau Summit which is not only easily reached by rail but is also the centre of a steadily increasing wheat area. Wheats bred here would find their places not only in the Gilgil and Thomson's Falls area but also in Molo, Mau Narok, Londiani, Timboroa and the Burnt Forest.

All three stations, the Scott Agricultural Laboratories, Njoro and Mau Summit are necessary for the production of the series of wheats needed to suit the wide range of conditions under which wheat can be grown in the country. Which, in the future, shall be the main station, must be determined by financial considerations.

From the plant breeder's point of view there are two possible programmes for improving the wheat crop. The first is to produce a series of wheats resistant to both black stem and yellow rust. Such wheats could be/

(30

be grown anywhere in the country where the soil and climatic conditions were suitable.

The second is to produce wheats resistant to either the black stem or the yellow rust. The former would be suitable for districts of comparatively low elevations and the latter for the higher districts. But no provision would then be made for the large areas at a more or less intermediate level.

Concerning the first programme it must be said that, so far, nothing is known with regard to the commercial possibilities of producing doubly resistant varieties. Theoretically it is possible to do so and at Njoro there are actually a number of small plots of hybrid wheat on which neither of the rusts have yet been found though both are abundant on neighbouring plots. These still have to be tested on the field scale and until this has been done no final opinion is possible.

The second programme is the simpler and if, as seems probable from the examination made this season, the attacks of yellow rust are comparatively slight at intermediate elevations a series of wheats resistant to one or the other would meet immediate needs.

To carry out the first programme would involve making Njoro the main breeding station instead of the Scott Agricultural Laboratories. All of the crosses would be made there and a thoroughly critical examination of every wheat in the generation raised from cross-breds would be possible. Any plants found to be resisting the attacks of both rust species would then be grown on at Njoro in order to fix the types and further test them whilst the produce of plants resistant to one or the other rusts could be transferred either to the Scott Agricultural Laboratories or to the station at Mau Summit for further observation, each

two/

two plant-breeders more or less centrally placed at this main station the difficulties of examining the crops from time to time at the substations, which have hitherto been so serious, would largely disappear.

The second programme requires three separate breeding stations, one for wheat resistant to the black stem rust at the Scott Agricultural Laboratories and the others at Mau Summit and Njoro for wheats resistant to the yellow rust with a plant-breeder stationed more or less permanently at each. The former station is suggested in addition to Njoro in view of the fact that the attacks of black stem rust are particularly severe there and consequently the testing out of new varieties would, from the beginning, be thoroughly drastic. The necessary facilities for the work exist there. During leave periods the investigations in progress at these stations could be kept running without much difficulty by sowing in March and harvesting in August at the Scott Agricultural Laboratories and sowing in June and harvesting in January at Mau Summit and Njoro.

Either programme requires the provision of buildings for the staff and for storage purposes. Before considering this, however, another side of the plant-breeder's work requires attention. This is the growing on and distributing of stocks of seed of the new types he has raised. Theoretically once the plant-breeder is satisfied that a new wheat is thoroughly fixed, that it yields well, is resistant to the attacks of rust and is suitable for general cultivation it requires no further attention from him. Multiplication of the seed stock and distribution can therefore be carried on by a separate organisation as it is for instance at Svalof or Cambridge with the result that a considerable

burden/

burden is taken from the shoulders of the Scientific staff. But there is always the chance that in the early stages of multiplication the plant-breeder can obtain useful information, for until the field stage is reached all of his observations have been made on comparatively small hand-sown plots. Under the more crowded conditions of field cultivation such features as a slight weakness in the straw, small differences in the time of ripening of individual plants, habit of growth, etc. may become obvious. On the whole, then, in a country in which much attention has not been given to seed production it seems advisable that the plant-breeder should keep control of the work.

If the first programme is adopted, which I most strongly recommend, Njoro would become the growing on and distributing centre as well as the breeding centre. For this purpose a minimum area of 100 acres is necessary, about 50 of which would be available each season for the production of seed corn. The following estimate shows the cost of staffing and equipping the stations to carry out both of these functions on the assumption that this area of Township land at Njoro can be obtained rent free :

Plant-breeding Sections:

		£	
Personal Emoluments.			
1 Plant Breeder	...	778	
1 Assistant Plant Breeder	...	500	
1 African Clerk	...	80	
Passages	...	90	
Travelling	...	350	1,798
Other Charges - Recurrent.			
Upkeep of Stations	...	500	
Labour	...	400	
Contingencies	...	50	950

Non-recurrent.

		£
Two houses and Office	...	2,300
Laboratory and Store	...	450
Wheat breeding cages	...	100
Quarters for Labourers	...	150
Farm Buildings	...	100
Oxen	...	200
Implements, Machinery & Equipment	...	550
Water supply	...	200
Fencing	...	150
		£4,200

A rough analysis shows that some £4,200 is a Capital charge and £2,768 is Recurrent expenditure.

The proceeds of the sales of seed wheat should help to cover the recurrent expenditure each year.

The second programme requires three breeding and propagating stations, one of which is already in existence at the Scott Agricultural Laboratories. It has been suggested that the other two should be placed at Mau Summit and Njoro. Here, for the sake of economy, it is suggested that the multiplication of the new wheats should be carried out under the supervision of the assistant Plant-breeder on land hired for the purpose from a neighbouring wheat grower who would undertake the sowing, cleaning and harvesting of the crop. The actual cost of the seed wheat (say at 50% above the market price of wheat) would be recovered from the purchasers of the new wheats.

The area used for breeding need not exceed five acres at each point.

The following estimate shows approximately the cost of the necessary equipment :

Buildings:

House, Asst. Plant Breeder ... £1,[illegible]

Laboratory and Store ... [illegible]

1/40
END

2 Wheat Cages 100' x 50'	...	60	
Quarters for Labourers	...	50	
Fencing	...	50	
Implements, Machinery and Equipment	...	270	
			1,930
Labour and Upkeep	...	250	
Contingencies	...	50	
			300

plus the Personal Emoluments shown in the first schedule.

X. 10232

1927

KENYA

CO533/368

X. 10232

1

1927

Kenya Uganda Railway: Soroti - Lira Line

Previous

See X. 10066/27 (Rly Development)

Subsequent

[illegible]	15/3
W Allen	15/3
Sir C Strachey	15/3.
Sir S Wilson	16/3
[illegible]	17/3
Telegraph Section	
[illegible]	5/4
W Allen	18/4
[illegible]	

X. 10232/27

1/2

1. Colonial Office — March, 1927

Sords Lira Memo. by Mr. Pelling regarding construction of line beyond Mbale.

