

1928

Kenya

No. 15052

SUBJECT

C.O. 533/376

Iron and cobalt content of
natural pastures.

Animal Nutrition Experiment

Previous

10173/27

Subsequent

15562/29

1 Mr. Lloyd — 22 Jan 1928
Reports that Mr. [unclear] who is visiting [unclear] will call at Kenya in Feb. and remain until [unclear]. D. [unclear] has asked that you be informed of his visit.

2 In Memorandum — 25 Jan 1928

Encloses copies of Sub-Committee Report and letter to Empire Marketing Board, for transmission to Kenya.

Copies of the ends to 2 have been registered general. Off. tel. Kenia. Recd. on Monday next for the contents of tel. to Kenya (see pencil note on No 1)

C. Jeffries
26. 28

3 So Gov. Board (in [unclear] incl. to No. 2)

80 JAN 1928

Mr. Wiseman

Off. tel. now beneath, in which Mr. Lloyd (S.M.B.) has concurred.

C. Jeffries
3.2.28

at once [unclear] 3/2/28

4/4 tel. to Gov. — 3 Feb 1928

have sent me a copy of no 4.

J. H. Jeffries

Gov. Orr, Feb. 28, 1928
"Your telegram dated 27th received. Animal nutrition experiment will (be) after consulting Orr."

Lois
J. H. Jeffries
28-2-28
A. M. C.

6-10-28
Cool is anxious to continue cooperation with regard to both animal and human research. Despatch follows and recommendation will be a matter of consultation with Orr.

J. H. Jeffries
17-3-8
A. M. C.

To C. C. R. (copy 6)
To C. C. R. (copies 4+5) } 26 MAR 1928

9th May 28
Enclosed is the report and as tract of meeting of C. C. R. also enclosed copies of report as published in the Local Press by Dr Orr.

also a copy of papers received

The C. C. R. direct from Dr Orr stating what has happened in the local circumstances. No doubt we shall soon get the despatch promised by the Gov in No 6.

As regards No. 4 I put up a draft for your copies. If dft did go to C. C. R. & E. M. B. LFF.

Jeffries 18
J. H. Jeffries
18.5.28

[Note on the formal removal of the E. M. B. to its new location at the point beyond the original 2 years, see no 4 in 50276/28 (Sumner)]
17.3.28

To Gov. Conf. (copy 1)

12-5-28
10-5-28

13. Gov. Grigg 202
 This copy letter taken at meeting of
 Departmental officers concerned, together
 with observations. Considering that investigations
 should be carried further if financial
 resources permit

Foot to the Dietetic
 Sub-Committee

The Committee of Civil Research have already had the enclosures (see the papers below No. 10), but, so far as I know, they have taken no action beyond circulating those papers to the two sub-committees, i.e., those on Native Diets and on the Mineral Content of Natural Pastures. Mr. Hemming is away until the end of this week, so I have not been able to discuss the matter with him.

The Committee of Civil Research makes three proposals: -
 (a) Native Diets. He proposes that the Committee should be provided with the services of a dietitian, that the Nairobi Laboratory be provided for the purpose by the Government with a cost of £800; and that the Empire Marketing Board should assist in the purchase of a dietitian and an assistant. The Committee should, if necessary, consider the possibility of making a contribution towards the cost of the Empire Marketing Board. It is generally felt that they would be able to contribute part of the salaries of the dietitian and assistant.

(b) Animal Nutrition. The Kenya Government proposed to hand over to the Rowett Institute the old Government Farm at Naivasha, and to provide £5,000 for the purchase of stock and other necessities.

(3) Animal Nutrition (b) The Kenya Government proposes to undertake the study of the capacity and capability of native cows at Ngong.

The present position is that the Empire Marketing Board provided: -

(a) £3,000 a year for two years for the dietetic study. This grant began in 1926, and we do not know what balance, if any, is left;

(b) £5,000 a year for two years ending on 31st March, 1928, for the study in Kenya and elsewhere of the mineral content of pastures. At the end of September last there was a balance of over £5,000, and the Board have agreed to the investigation being continued beyond the 31st March, 1928, within the limit of the £10,000 originally allocated.

As regards No. (1) of the Governor's proposals, it is clear that this will involve a considerable extension of the time for which assistance from the Empire Marketing Board is available, and, in all probability, a further grant from that body. It is clear that this matter requires consideration by the Board.

As a proposal No. (2), it is appreciated and contemplated that the Rowett Institute should undertake the management of the Farm on a paying basis. No further grant would therefore appear to be required, though any available balance of the existing grant would be useful at the commencement, e.g., for meeting the pay of the Manager as suggested by the local meeting. This proposal is therefore primarily for consideration by the Scottish Board of Agriculture. Proposal No. (3), it appears, would be carried out by and at the expense of the Kenya Government.

X6433/26
 Kemp

(50276/18
 General)

the proposal
 referred to at
 above

Send a copy of despatch only to the Civil Research Committee, saying that it is understood that copies of the memoranda and of other relevant papers have reached them direct from Mr. Carr. Ask for their observations on the scientific aspect of the points raised by the Governor, saying that, subject to such observations, the Secretary of State proposes to convene the Empire Marketing Board and the Scottish Board of Agriculture with a view to their considering the grant of assistance in the lines proposed by the Governor.

via the Hon. Secy. of State for the Colonies
considered in detail with a view to the research
and the results of the research should be made
available to the Hon. Secy. of State for the Colonies.

to Gov. Cal 3 June 18
~~W. H. ...~~
into the
requests of the office
to Mr. Allen
7/6/20
to Mr. Williams 8/6/20

Off. Secy. G. C. C. R.
May 1918
Allp.
5.6.20

Respect to Mr. ...
think the idea of a joint meeting
is a good one if it can be worked
out. I will discuss it with Mr. ...
I think it proper to advise Mr. ...
(next month) before
having the meeting ...
to be ...

Off. Secy. 19 6 18

10 Concur in suggestion that Governor's proposals should be examined by the Committee.

For pending recd. of further views
Entered
27/28
26/6

Further copies of C.C.R. not
yet received.

M. J. ...

The ... of ... July 1928

The copies of ... in Legislative
Council, ... to those bodies, by
... the ... to be ...

of ... C.C.R. & ... of ...

... of ... to ...

... of ...

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... (from ... 35512/22 + 53166/25 flagged)

... is responsible for

... Demand ...

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... 9/8/28

To C.C.R. as proposed

... is a previous

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copy of the ...

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...

...

all
10.8.28

of ... future ...

in ...

A joint meeting of the
... Sub-Committee
of the C.C.R. ... be held
on Sept. 17th. If you are
...

Mr Parkinson would wish to go

I could no doubt arrange

this with Mr Hemming

Mr Jeffries

9-28

Stam taken to the office

1st thing up 18/11
10/11/28

11/11/28

Mr Jeffries

I have personally had the
minutes of the meeting of the
Committee of Civil Research
submitted to the Governor

11/11/28

11/11/28

Secretary should be available

to see them so action all

we have officially from

the C. C. R.

11/11/28

11/11/28

11/11/28

19. Committee of Civil Research 3rd Oct. 1928
Submits recommendations of the Sub-Committee on the
Governor's proposals re investigations into native
diets and animal nutrition.

Subject to any doubts which Mr. Jeffries
or Mr. Green may have we should now send
letter to...

(1) EMB sending copy of nos 13 & Enclosure
14 & 19; we sh. say that it will be
observed that the Gov. makes 3 definite
proposals, ~~namely~~ as in (1) (2) & (3) of
Mr Jeffries minute of 8/6/28 on no 13. We
sh. set out the financial position as at
(a) & (b) & continue down to XX of
that minute with the additions indicated
in pencil.

(2) The British Board, with the same enclosure
& continue as to the EMB down to the end
of (b) of Mr Jeffries minute. Say that as
to the 1st proposal that the EMB are
being ~~convinced~~ asked whether any further
financial provision can be made, etc? a
copy of letter prepared above. As to the
2nd proposal say as in Mr Jeffries minute,
call attention to (iii) of the no. 19 & ask

for their views on the practical
-ability of the scheme. Observe
in addⁿ that the scheme has not
yet been submitted to the Sup. Ct.
in Kenya whose approval will be
necessary.

(3) Governor with copy of 14 219
& of 2 of 25 proposed above, promising
a further despatch as soon as replies
are received, & copy personal verbally
of Mr. Balfour & some copies of the C.C.R.
for copies of all
as in para 4 & 2 (1) of 219
& a copy of 2 of 25
to the C.C.R. 27 1/2

E. Eastwood

7/10

At the meeting it was understood
that sufficient balance remained
available from the present grants
made by the E.M.B. to carry out
the new proposals. But afterwards
it was discovered that there
was a misunderstanding, and
what has now been recommended

is that the C.C.R. should ask the
E.M.B. to make a further grant
of £15,000 to be spread over 3 years
from November, 1928, on the under-
standing that before a definite
recommendation is made to the
Board a statement of anticipated
financial requirements should be
submitted by Mr. Orr. We need
not refer to this in writing to
the E.M.B., but instead of A
in Mr. Eastwood's minute say that
the S. of H. hopes that the Board will
be able to make the necessary
further financial provision to
enable these proposals to be
carried out.

Otherwise as proposed.

J. Jeffries
10/10/28

J. Jeffries
10/10/28

D.H. Moran

11/10/28

at the

20 L. C. B. B. cons 12/12
(w. copies 13, 14, 15, 19 & 21)
(w.s. small)

29 OCT 1928

21. Bd. of Agriculture, cons
(w. copies 13, 14, 15, 19 & 21)
(w.s. small)

To Gov. 791- 13 Ann^d 28 OCT 1928
w/copy 14, 15, 19, 20 & 21 &
Progress Reports (M.C. 70) & CR(D) 21

22 L. C. B. B. cons of 21 & 22
(w.s. small)

23 { E.M.B. 25 Oct. 1928. (50276/28)
Has copy letter from Committee of Govt
Research & a letter to Govt Report of
the Board of Agriculture

It is suggested that we should
send to the Board of Agriculture
the letter
to the Board of Agriculture for
reference (M.C. 70 on file) with a drawing,
the Commission will apparently
concerned with the Board in
the negotiations referred to in 52 (a) (11)

Send a copy to the Commission with a copy
with a draft.

Then receive as to 23. - The Secretary
should see this - it seems doubtful whether
any action is required until we hear officially
either from the Board E.M.B. or the C.C.R.

Office!

Oct 28

acc'd

6.11.28

A. B. S.

24 Development Commission
11/21

I am sure on January 14th The
in (23) we have been recommended to the
Review Group of the E.M.B. for
abstain to the Board in the 5th committee
at a meeting of the Board on 14 Nov
2. But for which came from E.M.B.
C.C.R.

(Send with a 5869/28)

Stromy
12.11.28

Sheet
13
11
at once

25.

BOARD OF AGRICULTURE FOR SCOTLAND. 20 NOV. 1928
Concur generally in the proposals for the
continuance of the research work as recommended
by Ctee. of Civil Research and are prepared to
recommend acceptance of the offer as to proposed
experimental stock farms, subject to examination at
a later date of the proposed detailed arrangements.

28.

EMPIRE BACTERIAL DISEASES. 23 NOV. 1928.
Transmits copy letter to the Board of Agriculture
for Scotland, as to a further grant from the E.M.B.
for research on the bacterial content of natural
pastures.

1st Copy of 11 st 50 to you 27
of 4 no 22

2nd copy to be put in pending
the receipt of the official
letter from the Board of Agriculture
regr. the grant.

The Board of Agriculture will receive
copies of the letter regrant (no
23) and will be asked if they
had better send back saying
that E.M.B. have approved
the grant.

Can we can wait ~~for~~
to hear further from the Scottish
Board of Agr. But if we don't
hear in any a fortnight we
had better ask how the
matter stands.

J. C. Curry
30/11/28

J. J. Jeffries 30 11 28

W. J. Jeffries
I quite agree that there will be a better
Dip. rather than an LF.
But (1) in view of X we need to
No 26 is approval of the
grant yet final? or ought we
to qualify it in your minutes
in any way?

(2) if we send to the
copies of the C report (in No 23)
must the Dip. be made
conf, or that is a conf document
It wd. be much more convenient
if the Dip. in the
5th copy of numbered series. Need
the report be kept, or treated
as confidential?

Re: Parkhouse
1.12.28

In Parkhouse

(1) Perhaps it will do if we
add "in principle" - & say that further
dip. will be sent when the arrangements in detail
(2) The report should not be
published. Perhaps we had better
say in the numbered dip. that
a copy is being sent separately;
& send it conf. LF.

[It is going to be sent to all
Col. Garts. confidentially]

W. J. Jeffries
secretary
11.12.28

Re: Parkhouse
3.12.28
W. J. Jeffries 1.12.28

27 To Gov. 884 - w/copy 25 - 8 DEC 1928

To Gov. Conf. (w/copy 4th Report Civil Research Centre) *CR(C) 32 No 63* 17 DEC 1928
consto 16.28

29. SCOTISH MARKETING BOARD. 12 DECEMBER 1928.

The letter from the Board of Agriculture for Scotland regarding further grant from E.M.B. for research into dietetics.

2 Parts

(This copy rather unlegibly corrected with the rather correct a this (H.))

Since this letter was written we have heard that Dr Henderson has died.

F. Henderson
17.12.28

I send copy 29 (incl. to Gov. Dept. of Agric. Scot. 17), adding that copy of report is being read thoroughly and send copy of 3rd report & copy of 1st report.

There is some inconvenience in taking action on this paper, but copy of 29 & incl. above minute and draft, with copy of 3rd report of Dietetics Sub-Committee, should be placed

22/12

attached to 5044 of 28 1928

on X 15369/28. Found a copy of 29 & enclosed as on 5044/28 general C.J. Jeffries 19.12.28

Recd Parkin 19.12.28

The copy for Gov. Dept.

6/12/28

31 To Gov. 925 - w/copy 29. 81 DEC 1928

31. To Gov. Dept. (w/copy 3rd Report Dietetics Sub-Committee) *CR(C) 31. No. 41* 3 JAN 1929

ask the Scottish Board of Agriculture show the matter stands in the Mr. Jeffries minute of 30th Nov.

W. Gordon
19.12.28

Mr. Jeffries.

I am afraid that this was not re-circulated a fortnight after your minute of the 30th November, and nothing more has yet come from the Scottish Board.

? We had better now ask how the matter stands, vide your minute of 30th November; but I am afraid I don't quite understand what matter.

F. Henderson

In No. 25 the Scottish Board said that they agreed generally to the scheme & were prepared to recommend

its acceptance. What we now
want to know is what they
propose to do about it, i.e.

(a) whether they definitely
accept;

(b) if so what arrangements
they propose for the working of the
farm & when they propose to
begin.

C. Jeffries 8/1/29

I submit aft

9/1/29

Recd

10.1.29

11/2

at work

of (14) ... (15) ...

see

with

No reply yet received to No 32.

remind please

11/2/29

2.3.29

132

- Mr. Eastwood 10/1
- Mr. Jeffries 10/1
- Mr. Parkinson 10/1
- Mr. Bottomley
- Mr. B. Harland
- Mr. J. Shrubburn
- Mr. G. Connell
- Mr. G. Davis
- Mr. S. Wilson

103
10
150
2/24

Downing Street,

11 January 1929

Sir,

I am etc. to refer to

your letter No. 63074/3 of the

20th of November on the subject

of the research work ~~which is~~

being undertaken in Kenya in

human and animal nutrition

which you stated that the Board

of Agriculture for Scotland

agreed generally to the scheme

proposed by the Governor in the

despatch

DRAFT.

THE SECRETARY,
BOARD OF AGRICULTURE
FOR SCOTLAND.

Copy to Mr. 167-41 - on 15/5/29 - F. W. M. 1929

despatch, a copy of which was sent

closed in the letter from this

Department of the 29th of October 1928, (No. 21)

and were prepared to recommend

its acceptance, subject to examination at a later date of the proposal should arrangements be made.

I am now to enquire whether

a definite decision has yet been

reached by the Board as to acceptance

of the project of the scheme, and, if

so, whether they are in a position to propose detailed arrangements for the working of the farm referred to, and when they propose that should begin.

should begin.

should begin.

I am, etc.

(Signed) A. C. PARKINSON.

K. 10008/1928 Kenya

Mr. Eastwood 21/12

Mr. Fisher 27/12

Mr. Parkin 22/12

Mr. Boulton

Sir E. Harding

Sir J. Shuckburgh

Sir G. Grindle

Sir C. Davis

Sir S. Wilson

Mr. Ormsby-Gore

Lord Lovat

Mr. ...

C. D.
24 DEC
1928

Downing Street

31 December, 1928

Sir,

With reference to my despatch No. 884 of the 5th of December on the subject of the continuation of research into animal and human

DRAFT

KENYA

No. 925

O.A.G.

Fr. E.M.B. 18th Dec.

nutrition. I have the honour to transmit, for your information, the accompanying copy of a letter with enclosure, from the Empire Marketing Board on the subject of a further grant for research into

nutrition and dietetics.

While copying, please make at least 2 more copies

P.T.O.

Statistics.

2. A copy of the Report mentioned in the fourth paragraph of the letter sent by the Empire Marketing Board to the Board of Agriculture for Scotland is being forwarded to you separately.

I have, etc.,

(Signed) S. AMERY

of the Dietetics sub-committee of the Committee of Civil Research, of which I was a member.

1429

Telephone - VICTORIA 3443.
Telegrams - Inland - EMPMART, PAUL, LONDON.
Foreign - EMPMART, LONDON.

EMPIRE MARKETING BOARD,
2, QUEEN ANNE'S GATE BUILDINGS,
LONDON, S.W. 1.



Any reply to this letter
should be addressed to -
THE SECRETARY,
and the following number quoted

G.113.

12th December, 1928.

14
COL. OFF

The Secretary, Empire Marketing Board, presents his compliments to the Under Secretary of State, Colonial Office, and begs to transmit for information, a copy of a letter dated the 18th November to the Secretary, Board of Agriculture for Scotland, on the subject of a further grant from the Empire Marketing Fund for research into Diatetion.

Copy 5-925- BY DEC 1928

Letter to Empire Marketing Board, No.15052/28 of the 29th October.

16th November, 1928.

G.113.

Sir,

I am directed by the Chairman of the Empire Marketing Board to refer to the letter from this Department of the 25th October and to Mr. Weatherill's reply No. 63074/3 of the 31st October regarding the third report of the Dietetics Sub-Committee of the Committee of Civil Research.

I am now to inform you that the Board, at its meeting on the 14th November, confirmed a recommendation that, subject to funds being provided by Parliament, a further sum not exceeding £3,000 should be made available from the Empire Marketing Fund to enable Drs. Henderson and Foster to return to this country to study the accumulated data and prepare a full report on the scientific results of the work done during the last two years. The Board's approval was given subject to the actual amount to be paid being left to be determined after the receipt of detailed estimates. Steps will be taken to secure the formal authority of the Secretary of State for Dominion Affairs for the expenditure contemplated, when the position is clearer and when your Board is in a position to indicate the precise amount required for clearing up this investigation.

It is understood that your Department will undertake the financial responsibility for the administration of this further grant as hitherto, and that due provision has already been made in your Department's estimates for the year 1929.

The recommendation in paragraph 24 (d) of the Committee's Report relating to leave arrangements for temporary officers employed in Kenya, will, as pointed out in your letter of the 31st October, 1928, (63674/3) require to be discussed with the Lords Commissioners of H.M. Treasury.

I am, Sir,
Your obedient Servant,

The Secretary,
Board of Agriculture for
Scotland,
York Buildings,
Queen Street,
Edinburgh.

(Sgd.) W.F. HILDRED.

Could have been agreed in principle
to the grant of ~~an additional~~
~~sum of~~ for continuing the research work
amounting to \$5000 for a further period

~~of~~ of 3 years of
~~research~~ research

~~the~~ of
~~of~~ of

~~is~~ is
~~in~~ in

by the of Civil Research

~~of~~ of

~~the~~ the

~~of~~ of

Have

- Mr. Bottomley
- Mr. B. J. Harding
- Mr. J. Shackleton
- Mr. G. Grindle
- Mr. C. Dainton
- Mr. B. Wilson
- Mr. Ormsby-Gore
- Lord Lovat
- Mr. Amery

DRAFT

It is, I may add that
 copies of the Foret's
 Report of the Sub-
 Committee of the Committee
 of Work Research on the
 Commercial Customs of
 National Products are
 being sent to you
 separately

(Signed) J. AMERY

Telephone—VICTORIA 3452.

Telegrams—Inland—EMPMART, PARL, LONDON.

Foreign—EMPMART, LONDON.

EMPIRE MARKETING BOARD, 76

2, QUEEN ANNE'S GATE BUILDINGS,

LONDON, S.W.1.



Any reply to this letter
should be addressed to—

THE SECRETARY,

and the following number quoted.



22nd November, 1928.

G/2.

The Secretary, Empire Marketing Board, presents his compliments to the Under Secretary of State, Colonial Office, and begs to transmit for information, a copy of a letter dated the 21st November to the Secretary, Board of Agriculture for Scotland, on the subject of a further grant from the Empire Marketing Fund for research on the mineral content of natural pastures. Reference to previous correspondence:—
Letter to Empire Marketing Board No. 15052/28 of the 29th October, 1928.

ho 20

G/L.

Sir,

I am directed by the Chairman of the Empire Marketing Board to refer to your letter of the 31st October, relative to the Fourth Report of the Sub-Committee of the Committee of Civil Research on the Mineral Content of Natural Pastures.

I am to inform you that the Board, at its meeting on the 14th November, confirmed a recommendation that, subject to funds being provided by Parliament, a further sum not exceeding £15,000 should be made available from the Empire Marketing Fund for a further period of 3 years, the investigations into the efficiency of pastures on the lines suggested in paragraph 11 of the Fourth Report of the Sub-Committee of the Committee of Civil Research.

It is understood that your Department will undertake financial responsibility for the administration of this further grant as hitherto, and that due provision has already been made in the estimates of the Board of Agriculture for Scotland for the year 1928.

Steps will be taken to secure the formal authority of the Secretary of State for Dominion Affairs upon your Board in order to submit a detailed estimate. On this point it is understood that an estimate covering continuation expenditure during the present financial year and expenditure during 1929 has already been submitted to you by the Director of the Rowett Research Institute. It is intended that the salaries of the biophysicist and additional labourer mentioned in paragraph 46 (a.ii) and any additional staff required at the Rowett Institute mentioned in paragraph 46 (a.iii) should be met from the grant now approved. It, however, the funds available from that source are not sufficient for the purpose, the question will arise of approaching the Government of Kenya to meet the salaries mentioned in paragraph 46 (a.iii).