(See slip from Mr Amery Govt)

The railway services provided in the original estimates to the Treasury of the £3½ mill. loan included £750,000 for the branch Tororo-Kumi. Kumi is situated between Mbale and Soroti. Ultimately a composite item of £2,200,000 was included in the schedule of the loan to cover the extension of the main line from Tororo and the branch in North Kavirondo. As a result of savings on the estimate for the main line it was found that more money would be available for the branch line from Tororo. Paragraph 7 of the Schuster Committee report was as follows:-

"We understand that owing to economies on the estimates for the cost of extending the line as far as Mbale the former Kenya-Uganda loan of £3,500,000 will probably suffice to finance an extension as far as Soroti, thus covering a substantial part of the work in respect of which the estimate of £1,050,000 had been prepared" (for the extension to Soroti and then on to Lira).

In his despatch of the 14th December, 1926, (X.10066/27) forwarding his observations on the Schuster Committee's report, the High Commissioner indicated from the latest figures that in all probability a sum of only £50,000 would be required over and above the money available from the £3,500,000 loan to take the line as far as Lira - see marked

X. 10232
27

marked passage on pages 7 and 8 of the despatch flagged herewith.

It is therefore clear that it has been intended for some time past that the monies of the £3½ mill. loan should be used so far as they may be available for carrying the line as far as Soroti, and even beyond. Although the original estimate to the Treasury only related to a railway as far as Kumi, it does not seem necessary to consult them with regard to this proposal. || The condition that was laid down was that the loan of £3½ mill, together with any interest on the same prior to its being expended, was to be devoted to railway services in connection with cotton development, and this condition is fulfilled in regard to the extension of the railway as far as Lira and even beyond. The report of the East African Commission definitely [illegible] that the whole length of the line [illegible] Lira and Gulu [Either to] [illegible] itself [illegible] the navigable Nile between [illegible] and Lake Albert [illegible] pass through actual or potential [illegible] country.

In these circumstances [illegible] to the Acting High Commissioner as in draft [illegible] send copy to Sir Edward Grigg for information [illegible] to the memorandum which he left with [illegible].

[illegible] given in this rather [illegible] of our being told later [illegible] Department in finishing [illegible] rail sticking [illegible] beyond!!

J. V. Allen
15/3/27

The Schuster Committee is not concerned. J.V.A.

No.

And on page 11 they say that cotton development is [illegible] of all [illegible]. J.V.A.

p. 138

Col. Walker rang up & asked if Sir E. Grigg might have a copy, so I said one was S.O.
J.V. Allen
18/3

X. 10232/27

3

The draft does what Mr. Felling asks – i.e., authorises proceeding beyond Mbale as far as funds will permit. All the Kenya telegram asked for was authority to go as far as Soroti, but we can quite safely telegraph as proposed.

10066 Sir E. Grigg's despatch makes it clear that there are ~~[illegible]~~ funds for the extension not only as far as Soroti but beyond – (as far as Lira) C. 15/3

[signature] 16/3/27

at once [initials] 17.3.27

…ws. —— 18 Mar. 1927

…ekr …ngs) } S.O. – 18 Mar 927

…hat —— 5 April 1927

£300,000.

…ests for Tororo-Soroti Branch is …lable for contingencies and extension … is estimated £260,000 additional would … to Lira.

…tached. A copy of the tel …

also E.O. to Col. Walker S.O.

J.N. Allen

Copy Nov … Walker – S.O. 16/4/26 …

P.T.O.

X.10737

5 To Col. Walker (G30) 18/11/27.
To H.Cr. Trans./79, 22 Aug/27 on 10066/27 K
(Copy attached)

(Copy)

6.

Draft on 10066/26 Kenya

~~41001/27~~ 4

TRANSPORT
KENYA-UGANDA
No. 79

DOWNING STREET,
22 August, 1927.

Sir,

With reference to your despatch No. 133 of the 14th December 1926 I have the honour to inform you that, as it has been decided that the Colony of Kenya should not resort to the facilities offered by the Guaranteed Loans Act, it will be necessary for the East African Guaranteed Loan Committee to consider, inter alia, the effects of this decision so far as it concerns any allocation in respect of the Uganda share of the sum of £1,400,000 provisionally reserved for main line improvements and rolling stock and workshops.

2. The resolution adopted by the Legislative Council of Kenya on the 5th November, 1926 included the following railway items.

Main line improvements	£600,000
Locomotives and Rolling stock	880,000

In the debate in the Council on this resolution Mr Pelling suggested that the Kenya share in respect of rolling stock requirements might be put at £650,000 and the Uganda share at £280,000 or more: while in your despatch under reference the approximate division was put as Kenya £780,000 and Uganda £250,000. So far as I am aware I have not received any estimate of the division to be made between Kenya and Uganda

HIGH COMMISSIONER FOR TRANSPORT.
KENYA-UGANDA.

Uganda in respect of the £600,000 for main line improvements.

3. I should be glad if I could now be furnished, after consultation with the Governor of Uganda, with revised estimates of any allocations that may be required under the Guaranteed Loans Act in respect of the Uganda shares of loan expenditure on (a) main line improvements and (b) rolling stock, etc.

4. The recommendations on page 38 of the Guaranteed Loan Committee's Report included a provisional allocation of £700,000 for the Soroti-Lira extension. In your despatch under reference the cost of the line was estimated at £300,000; but, in your telegram No. 11 of the 4th April, it was estimated that to complete the line to Lira £550,000 would be required in addition to the balance of £114,000 available from the 1924 Parliamentary Loan for this purpose and for contingencies to which should apparently be added the amount which has accrued from time to time as interest on the unexpended portion of the £1,000,000. In view of the possibility that this extension, if ultimately built, may be left for construction as a Uganda guaranteed service under the Guaranteed Loans Act I shall be glad to receive a further estimate of cost for the information of the Guaranteed Loan Committee.

I have the honour to be,

Sir,

Your most obedient,

humble servant,

(For the Secretary of State)

5
6

Downing Street,

18th April, 1927.

Dear Walker,

On (I think) the 18th March, I sent you a copy of the telegram which the Secretary of State sent tothe High Commissioner for Transport, Kenya, on the 18th March regarding the extension of the Railway beyond Mbale in the direction of Soroti. I now enclose a copy of a telegram from the High Commissioner which was received on the 5th April giving the latest estimates as to the cost of the Tororo-Soroti branch and the completion to Lira.

I ought to have sent you this before, but, as you know, there have been many other things to attend to lately, and as there seemed no hurry some time has been occupied in comparing these later figures with the earlier ones for record purposes.

Yours sincerely,

J.M.P.

COLONEL C.W.G.WALKER, D.S.O.

£3,500,000 Loan

Provision for Tororo-Soroti-Lira Branch.

	A. (a) Item £2,200,000. Para.8 of 10066/27.	B. Tel. of 4 Apl. (10232/27)
Turbo Mbulamuti	£1,202,000.	£1,202,000.
Kavirondo Branch	175,000.	175,000.
Tororo-Mbale Soroti	550,000.	709,000.
Soroti-Lira ..	(100,000)(i)	(364,000)(i)
Contingencies	23,000.	
Balance	250,000.	114,000.
	2,200,000.	2,200,000.
(b) Addl. Rolling Stock.	800,000.	800,000.
(c) Capital Improvements.	500,000.	500,000

(i) Estimate not provided in £2,200,000. £3,500,000.

i.e. expenditure charged to the £2,200,000 under "A" left only £23,000 towards Soroti-Lira line, estimated at £300,000, but it was also estimated that there would be a balance of £250,000 from the £3½ mill. loan as a whole and that this further savings and interest would cover the £300,000 without further provision.

10066/27.

The new telegram adds £159,000 to the cost of the Tororo-Soroti branch and reduces the balance (including "contingencies") to £114,000 - the estimate for the Soroti-Lira branch being increased apparently to £364,000 i.e. (£114,000 + £250,000). Interest earned on the £3½ mill. loan money up to the 30th November 1925 was £272104 and further sums have doubtless

10232/27.

doubtless since accrued. It would there appear that even apart from savings there is still sufficient to meet the cost of the Soroti-Lira line.

16/4/26

TELEGRAM from the High Commissioner for Transport to the Secretary of State for Colonies.

Dated 4th April, 1927.

(Received, Colonial Office, 7.35 a.m. 5th April, 1927).

No.11 4th April My despatch of 14th December No.133 paragraph 8 (a) Revised Estimates Tororo-Soroti Branch is £709,000 leaving £114,000 available for contingencies and extension beyond Soroti £3,500,000 loan. Estimated £250,000 additional would be required to complete line to Lira.

Mr. Allen 18/3/27

X. 10232/27 Kenya.

Codedvent Rw. 11.20A 18/3/27

29

Mr.

Mr.

Mr. E. J. Harding.

Sir C. Strachey. 15

Sir J. Shuckburgh.

Sir G. Grindle.

Sir C. Davis.

~~Sir S. Wilson.~~ 16.3

Mr. Ormsby-Gore. at once 17.3

Earl of Clarendon.

Mr. Amery.

DRAFT. Tel.
(Cons: v. minute)

Mr. ... ma.

Nairobi.

With reference to recent telegram ... telling construction of ~~......~~ line beyond Mbale may proceed so far as money available from item £2,200,000 of schedule 1 £3,500,000 loan after setting aside adequate provision for Kavirondo branch

...

9th March, 1927.

1/10 End.

MEMORANDUM FOR THE HIGH COMMISSIONER FOR TRANSPORT.

Extension of line from Mbale to Soroti.

I have received the following cable from Kenya:-

"Can you obtain definite authority to construct "branch from Tororo as far as Soroti. Work on "Mbale section now in hand".

The provision in the scehdule of the £3,500,000 loan is as follows:-

"Extension of the Uganda Railway into Uganda "and construction of branches in Kavirondo and "Uganda ... ... £2,200,000".

I think, under the circumstances, authority should be given to us to take the line beyond Mbale as far as the money at our disposal under the above item of the Loan Schedule will permit. (after setting aside sufficient for the Kavirondo Branch)

General Manager,
Kenya and Uganda Railway.

A. 10240

1927

KENYA

UGANDA

X. 10240

1927

CO533/368

PAYMENT OF FEES TO MEMBERS OF THE INTER-COLONIAL RAILWAY COUNCIL.

Previous

H.C. 5273. F 26

Subsequent

25009/34.

2

1. --------- Gov. Gowers, Conf. ----- 25th February, 1927.
(Uganda)

Submits his obsons on the question of payment of fees to members of the Inter-Colonial Railway Council. Seeks approval to payment from Uganda funds and not from Railway funds, in the case of official members.

Mr Jeffries

The grounds for Sir William Gowers' objection to the payment of Uganda official members from Transport funds may, I think, be found in para. 3 of his desp. to Kenya of 18th February, i.e. he does not wish it to be thought that, in sitting on the Council, the Uganda officers are in any way acting as servants of the Railway.

It seems clear, however, that if Sir W. Gowers' suggestion is to be adopted for Uganda ~~[illegible]~~ official members the same ruling should be applicable to Kenya official members. And I we should reply to No. 1 pointing this out and saying that O.A.G. Kenya's obsns on the matter are being sought, on receipt of ~~which~~ a further despatch will be sent.

A

? And write to O.A.G. referring Uganda's despatch of 18th February and point out as at A above and ask

for C.A.G.'s obsns. on the proposal.

C A L Cliffe
4.iv.27

C J Jeffries
4.4.27.

The expansion of the Rly Cl to deal with the Port or the appt of a Port Advisory Bd under the Bu C or otherwise has some connexion with this & it would be well to wait a little & see how that matter develops. Bring up in a fortnight.

Noted

(No regs as to fees under the Bu C can be traced) J.R. Allen 6/4 [illegible]

4/4

[illegible] directed [illegible] think you have the [illegible]

[illegible] 2/5/27

Sir E. Grigg's memo on his Secretariat saved me tracking to the officials see your minute on KP 3273.26 Kenya - If you had been aware of Sir W. Gowers' views officials might not have been picked out for economy. If the Official members are paid then logically Railway funds shd bear the charge - but I think Sir W. Gowers' sho be allowed his way, merely suggesting to Kenya

Not Uganda [illegible]

the desirability of considering a similar arrangement in the case of the Kenya official members but not making the Uganda decision dependent on what Kenya may do.

A (It would be difficult to resist payment of official members of the Port Advisory Board were established but I think these allowances in respect of the Railway Cl continue & I think they sh'd be abolished as & when vacancies arise)

J.R. Allen
2/5/27

I don't appreciate Sir W. Gowers' point about Uganda paying - it seems to be founded on the old & evil jealousy of Uganda towards Kenya, & the members of the Council are better regarded as working together for the best interests of both countries.