The questions of increasing the salaries of staff surveys and of giving leave to officers temporarily employed in Kenya will require the approval of the Treasury after consultation between your Board and the Colonial Office; and as stated in the letter under reply the question of the reinforcement of the staff of the Rowett Institute is a matter which will require agreement between your Board, the Development Commission and the Treasury.

I should add that the Board recommended the grant now under discussion on the understanding that it would be a final grant for this purpose.

I am, Sir,

Your obedient servant,

(Sgd.) E.M.N. LLOYD.

The Secretary,
Board of Agriculture for Scotland,
York Buildings,
Queen Street,
EDINBURGH.

BH.

Telegrams - Board, Edinburgh.

Correspondents are asked to address replies to

The Secretary,

and to quote 65074/S.

BOARD OF AGRICULTURE FOR SCOTLAND

YORK BUILDINGS,

QUEEN STREET

EDINBURGH.



20th November, 1928.

21 NOV 1928

Sir,

I am directed by the Board of Agriculture for Scotland to refer to your letter of 29th ultimo (No. 15052/28) enclosing, for the Board's observations, a copy of a despatch from the Governor of Kenya and copies of other correspondence on the subject of the research work which is being undertaken in the Colony in human and animal nutrition.

In reply I am to acquaint you, for the information of Mr. Secretary Amery, that the Board concur generally in the proposals for the continuance of this work as recommended by the Committee of Civil Research. Referring particularly to the proposals contained in paragraphs 5 and 6 of the despatch from the Governor of Kenya I am to say that the Board consider that the proposed experimental stock farm in Kenya is likely to yield results of great value to agriculture throughout the Empire and they greatly appreciate the generous offer proposed to be made. The Board are prepared to recommend acceptance of the offer subject to examination at a later date of the proposed detailed arrangements. They note that in the event of the project being approved the Government of Kenya should not be called upon to bear any part of the maintenance costs of the farm.

I am,

Sir,

Your obedient Servant,

Res. O'Connell

Secretary.

The Under Secretary of State,
Colonial Office,
LONDON, S.W. 1.

No 21 below

Copy to Mr. Amery 5/11/28

25

26
21

Mr. Seal 7-11-25
Mr.
Mr.

- Mr. Bottomley.
- Sir E. Harding.
- Sir J. Shuckburgh
- Sir G. Grindle.
- Sir C. Davis.
- Sir S. Wilson.
- Mr. Ormsby-Gore.
- Lord Laval.
- Mr. Amery.

R 7 - NOV
D. 01

X15052/28. Kenya

10 November 1925

DRAFT

The Secretary
Development
Commission

Sir.

I am etc. to be to you,
for the information of the
Development Commission
the acc^y copy of a letter,
with enclosures, which
was sent from this Dept
to the Board of Agriculture
for Scotland on the 29th
October, on the subject of
~~some~~ research into
native dietetics and
animal nutrition in Kenya

To B.S. Agriculture for Scotland
29 Oct.
(No 21)

~~all enclosures~~

~~(copy falls with
for 10/11/25)~~

M.B. Kenya dep. of Agric
(3) enclosures need not
be copied. as I am getting
them from C.R. Other
enclos. to 21 must be copied.

Recd. 15/11/25

in the further prosecution
of which the assistance
of the Empire Marketing
Board and the Board
of Agriculture for Scotland
is being sought.

I am etc.

(Signed) J. G. GIBSON

Copy

23

Committee of Civil Research,

2, Whitehall Gardens,

London, S.W.1.

23rd October, 1928.

C. 47/0/10.

Sir,

With reference to the letter from this Department of the 3rd instant, I am directed by the Committee of Civil Research to transmit herewith in duplicate for the information of Mr. Secretary Amery two copies of the 4th Report of the Sub-Committee on the Mineral Content of Natural Pastures (C.R. (C) 32).

Lord Balfour concurs in the recommendations of the Sub-Committee and has therefore caused their Report to be forwarded to the Empire Marketing Board, with reference to the Sub-Committee's recommendations 46 (d), (e) and (f), with a covering letter, a copy of which is enclosed herewith.

3. The matters dealt with in recommendations
The Under Secretary of State,
Colonial Office.

DEC 1928

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23
46 (a), (b) and (c) of the Sub-Committee formed
the subject of the letter from the Committee of
to your
Civil Research Department of the 3rd instant.

I am, etc.,

(Sd) A.F.Hemming.

Assistant Secretary,
Committee of Civil Research.

CONFIDENTIAL

Copy No. 7

C.R. (C) 32

COMMITTEE OF CIVIL RESEARCH.

Sub-Committee on the Mineral Content of Natural Pastures.

FOURTH REPORT.

I.—INTRODUCTION

1. AT their meeting held on the 3rd July, 1925 (C.R. 2nd Meeting, Conclusion 2), the Committee of Civil Research appointed the following Sub-Committee to consider and report on the Mineral Content of Natural Pastures:

Major Walter Elliot, M.C., M.P., Parliamentary Under Secretary of State for Scotland (Chairman)

Sir A. D. Hall, K.C.B., F.R.S., Chief Scientific Adviser, Ministry of Agriculture and Fisheries

Dr. Robert Greig, M.C., Chairman of the Board of Agriculture for Scotland.

Sir L. J. Kershaw, K.C.S.I., C.I.E., Assistant Under Secretary of State, India Office

Mr. Maurice Headlam, C.B., Assistant Secretary, Treasury

Mr. C. J. Jeffries, Colonial Office

Walter M. D. Jones, F.R.C.S., Secretary, Medical Research Council

Thomas Mitchell-Kemp, C.B., Commissioner, Development Commission

Professor T. E. Wood, F.R.S., F.R.I.C., Professor of Agriculture to the University of Cambridge

Mr. A. F. Hemming, F.R.S., Assistant Secretary to the Committee of Civil Research, Secretary to the Sub-Committee

2. On the 23rd September, 1925, I presented a first interim Report (C.R. (C) 6) covering a Memorandum giving the substance of the scientific results at present achieved and containing a short questionnaire to indicate the lines on which further information was desired. We recommended that copies of the memorandum should be communicated to the India Office, the Dominions Office, the Colonial Office and the Foreign Office, for communication to the Government of India, the Dominion and Colonial Governments and the Government of the Sudan, who should be asked to forward observations and replies to the questions submitted. We further reported that, as a result of our representations, arrangements were being made for Dr. J. B. Orr, of the Rowett Research Institute, Aberdeen, to visit South Africa and Kenya in order to confer on the spot with the local authorities.

3. At their meeting held on the 12th October, 1925 (C.R. 9th Meeting, Conclusion 4), the Committee of Civil Research approved this Report, copies of which were forwarded in accordance with our recommendations to the Departments named for transmission to the Government of India, the Dominion and Colonial Governments and the Government of the Sudan.

4. In March 1926 we considered the replies received to the *questionnaire*, and also the report by Dr. J. B. Orr on his return from his visit to South Africa and Kenya. The information contained in these communications showed that the subject was one of great economic importance. It also indicated that co-ordinated research effort, if well directed, was likely, within a relatively short time to yield further information of practical value to the animal husbandry industry of the Empire.

5. On the 25th March, 1926, Dr. Orr was appointed a member of the Sub-Committee.

6. On the 14th April, 1926, we submitted a Second Report (C.R. (C.) 11) to the Committee of Civil Research setting out the facilities which we thought ought to be taken and outlining the investigations which we recommended should be undertaken immediately. Our principal recommendations in that Report may be summarised as follows:

- (a) That practical investigations should be carried out in the most suitable Colony or Dependency with a view to ascertaining whether the nature of the mineral deficiencies can be determined and the diseases due to them prevented.

That the most suitable site for this investigation was Kenya.

That a minimum of four bio-chemists should be engaged for this work on the 1st of July, 1926, in Britain and two field workers in Kenya.

That a special worker should be employed to carry out a search of the literature and to arrange the information in an easily accessible form.

That the total programme of from £5,000 to £10,000 should be approved by the Committee of Civil Research in paragraph (a) and (b) above, on the understanding that the Government should be made to secure a financial contribution of £5,000 from the Government of Kenya.

That the Secretary of the Empire Marketing Board should recommend the Secretary of the Board to the Committee of Civil Research, and that the Board should be asked to make arrangements for the employment of the workers recommended in paragraph (a) and (b) above, on the understanding that the Government should be made to secure a financial contribution of £5,000 from the Government of Kenya.

That the Secretary of the Empire Marketing Board should recommend the Secretary of the Board to the Committee of Civil Research, and that the Board should be asked to make arrangements for the employment of the workers recommended in paragraph (a) and (b) above, on the understanding that the Government should be made to secure a financial contribution of £5,000 from the Government of Kenya.

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start of the work in Kenya. Constant relations were maintained by the Research party with the Rowett Research Institute, to which reports were regularly submitted and samples of pastures were forwarded for analysis.

9. In July 1927 Mr. C. L. Stocks, Assistant Secretary, Treasury, joined the Sub-Committee in succession to Mr. A. P. Waterfield, C.B., who in the previous May had taken the place of Mr. Maurice Headlam, C.B., on the appointment of the latter as Comptroller-General, National Debt Office.

10. By November, 1927 the investigation had sufficiently progressed to enable Dr. Orr to submit to us an interim Report showing the results so far obtained in Kenya together with results of control tests with sheep undertaken concurrently in Scotland. These results appeared to us so promising that, at a meeting held on the 22nd November, 1927, we submitted to the Committee of Civil Research a Third Report (C.R. (C.) 25) on them, together with certain recommendations regarding the future conduct of the work. Those recommendations were summarised at the end of our Third Report as follows:—

- (a) The results already obtained through the investigation show that deficiencies of minerals in the pastures of Kenya do actually exist, and that the supplementary feeding of minerals to animals grazing the pastures has a definitely beneficial effect in preventing *Naturitis* and in increasing the rate of growth of lambs and the weight of the fleeces.

(b) The investigation should be continued beyond the period of two years for which it has been authorised, provided that the total expenditure incurred does not exceed the grant approved by the Empire Marketing Board, viz. £10,000 in all.

(a) As regards the expenditure of the remaining balance of the grant from the Empire Marketing Board, discretion should be given to Dr. Orr, the Director of the Research:—

- (i) to settle the detailed method by which the investigation should be continued; provided that the experiments undertaken should be in conformity with the general scheme recommended in our Second Report (C.R. (C.) 11), and approved by the Committee of Civil Research; and that the fullest possible advantage is taken of facilities offered by expert authorities in Scotland and this country;

(ii) to arrange with the Board of Agriculture for Scotland for the appointment of temporary staff within the limits of the funds available at rates of pay not exceeding the normal appropriate scales;

(iii) to arrange with the Board of Agriculture for Scotland, in consultation with the Colonial Office, for the grant of increments of salary to the temporary staff at present employed on the field investigations in Kenya on the completion of one year's probationary service from the date of sailing, the increments to be fixed with due regard to the prevailing rates of pay for Government servants in Kenya.

(a) The paper embodying the results of the search of the literature of nutrition should be communicated confidentially to the heads of Institutes working on nutritional problems in Canada, Australia, South Africa and New Zealand;

(i) In view of the valuable results obtained by the search of the literature of nutrition, the services of the workers employed should be retained and that, subject to the direction of Dr. Orr, they should be employed on searching and epitomising the literature of cognate scientific subjects.

11. In January 1928 the Committee of Civil Research approved our Third Report and transmitted it to the Empire Marketing Board with a covering letter, in which they expressed the hope that our recommendations for the continuance of the investigations would commend themselves to the Board, and that the Board would be willing to make the necessary arrangements to enable this to be done. The Empire Marketing Board concurred in this course, and the investigations have since proceeded on the lines which we recommended.

12. On the 10th September, 1928, we held a joint meeting with the Dietetics Sub-Committee, at which we had an opportunity of considering not only the results

of the work carried out in Kenya on animal nutrition, but also those which during the last two years have been conducted in that Colony under Dr. Orr's direction on similar problems of native dietetics.

II.—EXPERIMENTAL WORK UNDERTAKEN

13. In accordance with the recommendations contained in our earlier Reports, the bulk of the experimental work undertaken has been carried out in Kenya. In addition, a number of control tests have also been carried out in Scotland.

14. The main results of the work done may be summarised very briefly as follows:—

(a.) The chemical composition of the pastures collected in Kenya from different areas and at different seasons of the year corresponds with the known nutritive value of the pastures in those areas and at those seasons. Malnutrition is most prevalent in the areas where deficiencies are most marked.

(b.) The administration to grazing animals of inorganic salts rich in the elements believed to be deficient in the pastures has been followed by beneficial effects in two areas where the pastures were deficient. Particularly interesting results were obtained at Nakuru in connection with the disease *Nakurutitis*, which is probably due to an iron deficiency and which develops in animals, if put to graze in this district continuously for more than about six or eight months. In a third area, where the results of analyses showed no deficiency, no effect on rate of growth or health was obtained.

(c.) In other tests where, in addition to minerals, a small amount of protein, in which the pastures were poor and a trace of cod liver oil was fed, the beneficial effect, especially with regard to rate of growth in lambs, was more marked than when a mineral mixture only was administered.

15. These results obtained in Kenya correspond closely with those being obtained in other parts of the Empire where comparable tests are being done. The results on "Nakurutitis" correspond closely with the results obtained in New Zealand in connection with "Bush-Sickness," which is probably the same deficiency disease, and the increase in milk yield—about 30 per cent.—as a result of feeding inorganic salts to milk cows in a deficient area in a short test is very similar to that obtained by Sir Arnold Theiler and his fellow-workers in South Africa through feeding bone meal under similar conditions.

16. In Scotland, where feeding tests were carried out with sheep on the lines of paragraph 14 (c) above the results varied in different districts. In the Western Highlands, where the herbage is very deficient especially in calcium, and where the mortality amongst sheep is high, the condition of the ewes improved, the size of the lambs increased, the fleeces were heavier and there was a decrease in mortality. In these areas it is usually considered to be impossible to winter growing sheep; but at two of the experimental centres small groups of about twenty sheep of this type were successfully wintered when fed small amounts of the material used in these tests. In these tests the amount of the material fed varied from half an ounce to an ounce per ewe per day. The material fed consisted to the extent of over 50 per cent of inorganic salts. There is no evidence to show to what extent the beneficial results are due to inorganic salts and to what extent to organic substances.

17. In other areas in the South of Scotland where the pasture is richer, and also in a test on a hill near the Rowett Research Institute, Aberdeen, where the animals had access to a small area of comparatively good pasture, little or no difference was obtained between the experimental and control groups.

III.—COLLECTION OF INFORMATION

18. Simultaneously with the conduct of the experimental work, the results of which have been summarised in the preceding paragraphs, steps were taken to secure all available information on the subject. A large amount of information was received in the replies received to the *Questionnaire* attached to our First Report (C.R. (C) 0), which at the request of the Committee of Civil Research was circulated to all the Governments of the Empire. In general, it may be said that those replies showed

that pathological conditions which are probably attributable to deficiencies in the pasture were prevalent in nearly all parts of the Empire where there were large pastoral areas. Further, a worker was detailed to search the literature and summarise all the available papers bearing on the subject.

19. The information obtained from these sources has been collated, and in accordance with recommendation (e) in our Third Report, the paper prepared from this material has been circulated to all the research workers or officials within the Empire who are known to be interested in the subject, with a request that they will assist by correcting, supplementing, or offering any suggestions, especially with reference to their own Dominion or Territory, which they consider will be of use in making the review more accurate and complete. We are hopeful that this collection of information, which includes a bibliography of the literature, will prove of considerable value to the increasing number of officials and research workers throughout the Empire who are now studying this problem.

IV.—WORK IN OTHER PARTS OF THE EMPIRE.

20. Before indicating our view regarding the future development of the work carried out in Kenya and Scotland, we think it desirable to refer to similar work now being done in other parts of the Empire. Not only is such work of great importance to the problem before us, but owing to the great variety of conditions offered by the Empire, work which may be difficult, if not impossible, to undertake in one part of the Empire can often be done in very favourable conditions in another. It is of the first importance that full account should be taken of all such special conditions, when future developments of any particular investigation are under consideration.

21. In New Zealand, in addition to the work on "bush-sickness," to which reference has already been made, a general survey of the mineral content of pastures is in process of being made. The cause of malnutrition in sheep occurring in a certain area and believed to be due to calcium deficiency is being investigated. The condition of malnutrition presents certain similarities to those found in sheep in the West of Scotland. Arrangements are also being made for an iodine survey to be carried out jointly by the Medical and Agricultural Departments.

22. In Australia fundamental work is being done at the Waite Institute on the effect of deficiencies in the soil on the rate of transpiration of pasture plants. It has been found that the amount of moisture used by the plant is about 30 per cent. greater on a soil deficient in phosphorus than in the case of the same soil with phosphates added to it. This is in line with observations made in Kenya on the difference between the nutritive value of pastures in drought on rich and on poor soils. Other work in Australia includes a systematic investigation on the mineral content of different species of pasture plants, and an investigation on the incidence of goitre and its relation to iodine supply.

We understand also that feeding experiments on the lines carried out in South and East Africa and in the West Coast of Scotland will probably be undertaken in Australia in the immediate future.

23. In South Africa the work begun by Sir Arnold Theiler is being continued. Probably the most interesting result, which has not yet been published, is that the deterioration of improved breeds which takes place in phosphorus deficient areas is prevented by feeding inorganic phosphates.

24. In Canada the administration of iodine to all kinds of stock has been found to be followed by beneficial results. Systematic work on pastures on the above lines has not, however, been undertaken up to the present time.

25. In Ceylon work during the past year has shown that a disease in horses known as "Big Head" is prevented by feeding calcium salts, and it is suggested that the poor condition of the cattle there may be due to the same deficiency.

26. To complete this brief review, reference must be made to the important work on pastures being done at both Cambridge and Aberystwyth. This work has a direct bearing on the problem being studied. At Cambridge it has been shown that according to its chemical composition young pasture should have a very high nutritive value. This has been confirmed by digestibility and feeding tests. Experiments on the conservation of pasture at this stage of growth are being carried out.

At Aberystwyth work by plant breeders has led them to consider the chemical composition of pasture plants, and the results of the investigations there are beginning to throw further light on the special problem being investigated by this Sub-Committee. This brief reference to these important allied lines of investigation inserted here merely to draw attention to these important allied lines of investigation related to pastures. It would not be within our province to attempt to give a detailed survey of the important work carried out at these centres.

V.—PROGRAMME OF DEVELOPMENT RECOMMENDED

27. The primary object of the research carried out during the last two years by means of the grant made by the Empire Marketing Board may now be regarded as accomplished, and the results will be published in due course in the appropriate scientific journals. In the light of the results secured, we consider that, now that the experimental stage has closed, it is very desirable for that work to be followed up and tested, if full advantage is to be taken of the work already done.

28. The lines of work which we recommend should be followed are—

- (a.) The exploitation of the results of the past two years.
- (b.) Research on the influence of deficiencies in pastures on the incidence of disease.

29. As regards the first of these lines of work, we are confident that, if the Kenya results can be applied in practice, they will have a considerable bearing on the development of the live-stock industry of the Colony. As regards the second proposal, if the Scottish results are confirmed, and found applicable in ordinary sheep-farming practice in the Western Highlands, they should make possible both increased production of higher grade animals and some reduction in the loss caused by disease.

30. The extent to which results can be applied in practice, and the economic effect of their application, cannot, however, be determined until extensive tests with costings have been made. We recommend that this should be done along the lines indicated in the following paragraphs.

(a.) Live-stock Work in Kenya

31. We have received from the Colonial Office a copy of a despatch dated the 15th April 1928, from the Government of Kenya (see Appendix) in which he offers—

- (i.) to hand over to the Governors of the Rowett Research Institute, Aberdeen, a part of the Old Government Farm at Naivasha (consisting of approximately 4,000 acres and valued at about £25,000), and to make a contribution of £5,000 for the purchase of stock and other accessories;
- (ii.) to erect additional laboratory accommodation, at a cost of £850, to enable certain biochemical investigations to be carried out.

32. We desire to express our warm appreciation of the Governor's offer and to recommend that it should be gratefully accepted, subject to the arrangements being made on points of detail. We recommend that the Committee of Civil Research should inform the Secretary of State for the Colonies that they are satisfied that the proposals contained in the Governor of Kenya's despatch of the 15th April, 1928, are sound and that they would be grateful if he would convey to Sir Edward Grigg their appreciation of his offer of co-operation with their work put forward by him on behalf of the Kenya Government, that as regards paragraphs 3 and 4 of the Governor's despatch referred to above, they concur in the proposal that, as an interim arrangement for the duration of the grant from the Empire Marketing Board, the salary of the biochemist proposed to be appointed, and that of an additional laboratory assistant, should be defrayed from moneys made available by the Empire Marketing Board, on the understanding that if, having regard to other prior commitments, the funds available from that source are not sufficient for the proposed work, it may be desirable later to approach the Governor in regard to his offer to make a contribution to the cost; that, as regards paragraphs 5 and 6 of the

Governor's despatch, they warmly appreciate his offer to hand over to the Governors of the Rowett Research Institute, Aberdeen, a part of the old Government farm at Naivasha (consisting of approximately 4,000 acres and valued at some £25,000) and to make a contribution of £5,000 for the purchase of stock and other accessories; and that they recommend that this offer should be accepted subject to a satisfactory agreement on points of detail, and in particular in regard to the reinforcement of the staff of the Rowett Research Institute (which will probably be necessary as a result of the additional work involved) being reached between the Colonial Office, the Development Commission and the Scottish Board of Agriculture, and on the understanding that the arrangements for the financial control of the above property should be reconsidered when the Colonial Advisory Council of Agriculture and Animal Health is brought into existence; and that, as regards paragraph 7 of the Governor's Despatch, they welcome the investigation proposed by the Governor for ascertaining the capacity and capability of native cows under conditions of proper feeding and management.