But we should accept his view - [illegible] from a similar course in Kenya

[As to A, I would agree. I have never felt that Uganda officials should receive less than Uganda unofficials.]

we can leave this

W.C. Bottomley
3.5.27

12/5

2 to Gov Conf (Paraphs) 25 MAY 1927 [initials]

Mr. Whitlomlie 18/5/27
Mr. Allen. 18/5/27
-X Mr. Bottomley 20/5
Mr. E. J. Harding.
Sir [illegible] Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Lord Lovat.
Mr. Amery.

X 10240/27 Kenya Uganda

4

25 May, 1927.

DRAFT.

Uganda

Gov.

Lon. Lowers

Sir,

I have etc. to ack. the rect. of your conf. desp. of the 25th of February regarding the fees & allces. payable to members of the Inter-Colonial Railway Cl. & to inform you that I am prepared to sanction ~~your proposal~~ your proposal that

-X Make it no action requisite as regards here. JMO

No Words 2075

that, in the case of the

[illegible] members

[illegible], payment

[illegible] should

[illegible] from Uganda,

[illegible] of Railway funds.

2. [illegible] will no doubt communicate this decision to the S of S for Transport.

[illegible]

C13

1/5

Uganda Protectorate

No. Confidential.

GOVERNMENT HOUSE,
UGANDA

RECEIVED
25 MAR 1927
COL. OFFICE

25th February, 1927.

25 MAR 1927

Sir,

I have the honour to refer to your confidential despatch of the 17th July, 1926, addressed to the High Commissioner for Transport, in which you approved the payment of a fee of 4 guineas per diem to the Members of the Railway Advisory Council, while in attendance, as well as a travelling allowance of Shs 30/- per diem en route to and from the place of meeting.

2. I observe that the High Commissioner, in paragraph 3 of his confidential despatch of the 28th May on the same subject, informed you that I fully concurred with his views regarding the payment of fees to members of this Council. I fear that there has been some misunderstanding in the matter. While I agreed with the proposals so far as the unofficial members were concerned, I was of opinion that there was little reason for special remuneration of the official members. At the same time, I was prepared to agree to the rates suggested, on condition that, in the case of the official members representing the Uganda Government, payment should be made from Uganda funds and not from Railway funds. I enclose, for your information, copy of a

Enclos.

despatch

THE RIGHT HONOURABLE,

THE SECRETARY OF STATE FOR THE COLONIES,

etc, etc, etc.

6

despatch addressed by me to the Governor of Kenya on the 18th February, 1926, in which this point of view was emphasised.

3. I trust that you will agree that payment of the fees and allowances now authorised should be made, as regards the official members, from Protectorate funds, and I propose to sign a Special Warrant for the amount required in 1927, and to insert, in the 1928 Estimates, a vote for the purpose under Head XlX, similar to Item 22.

I have the honour to be,

Sir,

Your most obedient, humble servant,

W. F. Gowers

GOVERNOR.

Enclosure No. 1 to
Confidential despatch
of 25th February, 1937

Uganda Protectorate

GOVERNMENT HOUSE,
UGANDA.

No. Confidential.

18th February, 1926.

Sir,

I have the honour to acknowledge the receipt of Your Excellency's despatch, Confidential, No.21561/2/68 of the 29th December, 1925, on the subject of the payment of fees to the members of the Inter-Colonial Railway Council..

2. I feel obliged to dissent from the view expressed by the General Manager in paragraph 5 of his Memorandum No.R.C.11 of the 26th June, 1925, to the effect that the work of the members of the Council cannot be regarded as an integral part of their ordinary duties as Government servants. In my opinion their duties as members of the Railway Council are analogous to their duties as ex-officio or official members of the Legislative Council, which in many Colonies take up a great deal of time and add very appreciably to the work and responsibilities of officials.

3. I would add that I regard the official members of the Railway Council as representing the views and interests of the Governments to which they belong, and not as being servants of the Railway Administration, or entitled to remuneration from Railway funds.

4. At the same time I am prepared to agree to the rates of remuneration suggested if the Secretary of State approves. I

His Excellency the Governor,
Colony and Protectorate of Kenya,
Nairobi.

9
END.

I consider, however, that in the case of the Uganda members the payment should be made from Uganda funds for the reasons stated in paragraph 3.

5. As regards the date from which payment should be effected, I am of opinion that, if the principle of payment is accepted, it should be regarded as having been in operation since the Railway Council was first instituted.

I have the honour to be,

Sir,

Your Excellency's most obedient servant,

sd/- W. F. GOWERS.

GOVERNOR.

1927 Kenya. 1

No. 10243 CO533/368

SUBJECT

Jubaland Boundary Commission

Pay and Allowances etc.

Previous	
See 10111/27 See K/574/16/26	
Subsequent	
15022/28	

FILE C.

(1867) Wt.28588/27 2,000—10/29
H.P.Co. G.002/10

X. 10243

1927

KENYA

X. 10243

2

1927

PAY AND ALLOWANCES, ETC., OF THE JUBALAND BOUNDARY COMMISSION.

Previous

See X. 10114/27 (Refunds Lewis)

See K. 5716/26 (Income Tax)

Subsequent

X. 15022/28

[illegible]	29/3
[illegible]	30.3
Accounts Dept.	31/3/27
[illegible]	
Mr Allen	
Room 8	8/5
Room	5/6
[illegible]	11·6
[illegible]	11·6
[illegible]	
Room 3	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	

1. ——— Lt Col King ——— 23 Feb. 1927
(Mombasa)

In circs. stated strongly recommends that Capt Erskine be granted a tax free bonus of £150 and that on the termination of his final leave, he be granted a further tax free bonus equivalent to the taxation he will have paid on his emoluments

2 ——— Lt Col King ——— 23 Feb 1927
(Mombasa)

Asks whether leave privilege of 10 days per completed month applies to periods spent in England and Italy subsequent to the completion of the work in Africa. For reasons stated recommends Capt Erskine be placed on the same footing as himself and Capt Clifford as regards leave

~~Accounts Dept~~

As these two letters involve matters on which you are the authority (income tax on Capt Erskine's salary, & leave granted to officers on Boundary Commission) might we have your views?

It may perhaps be stated as a preliminary that as regards 1. the figure £700 for Capt Erskine's salary was that originally recommended by Col King as "a salary commensurate with the value of this officer" to him, & if Col King has had occasion to revise his opinion there seems no obj. [from EA Dept point of view] to putting the recommendation for some increase to Treasury.

K 50167 / 25

As regards 2. 30 days a month is the ~~[illegible]~~ for E. Officers in unhealthy stations, & many of these have to live in outstations or on continual safari, conditions which must [illegible] approximate fairly closely to those of the Boundary Commission.

[illegible] 2.3.27

East Africa Dept.

No. 1. Taking the last para. first, the form sent is that appropriate to foreign residence, i.e. outside U.K. and Colking was duly informed as to this in our letter of 29 July 26 × 5716/26. He should be referred to that letter, and also to C.O.

(1448/CS) letter of 17 Feb 1927 (wh. has crossed with his letter), the enclosure to which instructed him as to the amt. of tax deduction to be made in the case of Capt. Erskine.

As to the proposed bonus (a) in compensation for income tax and (b) because of the inadequacy of his remuneration, the first is quite out of the question and there is no power to issue emoluments provided on Parly. votes, free of tax. The suggestion has been made before and is always negatived. For the last occasion see

106, Treasury letter 3 Jan 1923 as regards the Iraq Levies.

If it is considered that Colking has made a case for an increase in Capt. Erskine's emoluments it is for this Office to submit the matter to the Treasury but for my part I think the proper time to do this will be after the conclusion of the work of the Commission in Italy, when Colking comes to England. It would be an advantage to discuss the matter with him, and I suggest replying to him in this sense. As to the work devolving on Capt. Erskine

× 3736/26 see Colking's letter of 13 March 26, where, in remarking that Capt. E.'s pay was less than he had been drawing under the Kenya Govt., he did not propose to recommend any increase.

In this [illegible] I may mention that we have

× 4405/26 Treasury authority to pay Capt. E. from 1 July 1925 but we have just accepted a charge for his pay for 29.30 June 25 on which days he was on his way up country

1148/ACS [illegible] and for which Kenya Govt. have repudiated liability.

× 5759/26 As the result of our letter to Treasury of 20 Aug 26 we have obtained sanction for the very favourable treatment of Capt. E. in the matter of full pay &

× 6744/26 passages in respect of the visit to Florence. 4

No. 2. As regards leave to Capt. Erskine,

— " — the plan approved by Treasury emanated from this Office and I assume that you will consider whether Colking adduces sufficient in the way of justifying more liberal treatment having regard to local circumstances. Colking's reference to the opening sentence of para. 10 of the Financial instructions has no relevancy. Those instructions were designed to apply to Regular Army Officers and Non Commd Officers only.

It must be borne in mind that any concessions in the way of bonus or better leave to Capt. E. will affect the provision available on the Estimates for 1927-8 which is based on present sanctions.

W J Drayson
31/3/27

Mr. Drayson,
Mr. Allen,

To save another minute I have endeavoured to embody the substance of the foregoing in two drafts for consideration herewith. As regards leave I do not think that there is really any need to be more generous to Captain Erskine than we already have been, and as regards salary it will obviously be best, as Mr. Drayson suggests, to wait till the work of the Commission is concluded.

I have not added in either draft anything about the Secretary of State being glad to note the good report on Captain Erskine's work; it might be as well to make some reference to this in the draft

This might wait [illegible] - he [illegible] a little with Erskine! [illegible]

as to salary, although Captain Erskine is not a permanent officer of the Kenya Government.

G Beel 5/4/27

H.S.D. 6/4

J.W. [illegible] 9/4

[illegible]

3 To King (no 1 [illegible])

4. To King (no [illegible])

9 MAY 1927

6 King [illegible]

For reasons stated considers it would be most unjust to apply the ordinary colonial scale of salary to Capt Erskine

[illegible]

We have said that the Financial Instns have no bearing. They were addressed to the Senior Brit. Commr. and are no concern of Capt Erskine whose existence was unknown to us when the Instns were drawn. Nor are we concerned with what he might have done had he known the leave conditions at the time. As a matter of fact leave to Political officers at the expense of Imp. funds in respect of attachment to a Boundary Commn is a thing unknown until now. Political officers have usually been attached [illegible] and presumably have [illegible] as reckoning for leave in ordinary [illegible]

A

x It has been agreed that no expenses of this Commn should fall on the Col Govt.

5

6

We know that the life of a Boundary Commr is an arduous one but we also know that it has other compensations for those who take it on.

Col King is writing pretty strongly when he tells the S of S that the wording of the F.I. legally entitle Capt E to something which the S of S has decided not to give him: and in saying the decision is most unjust.

In strictness, Capt Erskine is entitled to nothing in the way of leave and it is a concession to grant it in his case, and what more natural than to give him leave on the usual scale in the District in which he has served.

? Ackge receipt of letter stating his views saying that the S of S has nothing to add to his letter of 2 May.

[illegible]

(6)

As to A in Mr Drayson's minute. I think it is material to remember that Capt Erskine is not a permanent officer of the Govt of Kenya and had it not been for the leave which has been approved at the expense of imperial funds (at the ordinary rate of 3 days a month) he would have had no leave at all in respect of the services, admittedly valuable, he has rendered to the Commission. The concession therefore is one which could hardly in fairness have been refused.

~~[illegible]~~ At the same time [illegible]

that there is not necessarily a case for giving Capt Erskine the same privileges as are necessary in the case of military and technical Officers. He will get exactly the same as an ordinary civil Officer who does a tour in the N F P and then does not return for the service, with the addition that he will get pay for the return voyage from Florence to Kenya.

I sh. be inclined to answer that [illegible] not [illegible] any authority [illegible] in [illegible] conditions [illegible] "Capt. [illegible]" [illegible] [illegible] possible [illegible] the Kenya [illegible] [illegible] [illegible] the [illegible] [illegible] [illegible] Col. King [illegible] liberty to raise their [illegible] in this Country [illegible] to the question of an increase in the actual remuneration [illegible] for Capt Erskine.

[illegible] through Mr Drayson

G. [illegible] 11.6.27

6

So proceed. It is clear that in one way or another the terms of Capt. Erskine's employment have not worked out as well for him as [illegible] be, & probably Col. King anticipated when he was engaged, but I see no way of easing matters by correspondence.

[illegible] 11.6.27

To King (no 5 [illegible]) 21 JUN 1927

Mr Drayson

The position of Capt Erskine's pay [illegible] to have been discussed yesterday.

Pay. It was agreed that if any further recommendation is to be made to the Treasury it would better take the form of a [illegible] increase in salary. We undertook to look into the matter on the basis of the recommendations already made by Col King but also on the assumption that [illegible] free of income

the arrangement is inadmissible. I think all the necessary [illegible] are here – see the references in Mr [illegible] minute of 31/3/27. [illegible] undertaken to investigate the [illegible] in the first instance.