33. We further venture to hope that the Committee of Civil Research will ask the Secretary of State for the Colonies to convey to the Governor of Kenya their warm appreciation of the close and constant co-operation in the present investigations afforded by the Kenya Agricultural and Medical departments and by the local administrative officers, without whose wholehearted support it would have been impossible to secure the results achieved, and their confidence that the same co-operation will be forthcoming in the remaining stages of the investigation; and to request Sir Edward Grigg to convey their thanks to the officers of his Government concerned.

34. We recommend also that the Committee of Civil Research should communicate to the Secretary of State for the Colonies copies of Dr. O. J. Progress Reports on the investigation in regard to Animal Nutrition (M. 1270) and Native Diets (C. R. (D) 21), and to request the Government to forward them to the Governor of Kenya.

(b.) Live-stock Work in Scotland

35. For the development of the work on Scotland, we recommend that a small sheep farm should be leased in the Western Highlands in an area with a high fertility and poor quality of sheep. Economic tests could be carried out there under climatic conditions and methods of management common to the temperate zone, but totally different from those in the tropics or sub-tropics. The suggested new research work on the influence of deficiencies in the pastures on disease would be based on the Scottish sheep farm, the animals of which would be used as clinical material. The necessary laboratory work would be done at research centres in the United Kingdom. Thus, some physiological aspects of the problem would be investigated at the Nutrition Institute at Cambridge University, and problems on immunology would be studied at Edinburgh University with the assistance of the Animal Diseases Research Association. Provisional arrangements have been made with these bodies for having this work done if the necessary funds are made available. Further, we have reason to hope that the assistance and guidance of the Nutrition Committee of the Medical Research Council will be available in the prosecution of this research.

36. Research work based on the sheep farm proposed to be leased in Scotland would be rather extensive, involving to the first, the organization and equipment of existing research institutions in Britain and the unpaid assistance and guidance of senior scientific authorities, such as the Members of the Sub-Committee on Diets and of the Sub-Committee on the Mineral Content of Natural Pastures of the Committee of Civil Research, would be available; the actual cost of the investigation, apart from the non-recurrent expenditure incurred in taking over the sheep farm, would be limited to the salaries of three or four comparatively junior workers required to do actual field and laboratory work.

(c.) Temporary Staff Employed.

37. We desire briefly to refer to the position of the temporary staff engaged for this research. These officers have loyally carried out their duties in Kenya, and we think that when the time comes for their services to be dispensed with, all possible steps should be taken to assist them to find suitable employment. Further, we recommend that on the termination of their engagements arrangements should be

made to give them full leave on pay for a period not less than that to which they would have been entitled if they had been members of the permanent Colonial Service, on the understanding that Dr. Orr should be authorised to put forward recommendations for the grant of special additional leave, in cases where for any reason he considers it desirable.

(d.) Estimate of Cost.

38. We have carefully considered the probable cost during the next three years of the lines of research recommended in the preceding paragraphs, and have prepared the following estimate for the consideration of the Committee of Civil Research:—

ESTIMATED Cost of Pasture Research recommended for Period of three Years from November 1, 1928.

<i>Non-Recurrent Expenditure</i>		
Kenya: Fully equipped Experimental Station to be provided by Kenya Government (valued £25,000 together with £5,000 for stock and equipment)		Cost. £ Nil
Scotland: Purchase of animals and in-go of Sheep Farm (Estimate of Board of Agriculture for Scotland)		4,500
<i>Annual Recurrent Expenditure</i>		
Kenya: (Hector Innd)		
Salaries	1,700	
Travelling Expenses	250	
Materials	190	
Total	2,140	
Scotland:		
Salaries	400	
Travelling Expenses	250	
Materials	190	
Total	840	
Total Annual Recurrent Expenditure	3,500 for three years	10,500
		15,000

In considering the foregoing estimate it should be borne in mind that the cost of expenditure would vary from year to year, and would certainly be heaviest in the first year. If a lump sum grant of £15,000 were available for the three-year period, certain easements would be necessary in regard to the amount to be spent in each of the three years.

In the estimate it has been assumed that a bacteriologist will be available from the Animal Diseases Research Association of Scotland, and that most of the chemical work will be done at the Rowett Research Institute, Aberdeen, in the latter course of the work. The part-time services of senior workers at Cambridge, Aberdeen and Edinburgh and the equipment required for work at those institutions

would be available at a minimum cost. The co-operation of workers at Aberystwyth would also be sought in regard to certain aspects of the work connected with pasture improvement. It is believed that it would be available on the same terms.

41. The detailed financial estimating and accounting for work of this kind, for which there is little precedent in the administration of research, presents considerable difficulties. During the past two years the Finance Officer of the Empire Marketing Board has given constant guidance and assistance which has been of great value. The Board of Agriculture for Scotland, the Accounting Body, have greatly helped the administration of the grant in connection with detailed financial adjustments in the direction of the research. It is largely due to this assistance that the past two years' work has been carried out for less than the estimated cost. We are confident that, if the work is developed on the lines suggested, the same measure of assistance will be forthcoming from these authorities.

42. In considering the programme of research recommended above, it is necessary to have regard to the probable position at the end of the three-year period. As regards the farm at Nairobi which the Governor of Kenya proposes to hand over free of charge to the Rowett Research Institute, we have already stated (paragraph 32) that we consider the question of the permanent control of this property should be considered at the end of three years' time, when the proposed Colonial Advisory Council of Agriculture and Animal Health will, we hope, have been brought into existence. So far as concerns the farm to be acquired in Scotland, some return of funds may be anticipated through the disposal of the sheep stock if at the end of three years it is decided to terminate the investigations. If, however, the work proves successful and yields results of immediate economic value, we are not without hope that the Scottish Board of Agriculture may assume responsibility for the experimental sheep farm and to maintain it as a permanent institution. The Board would probably not be in a position to decide on this question until near the end of the three-year period, and as the financial and other arrangements would require a certain time to adjust, it is possible that a non-recurrent supplementary grant of the order of £1,000 per annum might be required to cover a transitional period of two years.

In general, it may be said that the past two years' work on pastures was a highly speculative form of research and that its further development along immediate economic and practical lines must also be regarded as speculative. The whole method of attack is rather novel and it is doubtful whether any single institution would be in a position to undertake such an investigation. Certainly no single institution could measure the problem all the scientific and practical information required to bring the work to a successful issue. We are, however, satisfied from the results so far achieved that the development of this research on the lines recommended offers a reasonable chance of success, and that if that success is achieved, the results will be of immediate economic importance to this country and to the Empire. We believe that the scientific results of the last two years' work are well worth the money spent and that the Empire Marketing Board made a real contribution to the advancement of knowledge in this field when they approved the grant from the Empire Marketing Fund which enabled this line of research to be developed. We are hopeful that, if this research is developed on the lines recommended, as valuable, if not more valuable, results may be obtained. We venture, therefore, to hope that the Empire Marketing Board will be willing to continue their support of this important branch of agricultural science. The grant of £10,000 approved by the Board in 1928 has by careful management proved sufficient to enable the work to be continued for several months beyond the period of two years originally contemplated. It will, however, be exhausted by the end of October 1928.

44. Briefly stated, the recommendation which we desire to submit to the Committee of Civil Research is that a series of three-year tests should be undertaken in Kenya and Scotland, to demonstrate more fully the results so far secured by feeding to animals small amounts of substances deficient in the pastures on which they graze, the assistance of the Kenya Government being sought for the work to be done in the Colony, and that of the Animal Diseases Research Association for Scotland and of the Medical Research Council for that to be done in Scotland; and that certain work should be undertaken at Cambridge under the direction of Professor T. B. Wood and other work at Aberystwyth, Edinburgh and elsewhere.

45. As regards the funds required to carry out the proposed programme, the generous offer of the Governor of Kenya will render it possible to carry out a trifling cost the important section of the work which will require to be undertaken in that Colony. So far as concerns the work to be done in Great Britain, a great deal of valuable assistance will be forthcoming, free of charge, from the leading authorities who are willing to co-operate. The total sum required during the next three years for the work in Kenya and in this country (of which the details have been given in paragraph 38 above) is £15,000. This sum we recommend the Committee of Civil Research should invite the Empire Marketing Board to provide from the Empire Marketing Fund.

VI.—SUMMARY OF RECOMMENDATIONS.

46. For the convenience of the Committee of Civil Research we submit the following summary of our recommendations:—

(a.) That the Committee of Civil Research should inform the Secretary of State for the Colonies that—

(i) they are satisfied that the proposals contained in the Governor of Kenya's Despatch of the 18th April, 1928, are sound and well conceived, and that they would be grateful if he would convey to Sir Edward Grigg their appreciation of his offer of co-operation with their work put forward by him on behalf of the Kenya Government;

(ii) as regards paragraphs 3 and 4 of the Governor's Despatch referred to above, they concur in the proposal that, as an interim arrangement for the duration of the grant from the Empire Marketing Board, the salary of the biochemist proposed to be appointed and that of an additional laboratory assistant should be defrayed from moneys made available by the Empire Marketing Board, on the understanding that if, having regard to other prior commitments, the funds available from that source are not sufficient for the purpose, it may be desirable later to approach the Governor in regard to his offer to make a contribution to the cost;

(iii) as regards paragraphs 5 and 6 of the Governor's Despatch, they warmly appreciate his offer to hand over to the Governor of the Rowett Research Institute, Aberdeen, a part of the old Government farm at Nalivasha (consisting of approximately 4,000 acres and valued at some £25,000), and to make a contribution of £5,000 for the purchase of stock and other accessories, and that they recommend that this offer should be accepted subject to a satisfactory agreement on points of detail and, in particular, in regard to the reinforcement of the staff of the Rowett Research Institute (which will probably be necessary as a result of the additional work involved) being reached between the Colonial Office, the Development Commission and the Scottish Board of Agriculture, and on the understanding that the arrangements for the financial control of the above property should be reconsidered when the Colonial Advisory Council of Agriculture and Animal Health is brought into existence;

(iv) as regards paragraph 7 of the Governor's Despatch, they welcome the investigation proposed by the Governor for ascertaining the capacity and capability of native cows under conditions of proper feeding and management.

(b.) That the Committee of Civil Research should ask the Secretary of State for the Colonies to convey to the Governor of Kenya their warm appreciation of the close and constant co-operation in the present investigations afforded by the Kenya Agricultural and Medical departments and by the local administrative officers, without whose wholehearted support it would have been impossible to secure the results achieved, and their confidence that the same co-operation will be forthcoming in the remaining stages of the investigations; and to request Sir Edward Grigg to convey their thanks to the officers of his Government concerned;

(c.) That the Committee of Civil Research should communicate to the Secretary of State for the Colonies copies of Dr. Orr's Progress Reports on the investigation in regard to Animal Nutrition (C.R. (M.C.) 70) and Native Diets (C.R. (D) 21), and to request him to forward them to the Governor of Kenya;

(d.) That the investigations should be continued for a further period, not exceeding three years, as from the 1st November, 1928; and should consist of:—

(i) a series of three-year tests, to be undertaken in Kenya and Scotland, to demonstrate more fully the results so far secured by feeding to animals small amounts of substances deficient in the pastures on which they feed, the assistance of the Kenya Government being sought for the work to be done in the Colony, and that of the Animal Diseases Research Association for Scotland and of the Medical Research Council for that to be done in Scotland;

(ii) certain work to be undertaken at Cambridge under the direction of Professor T. B. Wood; and work at Aberystwyth, Edinburgh and elsewhere;

(e.) That, for the purpose of carrying out the experimental work referred to in (d) above, the Committee of Civil Research should recommend, for the favourable consideration of the Empire Marketing Board, a further grant from the Empire Marketing Fund, not exceeding £15,000, to be spread over three years as from the 1st November, 1928, it being understood that the amount to be spent in any one year should be left to subsequent discussion between the Empire Marketing Board, the Scottish Board of Agriculture and Dr. Orr, the Director of the Research;

(f.) That, on the termination of their engagements, arrangements should be made to give full leave on pay to the officers temporarily employed in Kenya for a period not less than that to which they would have been entitled if they had been members of the permanent Colonial Service, on the understanding that Dr. Orr should be authorised to put forward recommendations for the grant of special additional leave, in cases where for any reason he considers it desirable.

Signed on behalf of the Sub-Committee,
WALTER ELLIOT, Chairman.

(Signed) A. F. HERRING,
Secretary to the Sub-Committee.

2, Whitehall Gardens, S.W. 1.
October 22, 1928.

23
31



CONFIDENTIAL

Emp. M. B. / R. C. / 270.
(26.10.28)

EMPIRE MARKETING BOARD

RESEARCH GRANTS COMMITTEE

Research into Mineral Content of Natural Pastures.

1. The attached letter from the Committee of Civil Research enclosing the 4th Report of the Sub-Committee on the Mineral Content of Natural Pastures is circulated for consideration by the Research Grants Committee at their meeting on the 2nd November.

2. The Sub-Committee's principal recommendations, which are confirmed by the Committee of Civil Research, are as follows:-

- (1) That the investigations should be continued for a further period not exceeding 3 years and should consist of:-
 - (a) a series of three year tests, to be undertaken in Kenya and Scotland, to demonstrate more fully the results so far secured, by feeding to animals small amounts of substances which exist in the pastures on which they feed, the assistance of the Kenya Government being sought for the work to be done in the Colony, and that of the Animal Diseases Research Association for Scotland and of the Medical Research Council for that to be done in Scotland;
 - (b) certain work to be undertaken at Cambridge under the direction of Professor T. B. Wood; and work at Aberystwyth, Edinburgh and elsewhere;
- (2) That the Board should approve a further grant from the Empire Marketing Fund, not exceeding £15,000 to be spread over three years to enable the further work proposed above to be carried out; the amount to be spent in any one year to be left to discussion between the Empire Marketing Board, the Board of Agriculture for Scotland and Dr. Orr.

3. It will be observed that the Governor of Kenya has offered to transfer to the Governors of the Rowett Research Institute for the prosecution of this research, a part of the Old Government farm at Naivasha consisting of approximately 2,000 acres and valued at some £25,000, and to make provision of £5,000 for the purchase of stock and other accessories.

L.L.R.L.

C.A./C./10.

32
COMMITTEE OF CIVIL RESEARCH,
2, Whitehall Gardens,
London, S.W.1.

23rd October, 1928.

Sir,

With reference to the letter from this Department of the 19th January last (C.A./C./7) transmitting a copy of the 3rd Report of the Sub-Committee on the Mineral Content of Natural Pastures (C.R.(C)25), I am directed by the Committee of Civil Research to transmit herewith, to be laid before the Empire Marketing Board, a copy of the 4th Report which they have received from that Sub-Committee. (C.R.(C)32).

Lord Balfour concurs in the recommendations of the Sub-Committee, and he commends to the favourable consideration of the Board the following recommendations of the Sub-Committee:-

- (a) That the investigations should be continued for a further period, not exceeding three years, as from the 1st November, 1928; and should consist of:-
- (i) a series of three-year tests, to be undertaken in Kenya and Scotland, to demonstrate more fully the results so far secured by feeding to animals small amounts of substances deficient in the pastures on which they feed, the assistance of the Kenya Government being sought for the work to be done in the Colony, and that of the Animal Diseases Research Association for Scotland and of the Medical Research Council for that to be done in Scotland;
 - (ii) certain work to be undertaken at Cambridge under the direction of Professor E.B. Wood; and work at Aberystwyth, Edinburgh and elsewhere;
- (b) That, for the purpose of carrying out the experimental work referred to in (d) above, the Committee of Civil Research should recommend, for the favourable consideration of the Empire Marketing Board, a further grant from the Empire Marketing Fund, not exceeding £15,000, to be spread over three years as from the 1st November, 1928, it being understood that the amount to be spent in any one year should be left to subsequent discussion between the Empire Marketing Board, the Scottish Board of Agriculture and Dr. Orr, the Director of the Research;

133

(2) That, on the termination of their engagements, arrangements should be made to give leave on full pay to the officers temporarily employed in Kenya for a period not less than that to which they would have been entitled if they had been members of the permanent Colonial Service, on the understanding that Dr. Orr should be authorised to put forward recommendations for the grant of special additional leave, in cases where for any reason he considers it desirable.

3. A communication has been addressed to the Colonial Office with regard to 46 (a), (b) and (c) in the Sub-Committee's Report. His Lordship does not doubt that the Board will share his appreciation of the generous offer of the Governor of Kenya to transfer, for the prosecution of this research, to the Governors of the Rowett Research Institute, Aberdeen, a part of the old Government farm at Naivasha consisting of approximately 1,000 acres and valued at some £25,000, and to make provision of £5,000 for the purchase of stock and other accessories.

In order to facilitate the circulation of the Sub-Committee's Report to your Board, the Committee have decided that a further copy of the Report shall be transmitted to you under separate cover.

A. F. HEALING
Assistant Secretary

A. F. HEALING
Assistant Secretary,
Committee of Civil Research.

LL

Mr Eastwood 16/10

Mr. Jefferys 17/10

Mr. Allen 18/10

Mr. Parkinson 19/10

Sir J. Shackburgh

Sir G. Grindal

Sir C. Davis

Sir S. Wilson

Mr. Ormsby-Gore

Lord Laval

Mr. Amery

Dawning Street,

29 October 1928.

Sir,

I have etc. to acknowledge

the receipt of your despatch

No. 202 of the 18th April, 1928.

on the subject of the continuation

of research into animal and human nutrition, and to enclose

for your information the

accompanying copy of correspondence

with the Committee on Civil

Research on the matter, and in

accordance with the request in

para. 4 of the letter from the

Committee of Civil Research of the

3rd October, to convey to you

Lord Balfour's personal thanks

for

for con.
DRAFT (1013)

KENYA

No. 791

Govt. Grieg.

S. J. Shackburgh

To Committee of Civil Research

From do. 19th June

From do. 3rd October

To Govt.

To British Ag. Assoc. u.

Program Reports

3 dfts. (copies being obtained from C.C.R.)

21X

(15) ✓

19

✓ dfts. two
✓ correct
✓ enclosed

for the cordial reception accorded to the special workers to research officers who have been engaged in research work on the anthrax matter in Kenya, and his warm appreciation of the great assistance which they have received while in the Colony.

2. I should also be glad if you would convey the thanks of the Committee of Civil Research to the officers of your Government concerned in accordance with the terms of para.2(b) of the same letter.

3 Copies of letters which have subsequently been addressed to the Scottish Board of Agriculture are also enclosed, and I shall address you in a further despatch as soon as replies have been received to them.

have also prepared Report of the Committee of Civil Research
 2(c) of an letter
 Civil Research
 enclosed herewith

(Signed) L. S. AMERY

- Mr. Eastwood
- Mr. ...
- Mr. Allen
- Mr. ...
- Sir E. ...
- Sir J. ...
- Sir G. ...
- Sir C. Davis
- Sir S. Wilson
- Mr. Ormsby-Gore
- Lord ...
- Mr. Amery

For Gordon

DRAFT

The Secretary
 Scottish Board of
 Agriculture for Scotland

10 NOV
 body to ...
 8th 1928
 10 NOV 1928
 body to ...
 12 OCT 1928
 body to ...
 14 NOV 1928
 body to ...

15062/28 Kenya
 Downing Street
 10 Downing Street, 1928

With reference to previous correspondence ending with your letter, No. 6043 of the 24th December 1925, I am etc. to transmit to you to be laid before the Board of

Agriculture for Scotland, the accompanying copy of a despatch and enclosures from the Governor of Kenya, on the subject of the research work which is being undertaken in the Colony in human and animal nutrition

2. I am also to enclose a copy of a letter to the Secretary of the Committee of Civil Research, dated the 16th June 1928, and two letters which have been received in reply, dated the 17th June 1928 and the 18th June 1928. It will be observed that

the Governor makes three definite proposals for further work:-

- (1) Native Dietetics. He proposes that this enquiry should be linked up with the research on

38/40
 1928
 From Gov. Kenya, No. 202, 18th April 1928
 To Secy. of Civil Research
 From do. 16th June 1928
 From do. 19th June 1928
 From do. 3rd Oct 1928

To E.M.B.
 (without encs.)

animal nutrition; that the Nairobi Laboratory should be extended by the Kenya Government at a cost of £850 and that the Empire Marketing Board should assist in providing a bio-chemist and an assistant. The Governor states that he would consider, if necessary, the propriety of making a contribution to the funds of the Empire Marketing Board. It is presumed that the Governor means by this that his Government should be prepared to bear part of the salaries of the officers mentioned.

Animal Nutrition (a) The Kenya Government is proposed to hand over to the Rowett Research Institute a part of the old Government stock and to contribute £5,000 for the purchase of stock and accessories.

(b) Animal Nutrition (1) The Governor proposes that a study should be made at Ngongu of the capacity and capability of native cows. Apparently this work would be undertaken at the expense of the Kenya Government.

4. It is hoped that the Empire Marketing

Board will find it possible to allocate further sums ~~in addition to the amount~~ ~~a year for two years which was allocated~~ ~~in 1925~~ for the carrying out of the first of the Governor's proposals, and I am to enclose, for the information ^{of} ~~on~~ of the Board, a copy of a letter which has been sent to ~~them~~ ^{the Board} ~~an~~ this subject.

A

5. Mr. Amery will be glad to receive the observations of the Board ^{of official nature} on the ~~possibility~~ ~~of the second~~ of the Governor's proposals, viz., that contained in paras. 5 and 6 of his despatch enclosed herewith. ~~The research which has already been carried out on this scheme has been financed by a grant of £5,000 a year from the ~~Board~~ ^{Science Research Council} for two years which ended on the 31st March 1928. The Board have agreed that the investigations should be continued beyond this date within the limit of the total of £10,000 originally allocated. It ^{will be} is apparently ~~then that~~ ~~under the scheme~~ contemplated that the Rowett Research~~

Institute ^{would} ~~should~~ now undertake the

management of the farm on a paying basis,
that is to say it would be responsible
~~no further grant from the E.M.B. would there~~
~~for the necessary outgoings and would~~
~~fore appear to be required, though the available~~
~~be entitled to retain the income~~
~~balance, if any, of the existing grant of~~
~~£10,000 referred to above could be employed for~~

of produce etc. Should any question arise
expenses incurred in the inauguration of the scheme,

of the Institute requiring a subsidy ^{either} in the
form of meeting ~~the~~ pay of the Manager as stated by

initial stages of its operation, ^{at a} ^{stage} ~~or~~ ~~later~~ it
was ~~at~~ the meeting in Kenya of the 29th February

it should, however, be observed that the

scheme has not yet been submitted to the Legislative

Council in Kenya whose approval will be necessary.

I am, etc.

to be formed from the grant
from the Empire Marketing Fund, as
it would ~~certainly~~ be hardly possible
to ask the Govt of Kenya to add
to its obligations in such a direction

It should be understood
that before any final arrangement
for the working of the experimental farm
can be concluded it will be necessary
to obtain the concurrence of the
Legislative Council of Kenya.

(Signed) A. C. G. PARKINSON

X.15052/29, Kenya

Mr. Eastwood

Mr. Jeffries

Mr. Allen

Mr. Barrington

Sir E. Harding

Sir J. Shuckburgh

Sir G. Grindie

Sir C. Davis

Sir S. Wilson

Mr. Ormsby-Gore

Mr. Amey

24 OCT

Downing Street

29 October 1928

Sir,

I am etc. to transmit to you, to

be laid before the Empire Marketing

Board, the accompanying copy of a despatch

and ... from the ... of Kenya

... the ... which

... the colony in ...

... nutrition

... a copy of

... of the Committee

... and of

... which have been received

... the 19th June and the

...

... will be observed that

... three definite proposals

... for further work

(1) Native Diets. He proposes

that this enquiry should be linked up

with the research on animal nutrition;

3 dfts. required

...

DEPART

The ...
Empire Marketing Board

Mr. G. ...

To ...

...

...

...

...

To Secty. Scottish Board of
Agriculture

dft. h.w. without encls.

that the Nairobi laboratory should be extended
by the Kenya Government at a cost of 2850 and that the
Empire Marketing Board should assist in providing a bio-
chemist and an assistant. The Governor states that

he would consider, if necessary, the propriety of making
a contribution to the funds of the Empire Marketing Board.

It is pointed out that the Governor means by this that his
Department will be required to bear part of the salaries of

the staff of the Nairobi laboratory.

It is suggested that the Governor should express his
confidence in the efficiency and capability

of the staff of the Nairobi laboratory and that he should
express his confidence in the efficiency and capability

of the staff of the Nairobi laboratory.

It is suggested that the Governor should be invited on the practicability of the

second part of the Governor's proposals, and to enclose a

copy of the letter which has been sent *to the Board*

It is suggested that the Governor should express his
understanding that the Board's response that they are
willing to assist the Board in the matter, & he hopes that it will be possible
to provide further financial provision to enable
the Governor's proposals to be carried out.

I am, etc.

Any further communication on this subject should be addressed to—

THE SECRETARY,
COMMITTEE OF CIVIL RESEARCH,
2, WHITEHALL GARDENS, S.W.1.

and the following number quoted.

C.A./Q./7.

COMMITTEE OF CIVIL RESEARCH,

2, WHITEHALL GARDENS,

LONDON, S.W.1.

3rd October 1928

3 OCT 1928

Sir,

I am directed by the Chairman of the Committee of Civil Research to request you to inform Mr. Secretary Amery that your letter of June 16th last (15052/28) transmitting a copy of a despatch from the Governor of Kenya, in which he enclosed the report of a meeting held in the Colony in February last, at which Dr. J. R. Orr and others were present, was considered at a joint meeting of the Sub-Committee on the Mineral Content of Natural Pastures and the Sub-Committee on Dietetics held at 2 Whitehall Gardens, on Wednesday, September 19th, 1928.

E. At that meeting, the two Sub-Committees agreed to recommend the Committee of Civil Research:-

(a) To inform the Secretary of State for the Colonies that

(i) They were satisfied that the proposals contained in the Governor of Kenya's despatch of April 16th 1928, were sound and well conceived and that they would be grateful if he would convey to Sir Edward Grigg their appreciation of his offer of co-operation with their work put forward by him on behalf of the Kenya Government.

As regards paragraphs 3 and 4 of the Governor's despatch referred to above, they concur in the proposal that as an interim arrangement for the duration of the grant from the Empire Marketing Board, the salary of the biochemist proposed to be appointed and that of an additional laboratory assistant should be derived from moneys made available by the Empire Marketing Board, on the understanding that if, having regard to other prior commitments, the funds available from that source are not sufficient for the purpose, it may be desirable later to approach the Governor in regard to his offer to make a contribution to the cost.

(ii) As regards paragraphs 5 and 6 of the Governor's despatch, they warmly appreciate his offer to hand over to the Governors of the Rowett Research Institute, Aberdeen, a part of the old Government farm at Naivasha (consisting of approximately 4,000 acres and valued at some £25,000) and to make a contribution of £5,000 for the purchase of stock and other accessories; and that they recommend that this offer should be accepted.

2-9 OCT 1928
Development 10

24 OCT 1928
C. A. Q. 7/1 - 24 OCT 1928

subject to a satisfactory agreement on points of detail and in particular in regard to the reinforcement of the staff of the Rowett Research Institute (which will probably be necessary as a result of the additional work involved) being reached between the Colonial Office and the Scottish Board of Agriculture, and on the understanding that the arrangements for financial control of the above property should be reconsidered when the Colonial Advisory Council of Agriculture and Animal Health is brought into existence;

*Mr. Amery
to note*

(iv) As regards paragraph 7 of the Governor's despatch they welcome the investigation proposed by the Governor for ascertaining the capacity and capability of native cows under conditions of proper feeding and management.

(b) To ask the Secretary of State for the Colonies to convey to the Governor of Kenya their appreciation of the way in which the Government in the present circumstances have met the needs of the Medical and Agricultural Departments and the Administrative Services, and to express their support for the Government's policy in the present circumstances.

... of staff for the program...
... local nutrition...
... to receive...

Lord Bledsoe...
... themselves...
... his way...
... sense...

4. ... Lordship...
... cordial co-operation...
... administration in Kenya...
... employed in the colony...
... to Sir Edward Grigg his personal thanks...
... reception accorded...
... the great assistance they have received...

I am, Sir,
Your obedient Servant,

W. J. ...
Secretary,

Committee of Civil Research.

The Under Secretary of State,
Colonial Office.

40/10



KENYA.

GOVERNMENT HOUSE,
NAIROBI.
KENYA.

No. 57

RECEIVED
- 2 AUG 1928
COL. OF

13th July, 1928.

CONFIDENTIAL.

Sir,

15052/28
(No. 10)

With reference to your Confidential despatch of the 18th May on the subject of investigations in Kenya in human and animal nutrition I have the honour to transmit copies of a Motion which was moved in Legislative Council by the Director of Medical and Sanitary Services and passed on the 18th June last in this connection. Tribute was paid in Council to those who in England by and through whose good offices investigations have been conducted and I enclose a copy of the report of the proceedings on this subject. In connection I would invite your attention to the expression of appreciation contained in paragraph 9 of my despatch No. 202 of the 18th May.

With reference to your confidential despatch of the 18th May, steps have been taken with a view to publication in the Kenya Medical

Journal -----

THE RIGHT HONOURABLE
LT. COL. L. C. M. S. AMERY, P. C., M. P.,
SECRETARY OF STATE FOR THE COLONIES,
DOWNING STREET,
LONDON.....S.W.

41

Journal of the descriptive paper by Dr. J.B. Orr, which formed an enclosure to that despatch. You will observe that this course was agreed to at the meeting held on the 29th February last, at which Dr. Orr was present, as recorded on page 11 of the enclosure to my despatch No. 202 of the 18th April.

No. 13.

No. 13A.

4. I note from your telegram of June 6th ^{5/12} that careful consideration is being given to the proposals contained in that despatch.

I have the honour to be,

Sir,

Your most obedient humble servant,

GOVERNOR

DEPUTY

INVESTIGATIONS INTO HUMAN AND ANIMAL NUTRITION -
MOTION BY CHAIRMAN

The Hon. The Director of Milk and Sanitary
Services (Mr. G. G. G. G.): Your Excellency, I beg to move

that the Council should express its gratitude
to the Government for the investigation
into the nutritive value of the milk
and the nutritive value of the
milk.

The Council has the honor to express its
gratitude to the Government for the
investigation into the nutritive value
of the milk and the nutritive value
of the milk. It is a matter of
great interest to the Council that
special workers have been paid

from Imperial funds, have worked out here with the closest possible co-operation and harmony with the local officers gives enormous promise for the future development of science and scientific research work generally. The liaison which has been maintained with science in England by this work and which, it is hoped, will continue is fraught with great economic possibilities.

THE HON. THE DIRECTOR OF AGRICULTURE: I have much pleasure in seconding the motion. I think it is proper that the Government and the public of Kenya should express their appreciation of a valuable service rendered at comparatively small cost to the Colony, and opportune that the motion should come when the completion of the first stage of the experimental work has been reached.

The results, which were obtained at comparatively small expense, are a fine example of the trainer in which experimental methods can be applied successfully in testing the findings of scientific research.

These nutritional experiments on cattle and sheep in Kenya though comparatively simple in themselves were based upon a large amount of analytical work done on Kenya pastures at the Rowett Institute and a study of research and experimental work carried out in other countries.

The value of the experimental work will not be confined to Kenya—it will be found to be of Imperial importance—e.g., since these experiments were started we have had a request from a Graziers' Association in Australia to be furnished with particulars. The value of the interchange of scientific knowledge is well illustrated by these experiments. New Zealand research workers (Ashton, Reakes and others) found that iron was a deficiency in certain pastures and their finding prompted Dr. Orr, after a study of the conditions at Nakuru, to test iron deficiency as the cause of Nakurutitis. Immediately positive results were obtained. Again, in the Union of South Africa, feeding tests, made by Theiler and his associates, showed phosphatic deficiency. That has been confirmed in some of the Kenya experiments.

In discussions at the Imperial Agricultural Research Conference held last year the importance of research work on animal nutrition was realised and emphasized, and one of the recommendations made was that an Imperial Bureau of Animal Nutrition should be established and attached to the Rowett Institute at Aberdeen.

I may mention, however, that research work on animal nutrition is also being carried out at the School of Agriculture, Cambridge University, in the closest association with Dr. Orr.

16th June, 1928

353

be domiciled in that area best suited to the particular work it is undertaking. I suggest to illustrate my point that nutritional experiments might possibly be concentrated in Kenya. Uganda may appear to be the most suitable area for investigations into the ravages of sleeping sickness, while the industry responsible for the breeding of exclusiveness might possibly be concentrated in Tanganyika. (Laughter).

The Chairman: The question is:—

That Mr. Connell desires to express his gratitude to the Imperial Government for the investigations in human and animal nutrition now being undertaken in Kenya and the auspices of the Empire Marketing Board and the Civil Research Committee with the good offices of the Research Institute and the Scottish Board of Agriculture.

The question was put and carried.

Any further communication on this subject should be addressed to—

THE SECRETARY,

COMMITTEE OF CIVIL RESEARCH,
2, WHITEHALL GARDENS, S.W.1,

and the following number quoted.

C. A. / Q. / 7.

RECEIVED
21 JUN 1928
COL

COMMITTEE OF CIVIL RESEARCH,

2, WHITEHALL GARDENS,

LONDON, S.W.1.

19th June 1928.

Sir,

I have laid before the Chairman of the Committee of Civil Research your letter of the 16th instant and have a copy of a despatch from the Governor of Kenya dated 18th April last, transmitting a report of a survey conducted in the Colony in February 1928, at which were discussed the investigations into malnutrition and general nutrition at present being conducted in the Colony.

In reply I am to inform you that I have advised the Governor's proposals to the Committee of Civil Research and have had the pleasure to invite the Secretary of the Committee to visit the Government of Kenya in order to discuss the details of the proposals.

Sir,

Secretary,

The Secretary of State,
Colonial Office.

15050.27
15
45

sc

part

Mr. Jeffries 12/6/28
Mr. Parkman 12/6/28

Quaid
13
H. J. ...

Mr. ...
Mr. ...
Mr. ...

13 JUN 1928

Sir G. Grindle
Sir D. Davis
Sir S. Wilson
Mr. Ormsby-Gore
Lord Lovat
Mr. Amery

for comment

Downing Street.

16 June, 1928.

DRAFT

The Secretary,
Committee of Civil Research.

29 OCT 1928
10 NOV 1928

With reference to

previous correspondence regarding
the work of the Sub-Committee on
the Mineral Content of Natural
and in Native Diets
Pastures, I am etc. to transmit to
you, to be laid before the Earl of
Balfour, a copy of a despatch
from the Governor of Kenya, in
which he encloses the report of a
meeting held in the Colony in
February last, at which Dr. ...
and others were present. It is
understood that copies of the
report and of other relevant
papers

Copy 500 791-28 OCT 1928

Encl. 202 18/4/26
Ch. B. ...

copy to ...

Recie. to ...
for

papers have already been furnished
to the Committee of Civil Research
by Dr. Orr.

2. It will be seen that the
Governor proposes that the
investigations into native dietetics
should be linked up with the
research into question of animal
nutrition, and that he makes certain
definite proposals for the collaboration
of the Colonial Government and the
Committee of Civil Research in this

* 16.

3. Mr. Amery would be glad to
receive the observations of the
Committee of Civil Research on the
scientific aspect of the Governor's
proposals. Subject to such
observations, he proposes to appoint
the Director of Agriculture and the
Director of Veterinary with a
view to their co-operation in the grant

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KENYA

No. 202



GOVERNMENT HOUSE,
NAIROBI,
KENYA.

MAY 1928
COL. OFFICE

13th April, 1928.

Sir,

RESEARCH ANIMAL AND HUMAN NUTRITION

With reference to your confidential despatch of January 30th 1928 transmitting copies of a further report by the Sub-Committee of Civil Research on the Mineral Content of Natural Pastures, I have the honour to inform you that, during Dr. Orr's recent visit, I held a Meeting of the departmental officers concerned and certain interested unofficials to discuss the position both as regards animal and human nutrition. I enclose a copy of the Notes taken at this meeting from which it is evident that the results of the experiments and research which have been undertaken here are likely to be fraught with great economic potentialities not only for Kenya but for other parts of the world, and that the investigations should be carried considerably further, if financial resources permit.

no. 2

5 June 1928

copy etc. to C. B. A. 16 JUN 1928

copy to S. A. B. (see) 29

2. The assistance to be given by The Empire Marketing Board of which you informed me in your telegram of February 3rd last is most gratifying though it is not clear whether that assistance refers solely to animal work, or will be afforded for work on animals and humans combined. I assume that the latter is the case as the two sections of this work are complementary and have an equal bearing on the general problems of nutrition.

no. 4

In.....

THE RT. HON. LT. COL. L.C.M.S. AMERY, P.C., MP.
SECRETARY OF STATE FOR THE COLONIES,
DOWNING STREET,
LONDON, S.W.

In order to allow the work both on animals and humans to be pursued properly, certain bio-chemical investigations will be necessary which from their nature cannot be conducted in England and for which the Agricultural Department has neither the staff nor equipment. It was suggested by Dr. Orr that all bio-chemical work should be performed at the Medical Research Laboratory and I agree.

3. In order to allow of such an arrangement being carried out an extension of the Laboratory will be necessary and the services of a bio-chemist and an extra laboratory assistant will be required as long as the investigations continue. This Government is prepared to meet the necessary extra accommodation at a cost of £5000.

4. It is hoped that the Empire Marketing Board will find themselves able to assist with regard to the provision of a bio-chemist and assistant. If necessary this Government would be prepared to make a contribution to the funds of the Empire Marketing Board as an expression of the importance which is attached to the continuance of the work. At the same time it is conscious that the solution of nutritional problems is not one which concerns India or even Africa alone, but is a matter of importance to the whole Empire.

5. In regard to the means of applying the results of cattle feeding experiments now available and likely to be obtained in the future you will observe from the enclosure to this despatch that I expressed my willingness, subject to the approval of Legislative Council, to hand over to the Governors of

the Rowett Research Institute a part of the old Government farm at Naivasha (consisting of approximately 4,000 acres and valued at some £25,000) and to make a contribution of £5,000 for the purchase of stock and other accessories. The general lines of the proposal are that the lands and buildings thereon, including certain houses would be granted on a special purposes lease free of stand premium and of rent for the purposes of an experimental stock nutrition farm to the Institute with the condition that if the Institute at any time abandons research work regarding methods of feeding and treatment of stock suitable for tropical and subtropical conditions and submission of such methods to practical economic use or other work in connection with experiments in animal nutrition, the land and any buildings which are on the land at that time shall revert to the Government of this Colony. The farm adjoins the Township of Naivasha and is interlocked by the Kenya and Uganda Railway, and is at present on temporary lease but can be made available at once.

The proposal will enable the farm to be put to what Dr. Orr characterized as a "real" project, and should be grateful if the proposal might be put tentatively before the Governors of the Rowett Research Institute for the expression of their views.

Dr. Orr suggested a second line of work. In view of the necessity for improvement of native stock it appears that the capacity and stability of native cows under conditions of proper feeding and management should be ascertained. It is proposed to combine this work with the training of natives in animal husbandry which is now proceeding at Ngong, utilizing for the purpose the additional stock inspector provided for in the sanctioned estimates for the current year. A suitable candidate has been suggested -----

suggested -----

suggested by Dr Orr..

8. I have consulted my Executive Council and unofficial members of Council who have expressed entire concurrence with these proposals and I should be glad to be able to put them to Legislative Council with your approval at the forthcoming session with such indication of the views of the Governors of the Institute as may be available.

9. The close liaison which has been effected between the officers of the Institute and of this Government and the volume of information and resources thereby brought to bear on the various problems has enabled results to be achieved in a period far shorter than would have been the case had the local organisation been solely employed, if indeed, the work could have been undertaken at all. The cordial relations which obtained between the officers from England and those holding appointments in the Colony hold out great promise for the conduct of research in future. I should be glad if an expression of appreciation of the work performed might be conveyed to those bodies in England by and through whose good offices the investigations have been conducted, particularly the Civil Research Committee, the Empire Marketing Board and the Scottish Board of Agriculture!

I have the honour to be,

Sir,

Your most obedient, humble servant,

Edward Gigg

GOVERNOR.

required in large amounts, and were comparable with the best British cultivated pastures.

He explained that feeding experiments were begun in order to avoid delay before the analyses of pastures were completed. At Naivasha the results had been negative but at other centres the results had been favourable both as regards growth of animals and increased production of milk. The present result is comparable with results obtained in South Africa. In the case of Holo and Naivasha the results on weight of animals were positive, the increase in weight being from 5 to 10 per cent. The results obtained in Nakuru with regard to the disease known as Nakuritis are similar to those which have been obtained in New Zealand.

Another line which had been followed was the investigation of the result on milk production of feeding concentrates. This had been tried out at Doonholm with favourable results.

Dr. Orr said that he was not prepared to discuss the bearing these results might have on the development of animal husbandry in Kenya. They were merely experimental results and the nature of the forage conditions had not yet been tested under ordinary conditions.

His Excellency thanked Dr. Orr for his report on the progress of the work.

Dr. Orr said he would like the work to carry on for at least another year to confirm the results obtained and to see the effect of feeding for longer periods.

His Excellency asked what attitude the Civil Research Committee would be likely to adopt.

Dr. Orr stated that he thought the scientific members/

members of the Civil Research Committee in London were interested in the results being obtained and that they would wish the experiments to be continued. He said that he thought also that the Empire Marketing Board would be willing to carry on apart from the scientific interest of the work because the results already obtained suggested that such work might be of value not only for Kenya but for other parts of the Empire.

His Excellency then asked if Dr. Orr could suggest a programme for future work, and the meeting then discussed the work at the four different centres where the experiments had been proceeding.

1. Nakuru.

Dr. Orr explained that the investigation at Nakuru was finished so far as the experimental aspect was concerned. It remained to be seen however whether the results obtained under experimental conditions would be obtained under ordinary farming conditions. He suggested that a few settlers should be invited to carry out the measures found beneficial in the experiment. No government assistance was necessary. Lord Delamere said that he was sure settlers would co-operate most willingly. Mr. L.J. Dawson agreed, and stated that they were already attempting to apply the results of the investigation on their own farms but they did not have full information about the method used in the experiment.

2. Nivasha.

Dr. Orr explained that no gross deficiencies had been discovered in the pasture at Nivasha, but in the test with sheep the yield of wool had been increased. There is so far no explanation of this, and he would like to continue experiments/

all expenditure on account of this project is provided from the grant made by the Empire Marketing Board, with the exception of the necessary co-operation by Government Departments.

Dr. Gilks mentioned that the Colonial Office had already intimated that continued support could be afforded by the Empire Marketing Board after the original period of two years.

His Excellency asked what general suggestions Dr. Orr had to make over and above the work already discussed.

Dr. Orr said that he was in considerable doubt as to the exact value to Kenya of the information so far obtained because the knowledge obtained had not yet been applied. He said that the future work most urgently required was not research but the practical application of what was already known. The lines he wished to mention were:

1. The capacity and availability of native cows under proper feeding and management had never been ascertained. It might be possible to arrange for a herd of native cows to be kept under proper conditions long enough to see what improvement could be effected in their milking capacity by proper feeding, handling and selective breeding from the best animals. This improvement of the native breed would be of advantage not only to native but also to European stock owner, because native stock was the basis of his herd. He believed the Veterinary Department was devoting attention to the study of native cattle.

His/

His Excellency asked Lord Delamere whether he thought that work devoted to native stock would be of benefit to the Colony generally.

Lord Delamere said that he considered improvement of native stock by the natives themselves was not likely to occur so long as the system of communal land holding existed. He thought that such improvement, if it could be effected, would be of value to the Colony as a whole, including the European stock owners.

Both Mr. J.K. Watson and Mr. J.J. Dawson agreed with Lord Delamere's opinion.

His Excellency asked how Dr. Orr proposed that this work should be carried out.

Dr. Orr suggested that it might be combined with the scheme proposed by the Veterinary Department for the training of Africans in animal husbandry.

Mr. Dixon said that it was the intention to include in this scheme of training the breeding of an improved herd of native cattle. He thought that the work could be done at Ngong.

Lord Delamere was prepared to offer land at Mvasha for the purpose, but agreed that it would be better to concentrate at Ngong.

His Excellency asked what expense would be incurred.

Dr. Orr said his suggestion could be incorporated as part of the scheme of the Veterinary Department. A practical expert in animal husbandry would be required to devote his whole time to see that methods of handling, milking and feeding were the best possible under the local conditions, to record the milk yield and select for breeding the

the intrinsic with the highest yield. He did not think the Empire Marketing Board could assist as the results would be of interest only to Kenya.

The Ex-Ambassy asked if Dr. Orr could give them a plan for this work.