Leave. It is [illegible] that there can be no change in the arrangement that leave [illegible] must be calculated on the E.A. basis: but there is the question whether any leave can be granted in respect of the time spent in Italy & England – see No 2. [illegible] 2 that letter [illegible] raises this question as [illegible] himself [illegible] Clifford also – but the point was apparently not taken up.

There seems to be two good arguments in favour of some concession as regards the stay in Italy – the period in England is almost negligible or apparently will be. These arguments are (1) owing to the extraordinary dilatoriness of the Italians the stay in Florence was prolonged to the exceptional period of 8 mos + (2) in the interests of the work the Commission took no recess during its work in E. Africa – such recess had been contemplated

[illegible] the specially arduous nature of the work in Jubaland.

May we have your suggestions on this point also?

J W Allen
4/1/27

Mr. Allen.

To save further minutes I put up a Draft [illegible] covering Capt Erskine's case and the question of leave for [illegible] at Florence. I hope that I have correctly [illegible] the result of the discussion we had with [illegible]. You may like to [illegible] as to the [illegible] of [illegible] which [illegible] is [illegible]. I think he would be agreeable to the leave solution [illegible] and [illegible] [illegible] [illegible].

W J Drayson
5/1/28

I have this afternoon seen Captain Erskine [illegible] Mr. Wiseman's request.

He still feels aggrieved [illegible] should be treated [illegible] differently from the [illegible] attached [illegible] Commission. I ex[illegible] there was [illegible] essential difference [illegible] in exactly the same way [illegible] been an official of the Kenya Government and that for my part I could not see how any other solution was logically possible seeing that up to the time of his engagement he had been a Kenya official and on the spot. I also said that, but for the special circumstances giving rise to this Commission, he would in fact have been in the position of a Kenya Official lent to the Commission. For my part I do not think the decision should be reviewed

reviewed.

His next point was that if for leave purposes he is treated under Kenya rules why should he not have the same pay and allowances as if he had been a Kenya Official. This is a better point, but I explained that he were in the hands of Colonel King who recommended him for £700 a year and that if he had at the time proposed something else doubtless we should have agreed; but now from Colonel King personally we were trying to put things right by the method of a gratuity. He also feels that he ought to have had a travelling allowance of 10/- a day like Kenya Officials? I said that Colonel King made no mention of it either at the time of his engagement or in the subsequent correspondence and that after all his transport expenses were borne entirely from Commission funds so that he could not have been out of pocket. However, he made one last point which was that he had a very large amount of further work to do for the Kenya Government which should have been performed by Colonial Officials but for the then transition state of Colonial Office affairs were withdrawn. This was [illegible] and lessening of returns to [illegible] owing me [illegible] something from the Kenya Govt. which [illegible] the amount of the [illegible] was seeking. I advised him [illegible] to the Colonial Office [illegible] whether it could be recommended to the Kenya Government.

He had a good deal to say on Income Tax but I was able to convince him that there was no escape from the liability.

On the whole I think he left me feeling rather

happier

happier about things. There is no reason why the draft to the Treasury should be further delayed.

W.G.D. Clayton
6.1.28

See min on 15022/28 Kenya

R.O.W.
14/1/28

H.M.Y. To Treasury, cons. 28 Jan/28. on 15022
28
No 3.

9

28 January 1928

10243/27

Sir,

With reference to the correspondence marginally noted, I am directed to request you to lay before the Lords Commissioners of the Treasury the following considerations concerning the remuneration of Captain E.N.Erskine, M.C., attached to the Jubaland Boundary Commission.

C.O.to Treas. 1st Dec.25.

Treas.11.Dec. 1925.

2. Captain Erskine was originally detailed to assist Lieutenant Colonel King the Chief British Commissioner as Interpreter in Italian; and, because his experience of Jubaland qualified him to act as Political Officer to the Commission, Colonel King recommended him for an inclusive salary of £700 per annum with an outfit allowance of £40. Approval for these terms was conveyed in Sir George Barstow's letter of 11th December, 1925.

THE SECRETARY,

TREASURY.

In

In February 1927 Colonel King reported that with the experience of actual field work behind him he was most strongly of opinion that the rate of £700 per annum was inadequate for the period of Captain Erskine's employment in Africa, and that when he allotted to this officer the charge of political, transport, supply and disciplinary duties, he had a very inadequate conception of the amount and importance of the work. He says that had he at the outset been more fully aware of the responsibility involved, he most certainly would have applied for the services of an additional Assistant Commissioner. When recommending a salary of £700, Colonel King had no knowledge that Captain Erskine's pay was liable to assessment to British income tax. Accordingly he proposed that Captain Erskine should be given a gratuity of £150, tax free, for his work in Africa, and that on the termination of his employment he should receive a further tax-free bonus equivalent to the amount of income tax for which he was liable. It was pointed out to Colonel King that exemption from income tax could not be entertained,

and

and that the Secretary of State was reluctant to re-openthe matter of remuneration. After some further correspondence the matter was left over for discussion on the return of the Commission to England.

3. Colonel King has now arrived in England and this and other questions have been fully discussed with him. He reports that the services of Captain Erskine have been invaluable to him, that in particular, as Transport Officer he was responsible for the purchase and equipment of Camels, the enrolment, discipline, organisation and subsistence of the native staff, in addition to his work as Interpreter and Political Officer and that in effect the general well-being of the Commission was entirely in his hands. Further, he was of the greatest assistance to the Italian side of the Commission so much so, that but for him, work in the field must have been much hampered and delayed. Captain Erskine served in the field for 21 months and having regard to the special hardships of the work, the Secretary of State is now convinced that a good case has been ma

made out for him, and he considers that the grant of a gratuity would meet the case. Captain Erskine's tax liability may be stated to amount to £100 and in view of Colonel King's recommendation already referred to, I am to suggest, for the favourable consideration of Their Lordships the grant of a gratuity of £300 to him.

4. I am now to refer to the letter from this Office of 20th August 1926 and to Treasury reply of 8th September following C.25637/2 regarding the arrangements for completing the Commission's work at Florence. It was originally expected that this would have involved some six weeks or so in Italy but it proved necessary to spend 8 months in Florence, and Colonel King has explained that this has been due to extraordinary delays for which the British Section of the Commission were in no way responsible. The delay however, enabled Colonel King to proceed with the preparation of his report which is now well advanced and also to accomplish other work which would otherwise have remained to be undertaken in England. The delay which has occurred is regrettable

but

but it was in the circumstances quite unavoidable and the British members of the Commission made every effort in their own interests to curtail it.