Dr. Orr said that he had been appointed under the terms of the agreement...

He mentioned that he had been in Kenya for some time and had been working on the problem of increasing the production of food...

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-8-

methods found to be successful elsewhere. He thought if this scheme were carried through it might have considerable bearing on the future of the dairying industry in Kenya, and the results might be of value to other parts of the Empire where animal husbandry was being developed under similar conditions.

His Excellency thought the success of the scheme would largely depend upon the man in charge.

Lord Delmore said that he felt very strongly that this demonstration farm should not be under the control of a Government Department, which is always subject to criticism by public opinion. He thought the demonstration should be carried out on a paying basis, if it were to impress settlers. He suggested that the Rowett Research Institute be offered the farm, which would then be put in their control, entirely free from political interference by the people of the Colony. He thought that the old Government farm at Nairobi would be the best place for the purpose.

Dr. Orr said this rather unusual proposal would require a good deal of consideration, but he was in entire agreement with the general lines of the proposal suggested by Lord Delmore. The Empire Marketing Board, he thought, might be interested in the suggestion and might allow the salary of a manager to be paid out of their present grant which ran for another year. If the scheme were carried out the present investigation would naturally merge into it, as the Government farm was the headquarters of operations for the present work being carried out under the Empire Marketing Board.

Lord/

Lord Delamere said that Government should provide the initial land and capital, and then hand the project over completely.

His Excellency stated that he was prepared to recommend that Government should make over a farm and stock to the Rowett Research Institute.

Lord Delamere stated that so far he had only expressed his own opinion, but he felt certain that the elected members of Legislative Council would agree with him.

Mr. J.J. Dawson expressed himself very strongly in favour of the scheme, and stated that Dr. Orr's experiments had been the first tangible result to be attained after 21 years of discussion. He thought that the work carried out as the result of Dr. Orr's initiative had been characterized by remarkable thoroughness and cheapness, and complete efficiency on the part of the staff employed.

It was suggested that Lord Delamere, Dr. Orr, Mr. Walker, Mr. Blunt and Mr. Dixon should meet to consider the terms on which the land and stock should be handed over, provided the scheme were approved by all the authorities concerned.

Dr. Orr said that a subject of very great importance had emerged from these investigations. That was the nutritional factor in disease. This was the subject of serious consideration not only with himself in connection with the special work here, but also of the Veterinary Department in connection with various diseases, and of the Medical Department in connection with disease in natives. Unanimity of opinion was arising that deficiencies of some essential substance in the diet or some other error of diet was an important predisposing cause of disease.

As a result of the general investigation some information
 has already been collected on this important problem and
 his thought work of this kind could be continued and ex-
 panded both by the Medical and Veterinary Research Depart-
 ment. The work of course involves a good deal of
 laboratory work.

Dr. Gilke was also concerned with the
 possibility of using the same method and cooperation
 of the Department of Agriculture and the Department of
 Health.

Dr. Gilke explained that if the work
 continued and concentrated at the Medical Research Laboratory
 additional accommodation would be required.
 His Excellency asked Dr. Orr if it was intended
 to publish the report which had been circulated at the
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Dr. Gilke explained that if the work
 continued and concentrated at the Medical Research Laboratory
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His Excellency asked Dr. Orr if it was intended
 to publish the report which had been circulated at the
 meeting.

meeting. He considered it important that results should be made known as soon as possible.

Dr. Orr thought that a summary of his report, in the form of a popular article, might be published; but he explained that it would be necessary to obtain previous sanction of the Civil Research Committee and the Empire Marketing Board. It was suggested that if permission were obtained this article might be published in the Kenya Medical Journal.

Sir Edward Denham suggested that publication in the public press would be desirable, and it was agreed that this could best be done by means of preliminary publication in a technical journal such as the Kenya Medical Journal, from which the public press could copy.

In conclusion, His Excellency expressed on behalf of all those present his gratitude to Dr. Orr for his very successful work in the interests of the Colony.

Dr. Orr said that the success of the work had been assured by the willing co-operation of Government Departments.

MEDICAL SECTION.

At request of the Governor, Dr. Orr gave a brief outline of the work which has been carried out.

The investigation had originated in the enquiry on the cause of malnutrition in farm animals. The Medical Department had recognized that a good deal of the disease amongst natives might be due directly or indirectly to deficiencies in the diets. After consultation with Dr. Gilks and his staff and a visit to the natives reserves, he (Dr. Orr) decided to insert a paragraph in the official report.

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Report calling attention to the nutritional problem in natives and suggesting that the problem in natives was of the same nature as the problem in animals. The Civil Research Committee after consideration of the Report decided that a grant should be made for work on native dietetics.

The object of investigation had been to determine the nature of native diets in different tribes and the nature of diseases most prevalent in these tribes.

A survey carried out by Dr. Foster amongst Kikuyu, who were almost completely free from pulmonary diseases were very prevalent. Tuberculosis appeared to be on the increase, diabetes very prevalent and condition of teeth poor. The general physique of the Kikuyu was poor. The result of an examination of the Kikuyu was in line with what was found in 1917 when drafts from this tribe were medically examined in recruitment for the Carrier Corps, where 65% of men chosen for work were rejected at the first medical examination.

The Masai who lived chiefly on milk and blood appeared to be of much better physique than the Kikuyu from pulmonary diseases or ulcers to anything like the extent found in Kikuyu. Teeth were good. The chief complaint seen to be rheumatism and constipation.

An analysis of native foodstuffs was being done at the Rowett Research Institute. Results are not yet all available.

Dr. Henderson with Dr. Kelly of the Kenya Medical Department, and later Dr. Harvey, had carried out an enquiry on the diet of prisoners. This diet was believed to be better/

bat

better than that in native reserves but analysis showed that it was probably deficient. The most marked deficiency was in calcium, the amount present being only about one-third of what was regarded as the optimum amount for an adult.

A number of metabolic experiments had been carried out in which it had been shown that in a diet rich in calcium when added to this diet the amount of calcium retained was actually increased, while rate of growth of young rats was augmented and their condition in general improved.

Other experiments were at present in progress to determine whether the addition of calcium in a cheap form to the diet would produce any effect. On the assumption that absorption might be reduced by faulty nutrition the experiments were carried out. In the present investigation, however, it had been found that the addition of calcium to the diet had been shown to be beneficial in the treatment of the disease.

It had been shown that malnutrition, vitamin deficiency and other factors might be concerned. In the present brood of rats the disease had been carried out and it had been found that in this case there existed a high incidence of the disease in a condition of asenitis and low calcium. The disease was probably associated with high carbon dioxide content of the atmosphere. It was noted that as the conditions improved the weight of the affected patients increased and they tended to heal.

As a result of this investigation there had been an extension of work which had been carried out on intestinal parasites which were known to have adverse effect on the native. It is probable that there was a connection between bad diet, malnutrition and worms.

better than that of native reserves but analysis showed that it was probably deficient. The most marked deficiency was in calcium, the amount present being only about one-third of what was regarded as the optimum amount for an adult.

A number of metabolic experiments had been carried out in which it had been shown that if a diet rich in calcium was added to this diet the amount of calcium retained was markedly increased, while rate of growth of young prisoners was augmented and their condition generally improved. However, experiments were at present in progress to determine whether the addition of calcium to a cheap

and palatable diet would produce any effect. On the assumption that the diet might be regarded as a quality nutrition the addition of calcium to the diet would be expected to have a beneficial effect. In the present investigation the diet was a cheap and palatable one and the results of the experiment are being applied. It had been known that calcium, vitamins and other nutrients were deficient in the diet and it had been found that in this diet there existed a high incidence of beriberi and other conditions of a general and low level of nutrition. It was probably associated with high carbohydrate intake and it was noteworthy that as the condition improved and weight of these ulcer patients increased the ulcers tended to heal.

As a result of this investigation there had been an extension of work which had been carried out on intestinal parasites which were known to have adverse effect on the native. It is probable that there was a connection between bad diet, malnutrition and worms.

In conclusion, Dr. Orr said that there had been the closest co-operation between workers sent out by the Rowett Research Institute and the permanent officials of the Medical Department both in clinical work and in the work carried on in the laboratories.

Dr. Gilks gave some further details regarding the work and spoke of its great importance in connection with the health of the natives and also its economic importance in connection with provision of efficient labour. He said that the grant under which the work was being done was a two years grant, and that it would be a great loss to the Colony if this research work on nutrition were stopped at the end of the present year. He strongly recommended that the Government should take the necessary steps to secure the continuance of the work and especially the advice and guidance of the distinguished members of the sub-committee of the Civil Research Committee under whose general direction this investigation on diet and nutrition of African natives was being carried out. He suggested that the Colony should not only offer all facilities for the work but should make a special research grant.

The Governor asked Dr. Orr what view the Civil Research Committee and the Empire Marketing Board would take with regard to the combination of this work in which he (The Governor) was very much interested and which he recognized would be of great importance to the Colony.

Dr. Orr said that the problems being investigated were not peculiar to Kenya, results being obtained were of considerable scientific interest and would be of value for other parts of the Empire. He thought therefore that the sub-committee of the Civil Research Committee would be willing to/

E. b. 100 67
18MAY 1928

Mr. Jeffries 14/5
X Mr. [unclear] 17/11/28
Mr. [unclear]

X Mr. Bottomley 17/6

Downing Street.

18 May, 1928

- Mr. E. J. Harding.
- Sir J. Shuckburgh.
- Sir G. Grindle.
- Sir C. Davis.
- Sir S. Wilson.
- Mr. Ormsby-Gore.
- Lord Lovat.
- Mr. Amery.

Sir,

With reference to my

Confidential despatch of the 30th of January and to subsequent telegraphic correspondence, I have etc. to inform you that the Empire Marketing Board have approved of the unexpended balance of the Board's grant of £10,000 towards the investigations in Kenya into the mineral content of natural pastures being made available for the continuation of the investigations beyond the period of two years which was originally laid down, provided that the total expenditure incurred does not exceed £10,000.

DRAFT

KENYA

Confidential

Gov. of Kenya

*Copy to C.C.R. 1/21
Emb. 28. 5/28
L.A. 28. 5/28*

*Copy of paper by N. 18. 5/28
C.C.R. 1/21
Emb. 28. 5/28
L.A. 28. 5/28*

*Copies to C.C.R.
& E.M.B. L.A.*

carried out in the Colony.

I enclose five copies of the paper in question, and I shall be glad provided that you see

steps to

page 507

1937

CONFIDENTIAL.

COPY NO. 8

C.R. (MUN) 1928

COMMITTEE OF CIVIL RESEARCH.

SUB-COMMITTEE ON THE MINERAL CONTENT OF
NATURAL PASTURES.

INVESTIGATION IN KENYA ON NATIVE DIETETICS AND ANIMAL
HUSBANDRY.

Note by the Secretary.

The following papers are circulated herewith by direction of the Chairman:-

- (1) Copy of a letter dated March 17th, 1928 from Dr. J. B. Orr to the Chairman.
- (2) Report on investigations on native Dietetics by the Director of Medical and Sanitary Services, Kenya.
- (3) Notes of a Meeting held at Government House, Nairobi on February 29th, 1928.
- (4) Pasture investigations in Kenya; November, 1928 to February, 1928. Note by Dr. J. B. Orr.

These papers have also been circulated to the Sub-Committee on Dietetics.

(Signed) A. F. HEMMING.

Secretary to the Sub-Committee.

Enclosure No. (1)

Copy of a letter dated March 17th 1928.

From Dr. J. P. Orr to the Chairman.

Nairobi, Kenya.

14th March, 1928.

Dear Major Elliot,

The following report is sent to you as Chairman of the various committees interested in the Kenya investigations, for your personal information. It has been drawn up so hurriedly that it is not fit to be submitted as an official report.

I visited the various centres where work is being done and have had repeated discussions with the workers sent out and the permanent officials interested in the investigation.

At the request of the Governor a Conference was held to consider the results of the work. Those present were the Colonial Secretary, the Director of Medical and Sanitary Services, the Acting Director of Agriculture, the Director of the Veterinary Research Department, and the Settlers on whose estates the feeding experiments with animals are being done.

A report of the animal work was drawn up for the Conference; a copy is attached. The report on the general work was made orally. A copy of the minutes is enclosed. A detailed account of the medical work is being drawn up by the Director of Medical and Sanitary Services, who has been in close touch with the work, and will accompany this report.

The main points of the reports are:-

Animals: The feeding tests at Nairobi are negative; the tests at the other centres are definitely positive. This is in accordance with what would be expected from the analysis of the faeces from the pastures.

Native Diets: The field survey shows a marked difference in the diets of the Kikuyu and the Masai, and a difference in the physique and kind of diseases prevalent in the respective tribes.

The laboratory and animal work has yielded interesting results, the practical significance of which for preventative medicine is in some cases not yet clear.

The opinion of the Conference seemed to be that the results of the work on animals is of considerable economic importance, and that on native dietetics of potential value in connection with the prevention of disease and the improvement of the physique of the natives.

It was unanimously agreed that the work should be continued and if possible extended especially along the lines of the practical application of the knowledge being accumulated. It may be expected that the Kenya Government will make a request for the work to be developed under the continued general guidance and direction of the present technical committee appointed by the Milk Research Council, and will offer the continued co-operation of the local officials, increased local facilities and a grant of money to enable the work to be extended.

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Nairobi, Kenya.

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At the request of the Governor a Conference was held to consider the results of the work. Those present were the Colonial Secretary, the Director of Medical and Sanitary Services, the Acting Director of Agriculture, the Director of the Veterinary Research Department, and the Settlers on whose estates the feeding experiments with animals are being done.

A report of the work done was drawn up for the Conference; a copy is attached. The report was read and was made orally. A copy of the report is enclosed. A detailed account of the medical work is being drawn up by the Director of Medical and Sanitary Services, who has had in close touch with the work, and will subsequently be sent.

The main points of the reports are:

Animals: The feeding tests at Nakuru and Kericho, and the tests at the other centres are definitely positive, and in accordance with what would be expected from the results of the feeding tests.

Native Diseases: The field survey shows a marked difference in the diet of the Kikuyu and the Masai, and a difference in the physique and kind of illnesses prevalent in the two districts.

The laboratory and clinical work has yielded interesting results, the practical significance of which for preventative medicine is in some cases not yet clear.

The opinion of the Conference seemed to be that the results of the work on animals is of considerable economic importance, and that on native dietetics of potential value in connection with the prevention of disease and the improvement of the physique of the natives.

It was unanimously agreed that the work should be continued and if possible extended especially along the lines of the practical application of the knowledge being accumulated. It may be expected that the Kenya Government will make a request for the work to be developed under the continued general guidance and direction of the present technical committee appointed by the Field Research Council, and will offer the continued co-operation of the local officials, increased local facilities and a grant of money to enable the work to be extended.

With regard to the completion of the investigation, the work with animals is clear and straightforward, the results are in accordance with those which have already been obtained in Britain, South Africa, Australia and New Zealand, and the main requirement is to demonstrate on a larger scale the application of the information gained. The programme for the immediate future is attached.

With regard to the medical work, I have arranged with the Director of Medical and Sanitary Services here that Doctor Foster and Doctor Henderson should continue the investigation along the lines indicated in the medical report attached until the late autumn of the present year, when they will have completed two years work. They should then be brought back to the Rowett Institute where the mass of data will be analysed and put into a form in which it can be considered by the district sub-committee of the Civil Research Committee. When that committee has considered the research proposals in the question of the desirability of continuing the work, the lines along which it should be continued, and the necessary arrangements, could then probably be arranged.

I would like to see that the whole investigation is carried out with a minimum of friction, especially on the part of the medical officers. It is to be hoped that the scientific part of the work was done by the workers themselves and not done by the officials.

The committee in London is being made by the Government to organize the scientific information which the Government has received of having existing problems.

Yours faithfully,

ENCLOSURE NO. (31)

REPORT ON INVESTIGATIONS ON NATIVE
DIETICS BY THE DIRECTOR OF MEDICAL
AND SANITARY SERVICES, KENYA.

The visit to Kenya of Dr. J.B. Orr afforded an unique opportunity for a discussion of the investigations on native dietics which are being carried out by the workers sent out by the Sub-Committee of the Civil Research Committee and by the Officers of the Kenya Medical Service. Certain other investigations having a bearing on the general problem were included. The discussion was of exceptional interest and of great value to all. As a result, it was considered desirable that a report giving a general idea of the progress made should be drawn up for the information of the Chairman of the Sub-Committee by the Director of Medical and Sanitary Services who has been in close touch with all the different aspects of the investigations.

It will be remembered that two Officers were appointed from England, one for field work and the collection of information regarding dietary habits and customs and their correlation with disease among the Masai and Kikuyu races, and the second for investigations on the aetiology of the ulcers which are so commonly met with among the natives.

The basic reason of the ulcer investigation was that it was considered that the large incidence of ulcers might be a result of some dietary deficiency. The collection of information relating to the dietaries of Masai and Kikuyu was decided upon on account of the wide variation met with in these two tribes, the first living almost entirely on animal products and the second on cereals.

One of the conditions attached to the investigation was that two Officers should be supplied by the Government of Kenya for work on the general problem. The Kenya Government agreed and also expressed its willingness to defray the local expenditure in connection with travelling, housing, etc., of the Officers appointed in London.

Dr. J.M. Henderson was selected for the ulcer investigation and Dr. J.W. Foster for the field work. The last named was employed for three months prior to sailing in an examination of the literature in order to obtain information as to dietary habits among uncivilised races which might indicate that special measures had been evolved in order to cope with deficiencies in the mineral constituents of the diet. Dr. Henderson arrived in Kenya on 11th November, 1926, and Dr. Foster on 19th February, 1927.

Necessary re-arrangements in the Medical Laboratory at Nairobi had been effected prior to Dr. Henderson's arrival, in order to accommodate the extra worker. In addition, plans had already been got out for the performance by the Kenya Bio-Chemist, Dr. F.C. Kelly, of metabolic experiments to be carried out on a large scale at the Nairobi Prison. With every assistance from the Prison Authorities special arrangements were made for the cooking and distribution of food to the groups of prisoners selected. On the retirement of Dr. Kelly the work was taken over

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were placed under his sole charge. Special arrangements for the feeding, addition of supplements to the diets and treatment of the cases were made. In addition to the chemical and clinical work which was required for the study of the ulcer cases and which was performed by Dr. Henderson himself, certain other investigations were necessary and were performed by the various members of the staff of the Medical Research Laboratory. These included bacteriological investigation of the ulcers, the Wassermann re-action of the cases and clinical laboratory work for the detection of protozoological or helminthological parasites. All the laboratory work both by Dr. Henderson and others came under the direct charge of the Deputy Director of Laboratory Services, Dr. W.H. Kauntze.

The metabolic experiments indicate that the prisoners at the gaol are probably suffering from a deficiency in calcium. The majority of the cases, particularly the growing boys, showed either a definite negative balance in this connection or a very small positive one. The results coincided with the analyses of the diets which showed a calcium content of roughly one-third of the generally accepted optimum, although they were satisfactory with regard to the other constituents and probably more satisfactory than the ordinary diet in a reserve.

These findings, investigations, by Dr. Foster in the Kikuyu Reserve and such analyses as have so far been performed at the Rowett Institute tend to confirm these findings, while it is clear that resort has been made by the natives to sources of calcium which are not obtainable in their ordinary food-stuffs. The results of the metabolic experiments are contained in three papers which have been written conjointly by Dr. Henderson and Dr. Kikuyu. It is suggested, should be published at an early date, that considerable economic importance attaches to these results. It appears clear that the ordinary food-stuffs of the country are normally deficient in calcium and that some effort has been made to amply supply of this mineral. It remained to be considered whether by the addition of some cheap form of calcium to the diet of the employed native outside his own reserve, physical improvement could be attained or, at any rate, a loss of physical efficiency prevented. The question of substitution to native diet generally will require to be considered. Further information has been collected as regards the calcium position in the reserves.

It was decided to perform a further metabolic experiment in the gaol to ascertain the effect of an addition of small quantities of

- (a) powdered chalk, and
- (b) powdered bone meal.

These substances were selected on account of their cheapness and from the fact that they could probably be added to the diet without causing any great disturbance either in the mind of a labourer or in the economy of the farm. The results to date tend to indicate that the addition of either of these substances is followed by a considerable retention of calcium in the growing boys on whom the experiment was conducted and who

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were previously on a very small positive balance.

During the course of the metabolic experiments an interesting and important point emerged. The addition of cod liver oil to one of the groups was not found to be followed by an increase in calcium retention in the absence of an additional supply of that mineral. Another group on an addition of a mineral mixture without cod liver oil was found to be retaining calcium. Both groups were exposed to similar conditions and amounts of sunlight.

The investigation into the aetiology of ulcers has so far produced little in the way of positive evidence of any special deficiency. It is clear however from data which have been collected that syphilis, yaws or malaria are not the causal factors. There was found to be distinct delay in the sugar tolerance curve but this was not confined to individuals suffering from ulcers. A similar observation was made in India in connection with cereal-eating people. The percentage calcium content of the blood in ulcer cases varied between wide limits: the average, however, was not definitely less than in non-ulcer cases. The blood phosphorous was definitely higher than normal. The exact significance of the last two observations is not understood, it is evident however that there is disturbance of the calcium and phosphorous metabolism associated in some way with a disturbance of sugar metabolism as evidenced by the delay in the sugar curve. There was an increase of the lymphocyte count. Apart from these observations little information was gained beyond the fact that the subjects were all in a state of malnutrition as shown by the co-incident healing of ulcers and improvement in the general condition.

During the course both of the metabolic investigations and those on ulcers it was apparent that the factor of helminthic infestation was one that could not be ignored and was one that might possibly have a considerable influence on metabolism generally and particularly of calcium.

An independent investigation conducted at the same time showed that an infestation by taenia of growing boys produced very considerable effects on the general nutritional condition. Information is being sought with regard to the effect on adults. The possible effect of helminthic infestation is obviously of such importance that the part played in the nutritional problem must be cleared up before any definite conclusions can be drawn. It is proposed immediately to undertake a metabolic investigation at the gaol on prisoners infested with intestinal worms.

In connection with the possible influence exercised by helminthic infestation on the nutritional condition a particular point has arisen on several occasions. It has been suggested, and a certain amount of evidence has been brought forward in support, that helminthic infestation itself is largely influenced by the nutritional condition. An endeavour is being made to ascertain evidence in support or otherwise of this theory. In this connection the feeding experiments at Molo at present being conducted on sheep may throw considerable light. In these experiments groups of sheep are being grazed together on the same pasture, some receiving supplementary feeding in order to balance up deficiencies.

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INDICATED NO. (III).

NOTES OF A MEETING HELD AT GOVERNMENT HOUSE,
NAIROBI, ON 29th FEBRUARY, 1928.

Present: His Excellency Sir Edward Grigg (in the Chair),
Sir Edward Denham, K.B.E., C.M.G., Colonial
Secretary,
Dr. John Boyd Orr, Director, Rowett Research
Institute,
Lord Delamere,
Dr. J.L. Gilks, Director of Medical and Sanitary
Services,
Mr. H.P. Martin, Commissioner for Local Government,
Lands and Settlement,
Mr. D.L. Blunt, Acting Director of Agriculture,
Mr. J.F. Watson,
Mr. W.J. Dawson,
Mr. O. Dixon, Senior Veterinary Officer,
Mr. J. Walker, Chief Veterinary Research Officer,
Mr. A. de V. Wade, Principal Assistant to the Chief
Native Commissioner.

His Excellency asked Dr. Orr to describe what work had been done up to the present, and to make suggestions for the future.

Dr. Orr circulated a summary of the results on pasture investigated in Kenya, November, 1926 to February, 1928. This having been studied by the meeting, Dr. Orr explained that the work has been in the nature of application of knowledge already gained elsewhere: it had not been new research.

The investigation was into any deficiency of certain nutrients, e.g. phosphorus calcium sodium potassium which might exist in Kenya pastures. Pastures from different districts had been analysed. Deficiencies were found in certain districts. On the other hand the pastures at Naivasha were exceptionally rich at least in all nutrients required in large amounts, and were comparable with the best British cultivated pastures.

He explained that feeding experiments were begun in order to avoid delay before the analyses of pasture were completed. At Naivasha the results had been negative but at other centres the results had been favourable both as regards growth of animals and increased production of milk. The latter result is comparable with results obtained in South Africa. In sheep tests at Molo and Naivasha the results on weight of fleece had been positive, the increase in weight being from 5 to 10 per cent. The results

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obtained in Nakuru with regard to the disease known as
Makuruti are similar to those which have been obtained in
New Zealand.

Another line which had been followed was an in-
vestigation of the result on milk production of feeding
concentrates. This had been tried out at Doonholm with
favorable results.

Dr. Orr said that he was not prepared to discuss
whether bearing these results might have on the development of
animal husbandry in Kenya. They were merely experimental
results and the nature of the information gained had not yet
been tested under ordinary conditions.

His Excellency asked for advice as to future
progress of the work.

Dr. Orr said he would like the work to carry on
for at least another year to confirm the results obtained
and to see the effect of feeding for longer periods.

His Excellency asked what attitude the Civil
Research Committee would be likely to adopt.

Dr. Orr stated that he thought the scientific
members of the Civil Research Committee in London were
interested in the results being obtained and that they
would wish the experiments to be continued. He said
that he thought also that the Empire Marketing Board would
be willing to carry on apart from the scientific interest
of the work because the results already obtained suggested
that such work might be of value not only for Kenya but for
other parts of the Empire.

His Excellency then asked if Dr. Orr could suggest
a programme for future work, and the meeting then discussed
the work at five or six different centres where the experiments
had been proceeding.

1. Nakuru.

Dr. Orr explained that the investigation at
Nakuru was finished so far as the experimental aspect was
concerned. It remained to be seen however whether the
results obtained under experimental conditions would be
obtained under ordinary farming conditions. He suggested
that a few settlers should be invited to carry out the
measures found beneficial in the experiment. No government
assistance was necessary. Lord Delmore said that he was
sure settlers would co-operate most willingly. Mr. F.J.
Dawson agreed, and stated that they were already attempting
to apply the results of the investigation on their own
farms but they did not have full information about the
method used in the experiment.

2. Naivasha.

Dr. Orr explained that no gross deficiencies had
been discovered in the pasture at Naivasha, but in the test
with sheep the yield of wool had been increased. There is
so far no explanation of this, and he would like to con-
tinue experiments for another few months, at least until
the next clip, to confirm this rather unexpected result.
Government assistance would not be necessary for this.

3. Doonholm.

Dr. Orr said it would be well worth while carrying on for another few months. Mr. J.K. Watson explained that there was a loss of revenue on account of the control herd of cattle, which were suffering severely during the drought. His Excellency suggested that Government might supply cattle. Lord Dalmeida thought that probably the local herd contained the best milkers in the country and thought that the work should be continued with the local herd, but that Government might assist in the form of compensation for actual loss incurred by the owner.

His Excellency concurred.

4.

Dr. Orr said that he had intended to carry on for one order, but that the supply of the milk cows had to be stopped to start the young animals, and that the young animals, which were being reared, would be available for the next year.

Dr. Orr explained that there were not cows sufficient to complete the programme, but that these four centres, which were the work so far had been carried out with less expense than had been expected.

His Excellency asked whether this programme was at all likely to be carried out. Dr. Orr explained that the programme required a financial outlay of about £10,000 at Malvasha to continue the work at Doonholm to be continued with compensation from the Kenya Government for any loss incurred by the owner. Dr. Orr said that the work at Malvasha would continue for the next year, and that the account of this programme is provided from the grant made by the Empire Marketing Board, with the approval of the Honorable Secretary of State for the Colonies.

Dr. Orr said that the Colonial Office had already indicated that financial support would be afforded in the Empire Marketing Board for the original period of two years.

His Excellency asked what general suggestions Dr. Orr had to make to carry on the work already discussed.

Dr. Orr said that he was in considerable doubt as to the extent of the information obtained from the work already carried out. He said that the work was not very far advanced, but that the practical difficulties were already known. Two lines appeared:

1. The capacity and capability of native cows under proper feeding and management had never been ascertained. It might be possible to arrange for a herd of native cows to be kept under proper conditions long enough to see what improvement could be effected in their milking capacity by proper feeding, handling and

selective breeding from the best animals. This improvement of the native breed would be of advantage not only to native but also to European stock owner, because native stock was the basis of his herd. He believed the Veterinary Department was devoting attention to the study of native cattle.

His Excellency asked Lord Delamere whether he thought that work devoted to native stock would be of benefit to the Colony generally.

Lord Delamere said that he considered improvement of native stock by the natives themselves was not likely to occur so long as the system of communal land holding existed. He thought that such improvement, if it could be effected, would be of value to the Colony as a whole, including the European stock owners.

Both Mr. J.K. Watson and Mr. W.J. Dawson agreed with Lord Delamere's opinion.

His Excellency asked how Dr. Orr proposed that this work should be carried out.

Dr. Orr suggested that it might be combined with the scheme proposed by the Veterinary Department for the training of African

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Mr. Blunt stated that there was a vacancy for one livestock officer, and thought that the appointment suggested would be the best way of filling the vacancy.

The question was raised whether this vacancy was not on account of an appointment sanctioned for some specific purpose.

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Dr. Orr suggested that it might be combined with the scheme proposed by the Veterinary Department for the training of Africans in animal husbandry.

Mr. Dixon said that it was the intention to include in this scheme of training the breeding of an improved herd of native cattle. He thought that the work could be done at Ngong.

Lord Delamere was prepared to offer land at Naivasha for the purpose, but agreed that it would be better to concentrate at Ngong.

His Excellency asked what expense would be incurred.

Dr. Orr said his suggestion could be incorporated as part of the scheme of the Veterinary Department. A practical expert in animal husbandry would be required to devote his whole time to see that methods of handling, milking and feeding were the best possible under the local conditions, to record the milk yield and select for breeding the animals with the highest yield. He did not think the Empire Marketing Board would assist as the results would be of interest only to Kenya.

His Excellency asked if Dr. Orr could give them a man for this work.

Dr. Orr said he might lend one of his men who should take on a semi-permanent appointment under the Veterinary Department, and should be entirely under that Department to avoid dual control.

Mr. Blunt stated that there was a vacancy for one livestock officer, and thought that the appointment suggested would be the best way of filling the vacancy.

The question was raised whether this vacancy was not on account of an appointment sanctioned for some specific purpose.

His Excellency stated that in any case Government must make provision for the salary of the officer suggested by Dr. Orr as essential for the scheme. With this Lord Delamere agreed.

2. Dr. Orr then proceeded to outline his second proposal, which he described as an ideal project. It was to take a farm and manage it in such a way as to demonstrate the value of methods which, as the result of the work so far completed, seemed to be practicable for application to farming in Kenya. It would be experimental work in the economic sense, in so far as the work would be on the basis of determining the profit and loss of different methods of feeding and construction of pens to apply under tropical conditions and to find out the most successful elements. He thought that the scheme would be carried through in a few years, considering the future of the livestock industry in Kenya, and the results might be of value in other parts of the Empire where animal husbandry was being developed under similar conditions.

His Excellency thought the scheme would be a very good thing and upon the whole in favour of it.

Lord Delamere said that he felt very strongly that this demonstration farm should not be under the control of the Government, which is always subject to criticism. Public opinion would thought the demonstration should be carried out on a paying basis, if it were to impress matters. He suggested that the Government should facilitate the farm, which would then be put in their control, central, free from political interference by the people of the Colony. He thought that the Government should be interested in the best place for the purpose.

Dr. Orr said that the original proposal would require a great deal of consideration, but he was in entire agreement with the general lines of the proposal suggested by Lord Delamere. The Empire Marketing Board had been very much interested in the suggestion and it would be very desirable to be carried out in the next year. It would be a very good thing to have a demonstration farm of this kind.

Mr. J. Dawson expressed himself very strongly in favour of the scheme and stated that Dr. Orr's experiments had been the first tangible result to be attained after 21 years of discussion. He thought that the work carried out as the result of Dr. Orr's initiative had been characterized by remarkable thoroughness and cheapness, and complete efficiency on the part of the staff employed.

It was suggested that Lord Delamere, Dr. Orr, Mr. Walker, Mr. Blunt and Mr. Dixon should meet to consider the terms on which the land and stock should be handed over, provided the scheme were approved by all the authorities concerned.

Dr. Orr said that a subject of very great importance had emerged from these investigations. That was the nutritional factor in disease. This was the subject of serious consideration not only with himself in connection with the special work here, but also of the Veterinary Department in connection with various diseases, and of the Medical Department in connection with disease in natives. Unanimity of opinion was arising that deficiencies of some essential substance in the diet or some other error of diet was an important predisposing cause of disease. As a result of the general investigation some information was already being obtained on this important problem and he thought work of this kind should be continued and expanded both by the Medical and Veterinary Research Departments. The work of course involved a good deal of physiological chemistry.

Mr. Walker said he was much impressed with the importance of the work that he had had under consideration and proposed for the employment of a Physiologist and a Bio-Chemist.

Mr. Walker had no objection to thorough agreement with the authorities in carrying this aspect of Veterinary Research forward. He suggested that developments which might arise as a result of the Commission on Veterinary Research now being set up should be discussed with the Commission. He suggested that it would be inadvisable to delay a long any new purely scientific work. He suggested that for a while the work should be carried along definite lines and the biochemical work should be carried in the Medical Laboratory where this branch of the work is already being done in connection both with animals and humans. He stated that work of this nature could be better carried on at the laboratory in Kenya than by the present method which involved a great deal of material had to be sent to England for examination. Increased laboratory accommodation would be necessary but this would only be a matter of some months or so.

Mr. Walker explained that if the work were to be continued and concentrated at the Medical Research Laboratory additional accommodation would be required.

Mr. Walker asked Dr. Orr if it was intended to publish the report which had been circulated at the meeting. He suggested that results should be made known as soon as possible.

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Dr. Orr thought that a summary of his report, in the form of a popular article, might be published; but he explained that it would be necessary to obtain previous sanction of the Civil Research Committee and the Empire Marketing Board. It was suggested that if permission were obtained this article might be published in the Kenya Medical Journal.

Sir Edward Denham suggested that publication in the public press would be desirable, and it was agreed that this could best be done by means of preliminary publication in a technical journal such as the Kenya Medical Journal, from which the public press could copy.

In conclusion, His Excellency expressed on behalf of all those present his gratitude to Dr. Orr for his very successful work in the interests of the Colony.

Dr. Orr said that the success of the work had been assured by the willing co-operation of Government Departments.

MEDICAL SECTION.

At request of the Government, Dr. Orr gave a brief outline of the work which has been carried out.

The investigation had originated in the enquiry on the cause of malnutrition in farm animals. The Medical Department had recognised that a good deal of the disease amongst natives might be due directly or indirectly to deficiencies in the diets. After consultation with Dr. Gilke and his staff and a visit to the natives reserves, he (Dr. Orr) decided to insert a paragraph in the official report calling attention to the nutritional problem in natives and suggesting that the problem in natives was of the same nature as the problem in animals. The Civil Research Committee after consideration of the Report decided that a grant should be made for work on native dietetics.

The object of investigation had been to determine that nature of native diets in different tribes and the kind of diseases most prevalent in these tribes.

A survey carried out by Dr. Foster had shown that amongst Kikuyu, who were almost completely vegetarian pulmonary diseases were very prevalent. Tuberculosis appeared to increase with the increase in age, and the condition of teeth was poor. The general physique of the Kikuyu was poor. The result of enquiry into the health of the Kikuyu was in line with what had been found in 1917 when drafts from this tribe were medically examined in recruitment for the Carrier Corps, when it was found that 65% of men chosen for work were rejected as physically unfit at the first medical examination.

The Masai who lived chiefly on meat, milk and blood appeared to be of much better physique: they did not suffer from pulmonary diseases or ulcers to anything like the extent found in Kikuyu. Teeth were good. The chief diseases seem to be rheumatism and constipation.

An analysis of native foodstuffs was being done at the Rowett Research Institute. Results are not yet available.

Dr. Henderson with Dr. Kelly of the Kenya Medical Department, and later Dr. Harvey, had carried out an enquiry on the diet of prisoners. This diet was believed to be better than that in native reserves but analysis showed that it was probably deficient. The most marked deficiency was in calcium, the amount present being only about one-third of what was regarded as the optimum amount for an adult.

A number of metabolic experiments had been carried out in which it has been shown that if foodstuffs rich in calcium were added to this diet the amount of calcium retained was definitely increased, while rate of growth of young prisoners was augmented and their condition in general improved. Metabolic experiments are at present in progress to determine whether the addition of calcium in a cheap form as calcium salt would produce the same effect. On the assumption that ulcers might be related to faulty nutrition this condition has been investigated. Some previous work had been directed to local treatment of ulcers but the present investigation however an attempt was made to eliminate the cause so that preventive measures might be applied. It had been shown that malaria, syphilis and yaws were probably related. Various blood investigations had been carried out and it had appeared that in this condition there existed a high percentage of phosphorus and a condition of anaemia and low tolerance to sugar, the latter probably associated with high carbohydrate diet. It is noteworthy that as the general condition and weight of these ulcer patients improved the ulcers tended to heal.

It is probable that there was a connection between the malnutrition and the parasites which were known to have adverse effects on the body. It is probable that there was a connection between the malnutrition and the parasites.

In conclusion, Dr. Henderson's visit had been the closest co-operation between the Kenya Government and the Rowett Research Institute and the permanent officials of the Kenya Department both in clinical work and in the laboratory.

Dr. Hildebrandt gave some further details regarding the work and spoke of its great importance in connection with the health of the natives and also its economic importance in connection with provision of sufficient labour. He said that the grant under which the work had been done was a two years grant, and that the work was now being done on a yearly basis. He said that the research was of a high standard and that the Government should take the necessary steps to continue the work and especially to encourage the distinguished members of the staff of the Rowett Research Committee under whose guidance the work had been carried out. He said that the Government should not only offer all facilities for the work but should make a special research grant.

The Governor asked Dr. Orr what view the Civil Research Committee and the Empire Marketing Board would take with regard to the continuation of this work in which he (The Governor) was very much interested and which recognised would be of great importance to the Colony.

Dr. Orr said that the problems being investigated were not peculiar to Kenya, results being obtained were of considerable scientific interest and would be of value for other parts of the Empire. He thought therefore that the sub-committee of the Civil Research Committee would be willing to continue the work provided the necessary grant were made by the Empire Marketing Board.

The Governor asked whether extra facilities would be required if work were to continue.

Dr. Orr replied that an extension of the Laboratory in Nairobi would be necessary.

Dr. Gilks in reply to the Governor said that extension would cost only a few hundred pounds.

Dr. Orr said that in addition to extension of the laboratory, there would be required another bio-chemist and assistant, so that some of the chemical work which at present is being done at the Rowett Institute could be carried out locally. He thought also that if extension of the laboratory were made, all the bio-chemical work, including blood examinations such as haemoglobin and sugar determinations, could be carried out there in connection with both animal and human experiments.

Mr. Walker spoke of the importance of nutrition in connection with the incidence of disease in animals, in many respects human and animal problems were similar. He thought the co-operation between Veterinary Department and the Medical Department and special workers from the Rowett Institute should be continued.

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ENCLOSURE NO. (IV)

SUMMARY OF RESULTS:

PASTURE INVESTIGATION IN KENYA

November 1926 - February 1928

NOTE by DR. J.B. ORR.

The investigation was undertaken to determine whether the pasture in certain districts in Kenya was deficient in essential nutrients and if so, whether these deficiencies were the cause of malnutrition in cattle and sheep.

The work consisted of:-

- A. Analysis of samples of pasture from four districts;
- B. Feeding experiments with cattle and sheep, to test the effect of feeding of certain constituents which were thought might be deficient.

A. COMPOSITION OF PASTURES.

The following Table on Appendix I, shows the average composition of the pastures at Naivasha, Athi Plains, Molo, and Nakuru, and for comparison that of good British pastures.

It is seen that the Naivasha pastures are rich in nitrogen, lime, phosphorus and potash, as good British pastures, though rather lower in sodium and chlorine. Molo and Nakuru are markedly deficient in all the constituents. Those of the Athi Plains are intermediate in value between Naivasha and Molo. The deficiency in phosphorus at Molo is very marked, and is comparable with that found in the phosphorus deficient areas of South Africa and Australia, where malnutrition due to this cause occurs.

Samples were collected at intervals throughout the year to determine the difference in analysis after rainfall during drought.

The Tables, Appendix 2, show the effect of rainfall in a good area - Naivasha, and a poor area - Nakuru.

It will be seen that there is a great increase in the mineral and protein content following rain. The increase is most marked in the good pasture - Naivasha, which responds to rain both by increased rate of growth and by improvement in quality much more rapidly than the poorer pastures of Nakuru and Molo.

B. FEEDING TESTS.

Nakuru. The tests at Nakuru were carried out to throw light on the cause of the local disease known as "akuruitis". From the appearance of the animals and the results of work in New Zealand it was thought that deficiency of iron might be an important factor.

Four groups each of 50 oxen were grazed on the affected area: the animals in one group were given a mixture of salt and iron oxide in equal proportions (1 lb.). Other two groups were given mineral mixtures with a lower amount of iron - 8 per cent and 1 per cent. The remaining group serving as control received nothing in addition to pasture.

The Table, Appendix 3, gives details of the average gain or loss in weights in the different groups for a period of ten months. The average gain or loss is as follows:-

	<u>Control.</u>	<u>Low iron.</u>	<u>Medium iron.</u>	<u>High iron.</u>
	lbs.	lbs.	lbs.	lbs.
Average gain or loss	- 36	- 11	+ 69	+ 136

It will be seen that the control group receiving no mineral mixture lost weight whereas considerable gains were made in the groups receiving salt and iron oxide. The other two groups were intermediate and roughly in proportion to the amount of iron oxide fed.

The control animals developed the typical signs of "Mak" disease, while all animals receiving salt and iron remained healthy and at this date, after the drought, are in marketable condition as slaughter or work animals.

A few animals suffering from the disease were brought by the administration of salt and iron with good results.

The Medical and Veterinary Laboratories conducted in the technical work involved in blood tests and histological examinations. The results of these examinations show that anaemia is a marked feature of the disease.

The results also indicate that whatever the cause of the disease it can be prevented by the administration of salt and iron.

RESULTS OBTAINED IN EXPERIMENTS.

Two groups of ewes with lambs were selected to be grazed on the affected area. One group received a mineral mixture, a second group received a protein mixture, the third group which served as control received nothing in addition to pasture at any time. The lambs received rock salt ad lib. The results for weights of ewes and rate of growth of lambs are given on appendix 4.

The following figures give a summary of the results to date:-

Average gain in weight of lambs:-

	<u>Control.</u>	<u>Control</u>	<u>Control</u>
	lbs.	lbs.	lbs.
12 months - Molo	83.24	87.75	85.57
14 months - Naivasha	55.2	57.3	57.5

86

The rate of growth of lambs is much greater - nearly double at Naivasha than at Molo. In the former district the addition of mineral and protein had little or no effect on the rate of growth, whereas at Molo the average rate of growth of the animals receiving the minerals was 19 per cent greater than the controls, those receiving protein in addition 53 per cent.

These results are in keeping with the analyses of the pastures which showed a marked deficiency at Molo but none at Naivasha.

The weights of the fleeces in the fed groups are about 10 per cent heavier in both Molo and Naivasha.

CALF REARING.

Molo and Naivasha.

Tests were carried out at Molo and Naivasha. At the latter centre no beneficial effect was obtained (up to one year) with feeding either minerals or protein. The animals in all the groups are in excellent condition.

At Molo the average increase to date was as follows:-

<u>Control.</u>	<u>Control Minerals.</u>	<u>Control Minerals, protein.</u>
255 lbs	370 lbs.	319 lbs.

Figures are given in detail on appendix 5.

MILK COW EXPERIMENT.

The tests at Naivasha and Molo were undertaken to determine the effects of the feeding of minerals and protein. There were, however, such marked differences in the quality of cows that the data are useless. At Molo a second test was carried out with helpers, whose milk yield was recorded during a preliminary period before feeding of minerals or protein was begun and the animals then arranged in 3 comparable groups of 8 with the same average yield. Appendix 5 gives data for this test.

The following table shows difference in milk yield, that of the control group being expressed as 100:-

<u>Control</u>	<u>Control Mineral</u>	<u>Control Mineral, protein.</u>
100	133	135

The feeding of minerals to those cows seems to have a marked beneficial effect on the milk yield.

In addition to work on the main problem, viz. deficiencies in pasture, it was possible to carry out, without additional expense, feeding experiments with milk cows, pigs

APPENDIX I.