5. The question now arises whether some special consideration should not be given to the three officers concerned in the matter of extended leave for which Colonel King has made application in respect of service in Florence. Ordinarily, Army officers attached to boundary commissions are, under standing arrangements, given leave in respect of service in the field only, and under those arrangements Colonel King and Captain Clifford are entitled to the following:-

For 12 consecutive months in Africa, 2 months leave from date of arrival in England, and an addition of 10 days for each completed month beyond 12 months. That is for Colonel King 160 days for Captain Clifford 130 days.

In the case of Captain Erskine, it was proposed in the letter from this Office of 20th August that he should be allowed leave under Kenya Government rates for service in unhealthy station viz.

viz. 3 days with full salary for each completed month of residential service, together with the actual period of the voyages. Approval of this proposal was given in Treasury letter of 8th September 1926. Captain Erskine is entitled to 63 days on that basis plus voyages and it is not proposed that this arrangement should be disturbed if the proposals in this letter which the Secretary of State regards as reasonable and fair, are accepted by the Lords Commissioners.

6. The Secretary of State feels, however, that some special concession in the matter of leave must be made to all three officers in respect of their prolonged work at Florence which included the worst months of the year and he desires to recommend that Colonel King and Captain Clifford should be given additional leave based on Army practice, i.e. at the rate of 61 days a year, which would mean a further 40 days, with the usual pay of their rank and half consolidated allowance, as for leave in respect of service in Africa. Although Captain Erskine has only been allowed 3 days leave in respect of each

completed

completed month of residential service in Africa there would not appear to be any justification for differentiating his case from the others in the matter of leave in respect of service in Florence and the Secretary of State would propose that he should be allowed a similar period to that recommended for Colonel King and Captain Clifford viz. 60 additional days with full pay at £700 a year.

7. It must be remembered that apart from the voyage to Italy these officers have been continuously at work from the middle of 1925 down to the date of their recent arrival in England just before Christmas; that their work has been extremely arduous, and that the usual practice of taking a recess during the field work was not followed in this case Colonel King having decided from a strong sense of duty and notwithstanding that he was most of the time in bad health, not to take any recess in Africa in view of the dislocation of work and the expense involved.

8.

8. I am to ask for the favour of an early reply.

I am,

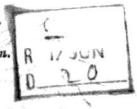
Sir,

Your most obedient servant,

617

X.10243/27

Mr. Seel 16. 6.27.
Mr. Drayson 17
Mr. Bottomley 17
Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.



DRAFT.

Lieut.Col.L.N.F.H.King,C.B.E.,R.E.,
Senior British Member,
Jubaland Boundary Commission.

Downing Street,
21 June, 1927.

Sir,

I am etc., to acknowledge the receipt of your letter of the 2nd of June, in which you submit further observations regarding the ~~rate at~~ basis upon which Capt. E.M. Erskine M.C., should be granted leave in respect of his employment with the Jubaland Boundary Commission.

2. Mr.Amery is not aware of any authority for the assumption that the conditions set out in the ~~final~~ Financial Instructions issued to you apply to Capt.Erskine's appointment, and he is not satisfied that, by comparison with the leave conditions applicable to civilian officers of the Kenya Govt., the arrangement already approved

for

for Lord Erskine are inadequate. He
fears, therefore, that he can
~~can, therefore~~ hold out no
[illegible] being able to alter
[illegible] that he would
[illegible] further concession
[illegible] but he will have
[illegible] ~~however~~. (if you so desire,
[illegible] striking this out also,
[illegible]

5
18

R

Jubaland Boundary Commission
c/o Istituto Geografico Militare
Firenze, Italy.

2nd June, 1927.

Sir,

No 4

I have the honour to acknowledge the receipt of your letter No. 10243/27 dated 2nd May, 1927.

With regard to para. 2 of your letter, I venture to draw your attention to the fact that the Financial Instructions issued to me quote leave conditions applying "to Officers ... serving on Boundary Commissions under the Colonial Office", without specifying military officers. on this wording, Captain Erskine is therefore legally entitled to these conditions, which were those both he and I assumed to be applicable when he was offered his present appointment. He informs me that, had he realised that the ordinary Colonial official's leave conditions would apply, he would have made his acceptance conditional on the issue of the Travelling, House and Local Allowances issuable under existing Regulations.

Rec'd 21 JUN 1927

No 1

As pointed out in my letter of 23rd February, 1927, the conditions of life on a Boundary Commission are entirely different from those of a Colonial official, and I consider that it would

(be)

be most unjust to apply the ordinary Colonial scale to him under the circumstances.

I have the honour to be,

Sir,

Your obedient servant,

L W King

Lieutenant-Colonel, R.E.,

Senior British Commissioner,

Jubaland Boundary Commission.

The Under-Secretary of State,

Colonial Office,

London, S.W., 1.

Mr. Seel. 5.4.27
Mr. Drayson 6/4/27
Mr. Allen
Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.

Downing Street,

~~April, 1927.~~ 2 MAY 1927

C. D.
R 11 APR
D

Sir,

I am &c. to acknowledge (2) the receipt of your letter of the 23rd of February, on the subject of the leave of officers of the Jubaland Boundary Commission, and to inform you that the financial instructions issued to you do not contemplate the grant of leave in respect of employment on the work of the Commission in this country or in Italy, and that as at present advised Mr. Amery does not consider it necessary to approach the L.C. of the Treasury with a view to obtaining their consent to the grant of leave

DRAFT.

LIEUTENANT COLONEL
L.N.F.I. KING, O.B.E., R.E.,
SENIOR BRITISH COMMISSIONER,
JUBALAND BOUNDARY
COMMISSION.

2 drafts.

in respect of such employment/service. You will be at liberty, however, to re-open this question at a later date, in the event of the proceedings of the Joint Commission in Italy being unduly protracted.

2. With regard to your recommendation that Captain Erskine should be placed on the same footing as Captain Clifford and yourself as regards leave privileges, I am to observe that the leave already approved in the case of this officer is on the scale usually granted to officers of the Kenya Government for service in unhealthy stations, and includes (6744/26) the actual period to be spent on voyages between Kenya and Italy. In the circumstances Mr. Amery considers that this leave is adequate, on the basis of comparison with that of civilian officers in the service of the Kenya Government, and he regrets that he is not prepared to approach the L.C. of the Treasury for any extension of the privileges already approved.