TABLE A.

Comparison of the Dry Matter of the herbage.

	Mavvasha Av. of 14 samples.		Lambton (Abli-Bains) Av. of 7 samples.		Wallo Av. of 18 samples.		Nakuru Av. of 23 samples.		British Pastures. Av. for 14. for hill Cultivated pasture "all pasture" eaten.	
	100		100		100		100		100	
Dry Matter	1.952	1.56	0.950	0.99	2.82	2.50	2.82	2.82	2.82	2.50
Nitrogen	5.635	4.72	2.422	2.90	6.64	5.85	6.64	6.64	6.64	5.85
Acid Sol. Ash	0.955	0.64	0.484	0.40	1.00	0.85	1.00	1.00	1.00	0.85
lime (CaO)	0.062	0.16	0.016	0.07	0.25	0.37	0.25	0.25	0.25	0.37
Soda (Na2O)	2.123	1.55	0.779	1.72	3.18	2.65	3.18	3.18	3.18	2.65
Potash (K2O)										
Phosphoric Acid	0.885	0.75	0.194	0.32	0.74	0.67	0.74	0.74	0.74	0.67
Chlorine (Cl)	0.389	0.47	0.170	0.35	0.94	0.64	0.94	0.94	0.94	0.64

TABLE B.

Rainfall Effect--Mavvasha. Percentages expressed on Dry Matter.

Date of Collection.	March 6th Before rain.	March 23rd After rain.
Dry Matter.	100	100
Nitrogen	1.05	2.60
Acid Soluble Ash	2.70	8.75
lime (CaO)	0.51	1.22
Soda (Na2O)	0.03	0.08
Potash (K2O)	0.70	4.17
Phosphoric Acid (P2O5)	0.50	1.15
Chlorine (Cl)	0.24	0.62

TABLE C.

Rainfall and Nutrient Effects - Nakuru.
Figures extracted in the Dry Matter.

Date of Collection	January 7th		March 10th		April 16th		June 27th	
	100	After rain.	100	After rain.	100	After rain.	100	Grass fully mature.
Dry Matter.	0.51	0.75	1.95	0.77	3.65	0.38	0.38	0.38
Nitrogen	2.25	2.41	6.12	0.52	0.06	1.96	0.19	0.13
Acid Soluble Ash	0.35	0.40	0.06	3.25	0.41	0.85		
Lime (CaC)	0.02	0.14	0.15					
Soda (Na ₂ O)	3.97	0.15	0.27					
Potash (K ₂ O)	3.17	0.26						
Phosphoric acid (P ₂ O ₅)	0.26							
Chlorine (Cl)								

FEEDING EXPERIMENT.

"Nakuruitis".

(Weight in lbs.)

	<u>Group I</u> <u>(Control)</u>	<u>Group II</u> <u>(Low Iron)</u> <u>Grade Oxen</u>	<u>Group III</u> <u>(Medium Iron)</u>	<u>Group IV</u> <u>(High Iron)</u>
11/11/23	720.0	774.3	753.8	764.3
12/1/23	724.5	769.3	827.7	952.2
		5.0	73.9	187.9

Grade Oxen.

	580.7	558.1
	415.3	633.9
	34.6	10.4
	150.0	601.0
	77.3	746.3
	18.4	146.3

Iron Content of Mixtures.

1% 80%

FEEDING EXPERIMENTS.MOLO.

Average weight per lamb (lbs)

	Group 1 Control	Group 2 Control Minerals.	Group 3 Control. Minerals protein.
	lbs.	lbs.	lbs.
Average wt. 16/2/27	35.0	35.2	35.1
Average wt. 16/2/28	58.34	62.95	70.67
Gain (12 months)	23.34	27.75	35.57
Gain expressed as % of gain in Group 1	100	119	153

Fleece Weights (lbs)

	Group 1	Group 2	Group 3
	lbs.	lbs.	lbs.
From 16/2/27 - 19/5/27	1.58	1.74	1.81
From 19/5/27 - 1/12/27	2.72	2.83	3.19
Total	4.30	4.57	5.00
Average condition of wool (possible 8 pts)	4.32	6.24	6.43

NAIVASHA.

	Group 1 Control.	Group 2 Control Minerals.	Group 3 Control Minerals protein.
	lbs.	lbs.	lbs.
Average wt. lambs 24/11/26	26.0	24.1	24.8
" " 7/2/28	80.8	81.4	82.8
Gain - 14 months	54.8	57.3	57.4

Fleece Weights (lbs)

	Group 1	Group 2	Group 3
	lbs.	lbs.	lbs.
Lambs - From 24/11/26 to 1/4/27	1.95	2.31	2.04
From 1/4/27 to 11/10/27	3.68	4.21	4.06
Total	5.63	6.52	6.10
Ewes - From 1/4/27 to 11/10/27	3.92	4.66	4.18

FEEDING EXPERIMENTS.

MOLO.

Average weight per lamb (lbs)

	Group 1 Control	Group 2 Control Minerals.	Group 3 Control, Minerals protein.
Average Wt. 16/2/27	35.0	35.2	35.1
Average Wt. 16/2/28	58.34	62.95	70.67
Gain (12 months)	23.34	27.75	35.57

Gain expressed as % of gain in Group 1

Group 1	100	119	153
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Total	4.30	4.57	5.00
Average condition of wool (possible 8 pts)	4.32	24	6.43

NAIVASHA.

	Group 1 Control.	Group 2 Control Minerals.	Group 3 Control, Minerals protein.
Average Wt. Lamb	25.0	24.1	24.8
From 8/11/26	40.2	37.4	32.8
Gain - 12 months	50.2	57.3	57.4

Fleece Weights (lbs)

Lambs - From 8/11/26	1.94	2.31	2.04
to 1/4/27	3.68	4.21	4.06
From 1/4/27			
to 11/10/27	5.63	6.52	6.10
Total			
Ewes - From 1/4/27	3.92	4.66	4.18
to 11/10/27			

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959

Any further communication on this subject should be addressed to:-

THE SECRETARY,
COMMITTEE OF CIVIL RESEARCH,
2, WHITEHALL GARDENS, S.W.1.

and the following number quoted:

C.A./C./71.

COMMITTEE OF CIVIL RESEARCH,

2, WHITEHALL GARDENS,

LONDON, S.W.1.

RECEIVED
10 MAY 1928
COL. OFFICE

10th May 1928.

Sir,

I am directed by the Committee of Civil Research to request you to inform Mr. Secretary Amary that at their 26th Meeting (C.R./26th Meeting, Conclusion 4), held on April 26th, 1928, they had before them the Third Report of the Sub-Committee on the Mineral Content of Natural Pastures (C.R.(O)25), a copy of which is enclosed herewith, together with the relevant extract from the Minutes of that Meeting of the Committee of Civil Research.

The Secretary of State will observe that the Committee agreed, inter alia,

That arrangements should be made by the Sub-Committee for the publication, semi-officially, in the local Kenya press of a descriptive paper in Dr. Orr's name dealing with the investigations carried out in that Colony.

I am accordingly to enclose herewith six copies of the proposed article by Dr. J. B. Orr (C.R.(M.O.)62), and to express the hope that the Secretary of State will arrange for this article to be published as soon as possible, semi-officially, in Dr. Orr's name, in the local press in Kenya.

I am, Sir,

Your obedient servant,

Thomas Jones

Secretary,
Committee of Civil Research.

The Under Secretary of State,
Colonial Office.

SECRET

Copy No. 20

C.R. 26th Meeting.

COMMITTEE OF CIVIL RESEARCH.

Extract from the

*Minutes of the TWENTY-SIXTH Meeting, held at 10, Downing Street, S.W. 1,
on Thursday, April 26, 1928, at 12.30 P.M.*

Present:

The Right Hon. STANLEY BALDWIN, M.P., Prime Minister (in the Chair).

The Right Hon. L. S. AMERY, M.P., Secretary of State for Dominion Affairs and the Colonies.

The Right Hon. Sir SAMUEL HOARE, Bt., G.B.E., O.M.G., M.P., Secretary of State for Air.

The Right Hon. W. C. BRIDGEMAN, M.P., First Lord of the Admiralty.

The Right Hon. WALTER GUINNESS, D.S.O., M.P., Minister of Agriculture and Fisheries.

Major W. E. ELLIOT, M.C., M.P., Parliamentary Under-Secretary of State for Scotland. (For Items 2, 3 and 4.)

Lieutenant-Colonel Sir M. P. A. HANKEY, G.C.B., Secretary, Committee of Imperial Defence.

Sir DANIEL HALL, K.C.B., F.R.S., Chief Scientific Adviser, Ministry of Agriculture and Fisheries.

Mr. THOMAS JONES, Secretary to the Committee.

Mr. A. P. HEMMING, O.B.E., Assistant Secretary to the Committee.

was one of great economic importance. It also indicated that co-ordinated research effort, if well directed, was likely, within a relatively short time to yield further information of practical value to the Animal Husbandry Industry of the Empire.

5. On the 14th April, 1926, we submitted a Second Report to the Committee of Civil Research setting out the facts which had been brought out by the enquiry and outlining the investigations which we recommended should be undertaken immediately. Our principal recommendations in that Report may be summarised as follows—

(a) That practical investigations should be carried out in the most suitable Colony or Dependency with a view to ascertaining whether the nature of the mineral deficiencies can be determined and the diseases due to them prevented.

(b) That the most suitable site for this investigation was Kenya.

(c) That a minimum of four bio-chemists should be engaged for this work in Great Britain and two field workers in Kenya.

(d) That a special worker should be employed to carry out a search of the scientific literature and to arrange the information in an easily accessible form.

(e) That a financial programme of £5,000 to £10,000 should be approved to carry out the work recommended in paragraphs (a) and (b) above, on the understanding that the Government should be ready to secure a financial contribution towards the cost of the work.

That the Committee of Civil Research should recommend the Secretary of State for Dominion Affairs to refer the matter to the Empire Marketing Board (then in process of being formed) for their favourable consideration, a proposal that a grant of £2,500 should be made from the Empire Marketing Board to cover the cost of the investigations recommended in paragraph (c) above and that in the meanwhile the Treasury should be asked to advance a sum of £1,500 by the Board of Agriculture.

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9. By November 1927, the investigation had sufficiently progressed to enable Dr. Orr to submit to us an interim Report showing the results so far obtained in Kenya, together with results of control tests with sheep undertaken concurrently in Scotland. These results appeared to us so promising that, at a meeting held on the 22nd November, 1927, we decided to submit to the Committee of Civil Research the following Report on them, together with certain recommendations regarding the future conduct of the work.

II.—GENERAL SCHEME OF WORK UNDERTAKEN

10. The problem before the Research party in Kenya was to determine whether the pastures in certain districts were deficient in essential mineral nutrients, and if so whether these deficiencies were the cause of the malnutrition and low productivity noted in cattle and sheep in the Colony.

11. This investigation has been carried out on the following lines—

(a) Work in Kenya.

The work of the Research party in Kenya has consisted of two main sections.

(i) *Chemical Work*—Samples of pastures have been collected at monthly (and in some cases shorter) intervals from four representative districts in Kenya, viz., Nakuru, Molo, Narivasha and the Athai Plains near Nairobi. These samples have been forwarded regularly to the Rowett Research Institute where their composition has been determined by chemical analysis.

(ii) *Feeding Experiments with grazing animals*—Feeding experiments have been carried out with various kinds of grazing animals in each of the four districts referred to above from which samples of pastures have been collected. The mineral food consisted of a mixture of inorganic salts rich in the minerals believed to be deficient in the pastures. In some cases protein rich substances were added to the mixture as the pastures were believed also to be deficient in this substance.

(b) Work in Great Britain.

12. Concurrently with the investigations in Kenya, feeding tests on more or less similar lines were undertaken in Scotland with sheep on farms where the pastures were known to be deficient. At the same time the scientific and agricultural men concerned were requested to bring together in easily accessible form all the information bearing on the deficiency of minerals in pastures, and the effect of these deficiencies on the health and productivity of the herbage.

III.—GENERAL ANALYSIS OF KENYA PASTURES

13. Seventy-nine samples of pasture have been analysed (Appendix I, Table (A)), shows the composition of the samples from the different centres, with, for comparison, the average composition of cultivated pasture and good uncultivated hill pasture in Great Britain.

14. The samples from Molo and Nakuru are deficient in all the essential minerals, samples from Molo being especially deficient in phosphorus. Nakuru samples are believed, from clinical observations on the cattle, to be deficient in iron, but it was impossible to collect samples under conditions which would enable iron determinations to be made with accuracy.

15. The data showing the seasonal variation are not yet available for the complete year. The most marked feature of the data so far collected is the great increase in the mineral and protein content of the pastures following rain. This is most marked in the good pastures of Narivasha, which respond to rain with greater rapidity than the poor pastures of Nakuru and Molo. After the period of growth during the rainy season the mineral and protein contents fall rapidly (see Appendix I, Tables (B) and (C)).

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- (e) That a financial programme of from £5,000 to £10,000 should be approved to carry out the work recommended in paragraphs (a) and (b) above, on the understanding that the Government should be able to secure a financial contribution towards the cost of this work from the Government of Kenya.
- (f) That the Committee of Civil Research should recommend the Secretary of State for Dominion Affairs to refer the matter to the Marketing Board (then in process of being formed), for their consideration, a proposal that a grant of £2,500 should be made from the Empire Marketing Board to cover the cost of the investigations recommended in paragraphs (c) and (d) above, and that in the meanwhile the Treasury should be asked to advance a sum of £1,500 by the Board of Agriculture and Fisheries to the Research Institute, on the understanding that the Board of Agriculture and Fisheries should contribute £1,000 from any contribution which they may receive from the Marketing Board.
- (g) That the Committee of Civil Research should appoint a Sub-Committee to investigate the mineral deficiencies of the pastures in the districts mentioned in the Report.

The Sub-Committee was appointed in East Africa, with a previous communication to the Government of Kenya and the Director of Agriculture and Fisheries, London.

The Sub-Committee was constituted in 1926 and 1927. Steps were taken to carry out the investigations recommended in the Report. The Director of Agriculture and Fisheries, Kenya was engaged to undertake preliminary preparatory work for two years. The Marketing Board and a party of four bio-chemists were sent to Kenya and a party of four bio-chemists were sent to the Dominion of Scotland respectively.

The research party consisted of four persons in this country for Kenya in August 1926, accompanied by Mr. Arthur Frithson, Head of the Animal Husbandry Department, Rowett Research Institute, who was able to superintend the work in Kenya. Constant relations were maintained by the Research Institute with the Rowett Research Institute, to which reports were regularly submitted and samples of pastures were forwarded for analysis.

In May 1927, Mr. A. Headlam, C.B., who represented the Treasury on our Sub-Committee, was appointed Comptroller-General National Debt Office, and his place was taken by Mr. F. Waterfield, C.B.

9. By November 1927, the investigation had sufficiently progressed to enable Dr. Orr to submit to us an interim Report showing the results so far obtained in Kenya, together with results of control tests with sheep undertaken concurrently in Scotland. These results appeared to us so promising that, at a meeting held on the 22nd November, 1927, we decided to submit to the Committee of Civil Research the following Report on them, together with certain recommendations regarding the future conduct of the work.

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Work in Scotland and Britain.

12. Concurrently with the investigations in Kenya, feeding tests in more or less similar lines were undertaken in Scotland with sheep on farms where the pastures were known to be deficient. At the same time the scientific and agricultural information was reviewed in readily accessible form all the information on the mineral deficiencies of pastures, and the effect of these deficiencies on the health and productivity of herbivores.

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IV.—FEEDING TESTS IN KENYA.

16. From the outset of the investigation, it was clear that it would be a matter of considerable difficulty to carry out properly the proposed feeding tests in Kenya. This was due to the lack of facilities for exact experimental work on the farms where the tests were done, and also to the fact that the men sent out were relatively inexperienced, having received only a three months' training in experimental work with animals. At one of the centres—Athi Plains—the arrangements made proved inadequate to the strain, and there are therefore no reliable data from this centre. The data from the other centres are, however, sufficient to enable a reliable report to be prepared.

(a.) Cattle at Nakuru.

17. The object of the work at Nakuru was to determine whether the disease *Nakurusitis*, which develops in animals if put to graze in this district continuously for more than about six or eight months, is due to a deficiency of iron and could be prevented by the administration of iron salts.

18. Four groups each of 25 oxen were grazed in the affected area. The animals of one group were allowed to lick a salt block consisting of equal parts of sodium chloride and ferric oxide to any extent that they desired. Two of the other groups were given salt mixtures with lower concentration of iron, and the fourth group—the control—received no mineral supplements to their diet.

19. The control group developed the typical signs of malnutrition. The group allowed to lick freely the mixture of salt and iron oxide has remained in good condition without any sign of disease. The two other groups are intermediate in condition between the control group and those receiving the richest iron mixture.

20. The average increases in weight in lbs. of the four groups for the eight months during which they were under observation, are as follows—

Control group (no iron)	14
Low iron group	31
Medium iron group	58
High iron group	96

21. The relative appearance of the control group and the high iron group is well shown in the plates reproduced in Appendix IV.

22. *Nakurusitis* was believed to be closely allied, if not identical, with Bush-sickness and the test was based on the results of many years' research by Aston and his fellow-workers on a similar subject in New Zealand. The results obtained in Kenya appear, therefore, to confirm the conclusions reached by Aston.

(b.) Sheep at Nakuru.

23. Feeding tests on sheep were carried out at Molo and Naivasha. A summary of results is given in Appendix II. The following table shows average gains of live weight and (b) the average weight of the fleeces in sheep receiving (a) mineral and (b) mineral and protein mixture, compared with those of similar animals receiving these supplements of the natural pasture.

	Molo (8 months)		Naivasha (6 months)	
	Gain in weight (in lbs.)	Weight of fleeces (in lbs.)	Gain in weight (in lbs.)	Weight of fleeces (in lbs.)
Control group	11.3	1.68	39.7	1.96
Group fed on mineral mixture	18.2	1.74	44.2	2.31
Group fed on mineral and protein mixture	22.0	1.81	42.2	2.04

24. The effect of the addition of minerals is more marked in the Molo sheep than in the Naivasha sheep. In the latter the addition of protein had no beneficial effect. This result is in accordance with the analysis of the pastures of these two districts, which has been carried out since these two experiments were begun. In the Naivasha pastures there is no marked deficiency of either minerals or protein.

In both areas the addition of minerals was accompanied by a definite increase in the weight of fleeces. There is no available information to show whether the quality of the fleece was affected in these cases.

(c.) Dairy Cows.

25. Owing to the breakdown in the centre in the Athi Plains, already referred to, the data in regard to dairy cows is not sufficient to enable a report to be prepared.

V.—WORK IN GREAT BRITAIN.

(a.) Feeding Tests in Scotland.

26. In certain districts in Scotland the hill pastures are deficient in minerals. An investigation, on a limited scale, on the effect of these deficiencies on sheep has been running for several years. In view of the work being carried out in Kenya, it was decided in 1928 to extend the tests in Scotland so that these home tests, which could be inspected personally by senior workers, should serve as general controls for the overseas tests. Though the expenditure for this Scottish work was not met from the grant made for the work in Kenya, the results are referred to here as they form, in effect, part of a single investigation.

27. The Scottish tests are not exactly comparable with those in Kenya because the material fed contained, in addition to minerals and protein, 5 per cent. of cod liver oil. Half an ounce of the material per head per day was fed to ewes from November to July. A summary of the results is given in Appendix III.

28. In six centres out of eight the lambs from ewes receiving a supplementary feed were heavier, on an average, at birth and at weaning than the controls, and on all the farms except one, where weights of fleeces were obtained, the average weight of the fleeces of the ewes receiving the supplementary feed was heavier than that of the controls. The results of these Scottish tests, therefore, tend to confirm those obtained in Kenya.

(b.) Search of Scientific Literature.

29. While the foregoing experiments have been in progress, it has been possible to carry out a survey of the literature bearing on deficiency of minerals in pastures and its effects on the health and productivity of grazing animals. Abstracts have been made of all available papers on this subject, and the information collected has been written up with a full bibliography.

VI.—RECOMMENDATIONS.

30. We are satisfied from the results already obtained through the investigation that deficiencies of minerals in the pastures of Kenya are a serious cause, and that the supplementary feeding of minerals to animals grazing the pastures has a definitely beneficial effect in preventing *Nakurusitis*, and in increasing the rate of growth of lambs and the weight of the fleeces.

31. The experiments described in the previous Sections have now been in progress for a full year. The investigation has been carried out with the utmost economy and its cost has been materially reduced by the many services rendered without charge by the Rowett Research Institute. The expenditure to the 30th September, 1927, from the grant received from the Empire Marketing Fund amounts to £4,589 4s. 6d. leaving an unexpended balance of £5,110 15s. 4d. The two years' period for which the grant was originally asked ends on the 31st March, 1928. We recommend that arrangements should be made to continue the investigation beyond that date provided that the total expenditure incurred does not exceed the unexpended balance of the grant approved by the Empire Marketing Board.

32. In the first place, we consider that the experimental tests in Kenya should be carried to a conclusion, though some rearrangement in the methods adopted is probably desirable, in the light of the experience gained during the past year. We further consider that the control tests in Scotland should be extended to include chemical and, if practicable, serological tests of the blood of animals under test, to determine the influence of the mineral content of the pastures and of supplementary feeding on the composition of the blood and resistance to disease. We recommend

that this work should be centred at the Moredun Institute for Research in Animal Diseases at Edinburgh, and that the co-operation of the Director of that Institute and the Professors of Bacteriology at Glasgow and Edinburgh Universities should be invited for this part of the investigation. This development will involve the appointment of a bacteriologist. We consider also that digestibility tests should be carried out with pastures of a low mineral content. Professor Wood, F.R.S. (one of the members of our Sub-Committee), has undertaken to arrange for this work to be done at the Nutrition Institute at Cambridge University. A junior bio-chemist will be required for this work.

33. As regards the conduct of this further stage of the investigation, it is not possible to anticipate indications of importance that later results may bring to light. It is therefore, we feel, be unwise to define a rigid programme. Accordingly, we recommend that in this matter a wide discretion should be given to Dr. Orr, the Director of the Research, in regard to the detailed methods to be adopted provided that these remain in accordance with the general scheme recommended in our Second Report (C.R.(C)11). Further, we consider that the fullest advantage should be taken of the facilities available in this country by expert authorities in the country. As regards the necessary arrangements to engage a professional staff, we suggest that it should be arranged with the Board of Agriculture for Scotland for the appointment of a professional staff within the limits of the funds available for the purpose. An inspection of the experimental field at the completion of one year's professional work should be arranged for the professional staff employed in the field investigation. It is suggested that the Director should be invited to visit Australia early in 1922, and we hope that a similar opportunity should be available to him to visit Kenya. A copy of the programme of work suggested in this report would be available to Dr. Orr for his consideration. We suggest that the Director should be invited to visit Australia early in 1922, and we hope that a similar opportunity should be available to him to visit Kenya. A copy of the programme of work suggested in this report would be available to Dr. Orr for his consideration.

VII. SUMMARY

Our conclusions and recommendations may be summarised as follows:—
That the results already obtained through the investigation show that deficiencies of minerals in the pastures of Kenya do actually exist, and that the supplementary feeding of minerals to animals grazing the pastures has a definitely beneficial effect in preventing *Nekrotois* and in increasing the rate of growth of lambs and the weight of the fleeces.
That the investigation should be continued beyond the period of two years for which it has been authorised, provided that the total expenditure incurred does not exceed the grant approved by the Empire Marketing Board, viz. £10,000 in all.

(c) That as regards the expenditure of the remaining balance of the grant from the Empire Marketing Board, discretion should be given to Dr. Orr, the Director of the Research.

(i) to settle the detailed method by which the investigation should be continued, provided that the experiments undertaken are in conformity with the general scheme recommended in our Second Report (C.R.(C)11), and approved by the Committee of Civil Research, and that the fullest possible advantage is taken of facilities offered by expert authorities in Scotland and this country;

(ii) to arrange with the Board of Agriculture for Scotland for the appointment of temporary staff within the limits of the funds available at rates of pay not exceeding the normal appropriate scales.

to arrange with the Board of Agriculture for Scotland, in consultation with the Colonial Office, for the grant of increments of salary to the temporary staff at the rate of one year's probable increase for every three years of service, and to be payable on the normal scale of pay for the country.

to invite Dr. Orr to visit Australia early in 1922, and to arrange for the necessary expenses of his journey and the cost of his maintenance during his stay in Australia.

to invite Dr. Orr to visit Kenya early in 1922, and to arrange for the necessary expenses of his journey and the cost of his maintenance during his stay in Kenya.

to invite Dr. Orr to visit Australia early in 1922, and to arrange for the necessary expenses of his journey and the cost of his maintenance during his stay in Australia.

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2, Whitehall Gardens, S.W.1
December 14, 1922.

APPENDIX I.

TABLE (A).—COMPOSITION OF THE DRY MATTER OF THE HERBAGE.

Constituents	Naivasha.		Dombholm (Ash Plains)		Kerengei Molo		Nakuru.		British Pastures.	
	Average of 12 Samples		Average of 7 Samples		Average of 19 Samples	Average of 10 Samples	Average of 28 Samples	Average for Cultivated Pasture	Average for Hill Pasture (All Exten)	
					Area A.	Area B.				
Dry Matter	100	100	100	100	100	100	100	100	100	100
Nitrogen	2.09	1.50	0.94	0.86	0.99	0.82	2.82	2.59	7.18	5.85
Total Ash	17.70	2.86	11.54	11.02	11.75	9.79	6.64	5.85	1.00	0.65
Acid Soluble Ash	3.50	4.42	0.17	0.48	0.40	0.07	0.25	0.37	3.18	2.66
Lime (CaO)	0.06	0.16	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Soda (Na ₂ O)	0.25	1.06	0.82	0.69	1.72	3.18	2.66	0.67	0.94	0.64
Phosphoric Acid (P ₂ O ₅)	0.03	0.06	0.10	0.17	0.32	0.74	0.67	0.67	0.64	0.64
Calories	47	37	0.18	0.17	0.35	0.94	0.64	0.64	0.64	0.64

TABLE (B).—RAINFALL EFFECT—NAIVASHA

Percentages expressed on Dry Matter:

Constituents	March 5		March 23	
	Before Rain	After Rain	Before Rain	After Rain
Dry Matter	100	100	100	100
Nitrogen	1.05	3.60	2.68	18.50
Total Ash	2.70	8.76	1.22	1.22
Acid Soluble Ash	0.51	0.08	0.08	0.08
Lime (CaO)	0.03	4.17	0.50	1.15
Soda (Na ₂ O)	0.29	0.62	0.74	0.62
Phosphoric Acid (P ₂ O ₅)	0.06	0.06	0.06	0.06
Calories	0.24	0.62	0.24	0.62

TABLE (C).—RAINFALL AND MATURITY EFFECTS—NAKURU

Percentages expressed on the Dry Matter:

Constituents	February		March 10		April 18		June 27	
	Before Rain	After Rain	Before Rain	After Rain	Before Rain	After Rain	Grass Fully Mature	
Dry Matter	100	100	100	100	100	100	100	
Nitrogen	1.1	0.75	1.35	0.77	2.90	3.54	3.54	
Total Ash	14.10	11.54	8.12	8.65	8.12	8.65	8.65	
Acid Soluble Ash	2.35	3.41	0.32	0.28	0.32	0.28	0.28	
Lime (CaO)	0.39	0.40	0.03	0.06	0.06	0.06	0.06	
Soda (Na ₂ O)	0.55	1.14	3.20	1.90	3.20	1.90	1.90	
Phosphoric Acid (P ₂ O ₅)	0.17	0.15	0.41	0.18	0.41	0.18	0.18	
Calories	0.26	0.27	0.55	0.13	0.55	0.13	0.13	

APPENDIX II.

FEEDING TESTS: CATTLE: NAKURU.

Weights in Lbs.

	Weights in Lbs.			
	Group I. Control.	Group II. Low Iron.	Group III. Medium Iron.	Group IV. High Iron.
	Nil	Mineral Mixture with 1 per cent. Fe ₂ O ₃ ad lib.	Mineral Mixture with 2 1/2 per cent. Fe ₂ O ₃ —4 ozs. daily.	Mineral Mixture with 50 per cent. Fe ₂ O ₃ ad lib.
<i>Grade Green (3).</i>				
Average weight Nov. 16, 1926	704.7	774.3	753.8	764.3
Average weight July 4, 1927	773.0	829.1	843.4	894.4
Gain	68.3	54.8	89.6	130.1
<i>Work Green (15).</i>				
Average weight Nov. 16, 1926	610.19	589.1	580.7	586.9
Average weight July 4, 1927	600.11	608.8	620.5	643.2
Gain	19.8	19.7	39.8	76.3
<i>Native Green (11).</i>				
Average weight Nov. 16, 1926	607.8	603.4	607.5	606.8
Average weight July 4, 1927	630.0	660.7	688.0	693.5
Gain	32.2	57.3	80.5	86.7

SHEEP TEST

	Weights in Lbs.		
	Group I. Basal.	Group II. Basal + Minerals.	Group III. Basal + Minerals + Protein.
<i>Wool (45 per group).</i>			
Average weight Nov. 19, 1927	35.0	37.2	35.1
Average weight Sep. 19, 1927	12.1	32.4	37.1
Gain	22.9	4.8	27.0
Gain expressed as per cent. of gain in Group I.	100	21.4	118.4
Average Fleeces weights	22.9	17.4	31.1
<i>Naivasha (16 per group).</i>			
Average weight Nov. 24, 1926	25.0	24.1	24.5
Average weight Aug. 18, 1927	64.1	68.3	67.0
Gain	39.7	44.2	42.2
Gain expressed as per cent. of gain in Group I.	100	111.4	106
Average Fleeces weights	39.7	44.2	42.2
Feeding	Mineral Mixture—Nil.	Mineral Mixture—1/2 oz. each daily plus lick ad lib.	As in p. 2—2 oz. protein per sheep daily.

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PASTURE INVESTIGATION IN KENYA.

NOVEMBER 1928 - FEBRUARY 1928.

INTRODUCTION.

Origin of
Investigation.

This investigation originated in a recommendation made to the Empire Marketing Board by the Civil Research Committee of the Cabinet in April 1926. The general scheme of the investigation was drawn up by a Sub-Committee of the Committee of Civil Research consisting of recognised authorities on animal nutrition with Major Elliot, Under-Secretary of State for Scotland as Chairman. The main cost of the investigation is being defrayed by a special grant made to the Rowett Research Institute, Aberdeen, from which workers were seconded to the Agricultural Department of Kenya to carry out the necessary field work in connection with the investigation. An interim report has already been submitted to this Committee of the Civil Research Committee.

The present account of the work which is published with the permission of the Committee of Civil Research gives a general idea of the nature of the investigation and of the results being obtained.

Nature of
Investigation.

The investigation was undertaken to determine whether the pasture in certain districts in Kenya was deficient in essential nutrients and if so, whether these deficiencies were the cause of malnutrition in cattle and sheep.

The work consisted of:-

- A. Analysis of samples of pasture from four districts;
- B. Feeding experiments with cattle and sheep, to test the effect of feeding of certain constituents which were thought might be deficient.

area sampled, the pasture is exceedingly rich, whereas in other areas there are marked deficiencies. It will probably be found that large areas in the plains will resemble the area samples in the Athi Plains, and the higher hills will resemble the area sampled in the Dale district.

It should be stated here that the chemical composition of a pasture is of course not a complete indication of the suitability of the district for stock raising. There are several other factors here to be taken into account. For example, though the pastures in the Dale district are undoubtedly excellent, the weather is still there somewhat drier pasture for a greater proportion of the year than in other districts.

When the deficiencies are concerned, the results of the chemical analysis would lead to the conclusion that there are to some extent deficiencies in the nature of the deficiency of phosphorus.

Phosphorus

The results of the chemical analysis carried out to determine the phosphorus content of the pastures in the district are collected in the following table. The effect of the rate of growth, weight of the plants, and health of grazing animals is also noted.

In order to determine if a special test was carried out in connection with the local disease "Ruminantia" which from results of work in New Zealand by Anton, Reeson and others, on a similar disease in that country, was thought might be due to a deficiency of iron in the herbage. It will be convenient to give results of this special test before dealing with the other regular experiments whose

Results are applicable to such wider areas.

Four groups each of 30 oxen were grazed on the affected area; the animals in one group were given a mixture of common salt and iron oxide in equal proportions ad lib. Other two groups were given the same mixture with a lower amount of iron viz. 1/3 part of the mixture. The remaining group which received a salt ration received nothing in addition to pasture.

Table IV gives details of the average gain in live weights in the different groups for a period of ten months. The average gain in each is as follows:

	Control.	Low iron.	Medium iron.	High iron.
	lbs.	lbs.	lbs.	lbs.
Average gain per oxen.	+ 32	+ 11	+ 69	+ 100

It will be seen that the animals receiving iron oxide in addition to salt gained a considerable amount of weight. The effect was most marked in the group which received the highest amount of iron oxide.

The only animal which developed a fatal disease "Nekrosis" while all animals receiving salt and iron became healthy and at this date, after the treatment in marketable condition as slaughter or were utilized as cow animals besides. From the above facts treated by the administration of salt and iron with good results.

The National and Veterinary Laboratories are engaged in the technical work involved in blood tests and post-mortem examinations. The results of these examinations show that anaemia is a condition of the blood.

The result seems to indicate that whatever the cause of the condition may be, it can be prevented by the feeding of the mixture.

SHEEP FEEDING TESTS.

These were carried out at Naivasha and Holo.

Three groups of ewes with lambs were grazed together. One group received a mineral mixture, a second group a mineral and protein mixture, the third group which served as control received nothing in addition to pasture at Naivasha, but at Holo received rock salt 3 lb. The figures for weights of fleeces and rate of growth of lambs are given in Table V.

The following figures give a summary of the results:-

Weight of lamb:-

	Mineral.	Mineral + Protein.	Controls.
Naivasha	27.5	27.5	27.5
Holo	27.5	27.5	27.5

The results show that the addition of greater amounts of salt at Holo and Naivasha in the former which for the addition of a mineral and protein had little effect on the rate of growth of lambs at Holo and Naivasha. The results of the animals receiving salt at Holo were better than in the controls. In these results the rate of growth of the salt mixture group was greater than in the control group. These results are in agreement with

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The analyses of the pastures which showed a marked deficiency at Molo but none at Naivasha.

The weights of the fleeces in the fed groups are from 5 to about 10 per cent heavier both in Molo and Naivasha. Similar results are now being obtained with sheep in Scotland. It is difficult to account for the greater rate of growth of fleece at Naivasha where there is no obvious deficiency in the pasture. Further work is being carried out to confirm these results and if confirmed to determine the constituent of the salt mixture which gives this beneficial effect.

CALF REARING.

Tests were carried out at Molo and Naivasha. At the latter centre no beneficial effects have so far been obtained (after 12 months) with feeding either a salt mixture or a protein rich mixture. The animals in all the groups are in excellent condition.

At Molo the average increase for 13 months was as follows:-

<u>Control.</u>	<u>Control. Minerals.</u>	<u>Control. Minerals protein.</u>
256 lbs.	270 lbs.	319 lbs.

Table VI gives more complete data.

MILK COW EXPERIMENT.

The tests at Naivasha and Molo were undertaken to determine the effects of the feeding of minerals and protein. There were, however, such marked differences in the quality of cows that the data are useless. At

bold a second test was carried out with heifers, whose milk yield was recorded during a preliminary period before feeding of minerals or protein was begun and the animals then arranged in three comparable groups of 8 heifers with the same average yield. Table VII gives the data for this test.

The following figures show difference in milk yield that of the control group being expressed as 100:-

Control.	Control + Mineral + Protein	Control + Mineral + Protein
100	135	156

This result is somewhat similar to results obtained by Sir Arnold Thresher and his co-workers in South Africa. They found that cows grazing on an area deficient in phosphorus showed an increase of about 30 per cent in milk yield when fed a phosphorus rich mixture.

CONCLUSION.

It should be kept in view that these tests have not been carried out over a long period and the results are therefore to be regarded as conclusive. They seem to indicate, however, that in areas where Sakuru and K.V. exist the pastures are deficient in minerals and that a rate of growth can be obtained on lands and areas, an increased milk yield can be obtained in good and bad areas and a better light or soil is obtained by the feeding of appropriate mineral mixtures.

Further experiments are required to determine the economic value (if any) of these results, and further if they should be found to be of practical value to ascertain the best combination and amount of supplements.

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To feed to obtain the maximum result at the minimum cost.

The application of the results of the special feeding experiment at Nakuru may be carried out under ordinary conditions by stock owners on farms where a similar deficiency is believed to exist, and full particulars regarding the salt mixture used and its administration may be obtained by settlers on application to the Government Farm, Naivasha.

Another aspect of the problem which as a matter of fact was under consideration by the Veterinary Department, before this investigation was undertaken, and which has recently been again considered jointly by the Chief Veterinary Research Officer and the Director of this special investigation is the influence of deficiencies in the pastures on the susceptibility of animals to certain diseases. Certain data have already been collected and it seems probable further work along this line would yield results of economic value.

In conclusion this opportunity should be taken of expressing the indebtedness of all concerned with this investigation to the Rt. Hon. Lord Delamere, W.J. Dawson, Esq., E. Pardoe, Esq., and J.K. Watson, Esq., who provided animals and labour for the feeding tests. It was chiefly at the instigation of Lord Delamere and the Hon. Galbraith Cole that the whole scheme of investigation was undertaken. The original idea of the special test at Nakuru is due entirely to W.J. Dawson, Esq., Njoro who had already made a study of the subject, and had collected all available scientific information bearing on the problem.

Rainfall and Nutrient Effects - Makuru.

Per cent of nutrient expressed on the Dry Matter.

<u>Date of Collection.</u>	<u>Amount</u>	<u>March 10th</u>	<u>April 16th</u>	<u>June 27th</u>
	<u>Before Rain.</u>	<u>After Rain.</u>	<u>After Rain.</u>	<u>Grass fully mature.</u>
Dry Matter	100	100	100	100
Nitrogen	0.51	0.75	1.95	0.77
Acid Soluble Ash	2.36	3.41	6.12	3.65
lime (CaO)	0.39	0.40	0.52	0.28
Soda (Na ₂ O)	0.55	0.03	0.06	0.06
Potash (K ₂ O)	0.99	1.14	2.25	1.96
Phosphoric Acid	0.17	0.15	0.41	0.19
Chlorine (Cl)	0.26	0.27	0.65	0.13

TABLE VII.

HETTERS - 1st LACTATION.

MOLO.

	Group 1 (Basal) lbs.	Group 2 (Basal, Minerals) lbs.	Group 3 (Basal, Mineral, Protein). lbs.
Preliminary Period.			
Initial Yield (14 days)	2052	1939	1990
Yield till 31st Jan.	19464	25158	25540
Yield for Exp. period	17412	23217	23550
Taking Group 1 yield as 100 =	100	133.3	135.2

TABLE VI.

CALF FEEDING EXPERIMENT.

Keringet.

	Group 1 (Control) lbs.	Group 2 (Control, mineral) lbs.	Group 3 (Control, min- eral, protein) lbs.
Av. Initial Weight	104	100	107
Av. Weight after 13 months	380	370	428
Average Gain	250	270	319

Naivaaha.

Av. Initial Weight	75.2	72.5	77.1
Av. Weight after 11 months	396	396.3	324
Average gain	321	324	309

TABLE V.

FEDDING EXPERIMENTS - MOLO.

Average Weight per lamb (lbs.)

	<u>Group 1.</u>	<u>Group 2.</u>	<u>Group 3.</u>
	<u>Control.</u>	<u>Control</u>	<u>Control, Minerals</u>
	<u>lbs.</u>	<u>lbs.</u>	<u>lbs.</u>
Average Wt. 18.2.27	35.0	35.2	35.1
Average Wt. 18.2.28	58.34	62.95	70.67
Gain (12 months)	23.34	27.75	35.67
Gain expressed as % of gain in group 1.	100	119	153

Fleece Weights (lbs.)

From 18.2.27-19.5.27	1.58	1.74	1.81
From 19.5.27- 1.12.27	2.72	2.83	3.12
Total	4.30	4.57	5.00
Average condition of wool (possible 8 pts).	4.32	6.24	6.43

NAIVASHA.

	<u>Group 1.</u>	<u>Group 2.</u>	<u>Group 3.</u>
	<u>Control</u>	<u>Control</u>	<u>Control, Minerals</u>
	<u>lbs.</u>	<u>lbs.</u>	<u>lbs.</u>
Average Wt. lambs			
24.11.26	26.0	24.1	24.8
" 7. 2.28	80.2	81.4	82.2
Gain - 14 months	55.2	57.3	57.4

Fleece Weights (lbs.)

Lambs - From 24.11.26 to			
1. 4.27	1.96	2.31	2.04
" 1. 4.27 to			
11.10.27	3.68	4.21	4.08
Total	5.63	6.52	6.10
Ewes - From 1. 4.27 to			
11.10.27	3.92	4.68	4.18

TABLE V.

FEEDING EXPERIMENTS - MOLO.

Average Weight per Lamb (lbs.)

	<u>Group 1.</u>	<u>Group 2.</u>	<u>Group 3.</u>
	<u>Control.</u>	<u>Control</u>	<u>Control, Minerals</u>
	<u>lbs.</u>	<u>lbs.</u>	<u>Protein,</u>
			<u>lbs.</u>
Average Wt. 16.2.27	35.0	35.2	35.1
Average Wt. 16.2.28	58.34	62.95	70.87
Gain (12 months)	23.34	27.75	35.67
Gain expressed as % of gain in Group 1.	100	119	153

Fleece Weights (lbs.)

From 16.2.27-19.5.27	1.58	1.74	1.81
From 19.5.27- 1.12.27	2.72	2.83	3.10
Total	4.30	4.57	5.00
Average condition of wool (possible 8 pts).	4.32	6.24	6.42

NAIVASHA.

	<u>Group 1.</u>	<u>Group 2.</u>	<u>Group 3.</u>
	<u>Control</u>	<u>Control</u>	<u>Control, Minerals</u>
	<u>lbs.</u>	<u>lbs.</u>	<u>Protein,</u>
			<u>lbs.</u>
Average Wt. Lambs			
24.11.26	25.0	24.1	24.8
" " 7. 2.28	80.2	81.4	82.2
Gain - 14 months	55.2	57.5	57.4

Fleece Weights (lbs.)

Lambs - From 24.11.26 to			
1. 4.27	1.95	2.31	2.04
" 1. 4.27 to			
11.10.27	3.89	4.21	4.03
Total	5.83	6.52	6.10
Ewes - From 1. 4.27 to			
11.10.27	3.92	4.66	4.18

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Kenya

Amad
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Codel 551-
p. 3
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31.1.28
Kloppel
Wise
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atomic

- Mr. D. J. Harding
- Sir C. Strachan
- Sir Ul. Shuckburgh
- Sir G. Arnold
- Sir C. Davis
- Sir S. Wilson
- Mr. Ormsby-Gore
- Lord Lotal
- Mr. Amery

KEA
(10173/27)

3 Feb.

My conf. des. 2 Feb
March 1927 in view

DRAFT. Tel code

Governor

Nairobi

Copy to C.C.R. 26 MAR 1928 B.G.

of promising results
 obtained from animal
 nutrition experiments
 which as explained
 in report being sent
 by despatch ^{imperial} ~~commerce~~
 Marketing Board
 is arranging to finance
 research beyond
 original period of
 two years @ I
 assume that Kenya

X/5051/28

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- Mr. *Officer 26/1/28*
- Mr. *Corrigan 26/1/28*
- Mr.
- Mr. E. J. Harding
- Mr. G. Strachey
- Mr. J. Shackleton
- Mr. G. Grivale
- Mr. G. Davis
- Mr. S. Wilson

Kenya

2
 20 JAN
 1928

30 Jan 1928

- Mr. Ormsby Gore
- Lord Lugard
- Mr. Amery

for comment

DRAFT

(10173/27)

Kenya

Camb

Mr. Grigg

with ref. to my copy
 desk of the end of January
 1927, I have to submit to you copies
 of a further report of
 the Sub-Committee of
 the C.M.S. on the
 Research in the
 Content of
 Pastures, together with
 a copy of a letter from
 which has been sent
 by the Com. to the
 Empire Marketing
 Board, in which it

Report

15 E.M.S. 19/1/28

2 copies
 of each
 in file

Please
 kindly 30th Jan