The Financial Instructions, to which I am to ask your kind attention, apply only to Officers of the Regular Army and to non-Commissioned Officers. They have no bearing on the case of Capt. [illegible]

Mr. Seel. 5.4
Mr. Thompson 6/4/27
Mr. Allen 9/4
Mr. E. J. Harding.
Sir C. Strachey.
Sir J. Shuckburgh.
Sir G. Grindle.
Sir C. Davis.
Sir S. Wilson.
Mr. Ormsby-Gore.
Earl of Clarendon.
Mr. Amery.

DRAFT.

LIEUTENANT COLONEL
L.N.I.I. KING, C.B.E., R.E.,
SENIOR BRITISH COMMISSIONER,
JUBALAND BOUNDARY
COMMISSION.

2 drafts.

F 10243/27 Kenya

Downing Street,

~~April, 1927~~.

2 MAY 1927

Sir,

I am &c. to acknowledge the receipt of your letter of the 23rd of February regarding certain matters in connection with the employment of Captain E.N. Erskine, M.C. with the Jubaland Boundary Commission. With regard to your recommendation that Captain Erskine should receive a tax-free bonus of £150 now, ~~on the ground that the salary originally approved has proved inadequate~~, and ~~that he should receive~~ a further tax-free bonus, on the termination of his final leave, of an amount equivalent to the taxation he will have paid on his emoluments during his engagement, I am to observe in the first place that there is no power to issue

a bonus, provided out of Parliamentary votes, free of tax, and Mr. Amery would ~~accordingly~~ not be able to ~~consider~~ entertain any question of making a payment to Captain Erskine in compensation for Income Tax. As regards the question of the adequacy or otherwise of the emoluments already approved for Captain Erskine, Mr. Amery would prefer, before considering whether ~~you~~ he would be justified in making representations on this point to the Treasury, to await the conclusion of the work of the Commission and your arrival in this country. ~~and~~ [illegible] ~~I am accordingly to suggest that you should~~ ~~raise~~ the question ~~for discussion~~ upon your return ~~to this country~~.

2. With regard to the last paragraph of your letter as to the Income Tax payable on Captain Erskine's salary, I am to invite reference to the letter from this Department No. Y.5716/26 of the 29th of July, 1926, and also to the letter sent to you on the 17th of February,

February, 1927 (148/Accounts), the enclosure to which contained instructions as to the amount of tax deduction to be made in the case of Captain Erskine.

I am &c.,

(Signed) H. T. ALLEN.

for Secretary of State.

Jubaland Boundary Commission,
c/o G.P.O., Mombasa,
23rd February, 1927.

Sir,

I have the honour to make the following representations regarding the leave of officers of the Jubaland Boundary Commission.

2. In the financial instructions forwarded under your letter No. 3313/25 of 13th August 1925, para. 10 sub-para (i), it is stated that 10 days leave will be granted to officers for each completed month of service beyond 12 months consecutive service in Africa. I shall be glad if you will kindly inform me if this leave privilege of 10 days per completed month extends to periods of employment in Italy and England subsequent to the conclusion of work in Africa, and if this is not the case, what are the leave terms with respect to these periods.

Rec'd 28 MAY 1927

3. As regards Capt. Erskine, I note from the Treasury letter of 8th September 1926, a copy of which was forwarded to me under your X.6744/26 of 5th October 1926, that leave privileges have been sanctioned to this officer at the rate of 3 days per completed month in Africa. I most respectfully request that this decision may be reviewed for the following reasons.

Normal residence in an unhealthy climate cannot be compared with the conditions of hardship experienced throughout the field activities of the Commission, which latter were exercised in all seasons under canvas and generally at a distance from water and off beaten tracks, and in this connection I would stress the fact that the whole Commission remained in the field through the hot season

season of 1928 in spite of your expressed anticipation that a/ vacation in South Africa might be necessary.

May I also draw your attention to the wording of the financial instructions quoted in para. 2 above, para 10 of which opens thus:-

" The following rules apply to officers and N.C.Os serving on Boundary Commissions under the Colonial Office."

In another letter of this date I brought to your notice the excellent work done by Capt. Erskine, but I did not mention the fact that his very great efforts in this trying climate have weakened his health considerably.

In view of the above, I most strongly recommend that Capt. Erskine may be placed on the same footing as Capt. Clifford and myself as regards leave privileges.

I have the honour to be,

Sir,

Your obedient Servant,

L. N. King

Lt.Col., R.E.,

Senior British Commissioner,

Jubaland Boundary Commission.

The Under Secretary of State,

Colonial Office,

London, S.W. 1.

25

Jubaland Boundary Commission,
c/o G.P.O., Mombasa,
23rd February, 1927.

Sir,

I have the honour to bring to your notice certain matters relative to the employment of Capt. Erskine on the Jubaland Boundary Commission.

K.6018/25

2. In my letter to you of 16th October 1925, I valued this Officer's services at £700 per annum, but with the experience of the actual field work behind me I am now most strongly of the opinion that this salary has been inadequate for the period of his employment in Africa. When I originally allotted to him the political, transport, supply and disciplinary duties I had a very wrong conception of the amount and importance of the work involved, otherwise I would most certainly have applied for the services of an additional assistant.

Answd

Capt. Erskine's work has continuously given me the very greatest satisfaction and I largely attribute any success that the Commission may have achieved, to his ability, zeal and energy.

3. In view of the foregoing, I most strongly recommend that Capt. Erskine may now receive a tax-free bonus of £150, and that on the termination of his final leave he may receive a further tax-free bonus of an amount equivalent to the taxation he will have paid on his emoluments during the period of his present engagement, and I respectfully request that these two bonuses may receive consideration simultaneously.

In this same connection I shall be glad to know

what

26
END.

See CO letter of 17 Feb 27 - No. ...

See CO letter of 29 July 26 - x 5716/26

what deductions I should make from this Officer's salary with respect to income tax, as the normal forms appear to be inapplicable to the case of a British subject whose home and family are in South Africa.

I have the honour to be,

Sir,

Your obedient Servant,

L. N. King

Lt.Col., R.E.,

Senior British Commissioner,

Jubaland Boundary Commission.

The Under Secretary of State,

Colonial Office,

London, S.W. 1.

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No. 10245 CO533/368

SUBJECT

East African Trade Information Office

Kenya Section

Previous	
Sec Gov. 4834/26	
Subsequent	
15203/28	

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