

129/67



COLONY AND PROTECTORATE OF KENYA

DEPARTMENT
OF KENYA
LIBRARY

REPORT

Inquiry into the General Economy of Farming in the Highlands having regard to Capital Invested and Long- and Short-term Financial Commitments, whether Secured or Unsecured; excluding Farming Enterprises solely concerned with the Production of Sisal, Wattle, Tea and Coffee.

COMMISSIONER:
L. G. TROUP, O.B.E.

1953

Printed by the Government Printer, Nairobi

Price: Sh. 45/-

5/2

630

14.147
K/AGR

LEGISLATIVE COUNCIL LIBRARY



REPORT

Inquiry into the General Economy of Farming in the Highlands having regard to Capital Invested and Long- and Short-term Financial Commitments, whether Secured or Unsecured; excluding Farming Enterprises solely concerned with the Production of Sisal, Wattle, Tea and Coffee.

COMMISSIONER:
L. G. TROUP, O.B.E.

KENYA NATIONAL ASSEMBLY

Accession: 10013852

Call No: 630 CP14



REPORT

Industry into the Government Economy
in the Highlands, having regard to capital
invested and long and short term
Commitments, whether secured or unsecured,
excluding farming Enterprises solely concerned
with the production of Cereals, Wheat, Tobacco and
Coffee.

CONTENTS

	PARAGRAPH	PAGE
Introduction	1- 4	1
Meetings	5- 7	1
Witnesses	8- 9	2
Historical	10- 21	2
Present Organization	22- 46	4
Previous Commissions and Inquiries	47- 51	8
Agricultural Indebtedness	52- 79	9
Agricultural Credit	54- 59	9
Types of Credit	60- 70	10
Economic Analysis of Credit Facilities	71- 78	11
Conclusion	79	13
General Considerations	80- 91	14
Farming Appreciation	92-161	15
Crops	93-114	15
Livestock	115-131	18
Horticulture	132-135	21
Machinery	136-141	22
Labour	142-145	22
Farm Management	146-160	23
General	161	25
The Present Position	162-168	25
A—Commodity Build-up	166	25
B—Capital and Gross Output	167-168	26
The Future	169-176	26
A—Development Potential	169-172	26
B—1963 Target	173-175	27
C—Estimated Capital	176	28
Requirements Necessary for Successful Fulfilment of the ten-year Target	177-204	28
Settlement and Farming, etc.	178-191	28
Finance	192	30
Sources of Capital	193-197	30
Income Tax	198-202	32
Maintenance of Satisfactory Level of Prices	203-204	33
Development of Organizations	205-219	33
Farm Statistics	220-222	34
Price-fixing Policy	223	35
Summary and Recommendations	224-230	35
Conclusion	231-237	36

CONTENTS—(Contd.)

Appendices	PAGE
A List of Witnesses	37
B Questionnaire to Farmers	43
C <i>Pro Forma</i> for Completion of Accounts of Individual Farmers ...	44
D Operations of Government Cereals Finance During Period 1949/50 to 1952/53	45
E The Main Soil Groups of the European Areas of the Kenya Highlands and their Utilization	46
F Notes on Temporary Leys in the European Farming Areas	51
G Pig Production, Ol Joro Orok Experimental Farm	55
H Edible Canna Feeding to Pigs on the Lehmann System	56
J The Principles of Farm Planning	58
K Summary of Development and Returns on a Planned Farm	61
L Proposals for a Farm Plan	63
M Prospects of Increase of Livestock in the European Areas	67
N Handling and Storage of the Colony's Wheat	70
O Bibliography	74
I —Map of Central Kenya.	
II —Soil Map, European Areas.	
III —Annual Rainfall in the Kenya Highlands.	
IV —Vegetation Map—Kenya Highlands.	
V —Farming Types and Zones.	
VI —Farm Lands.	
VIIa—Map of Portion of L.R. Nos. 847/2 and 2967/1.	
VIIb—Map of Portion of L.R. Nos. 847/2 and 2967/1.	

YOUR EXCELLENCY,

INTRODUCTION

I have the honour to submit my report in accordance with the terms of reference of the Commission issued by Your Excellency's predecessor and published in the Official Gazette of the 26th February, 1952, under authority of the Commissions of Inquiry Ordinance (Cap. 40).

2. The terms of reference, as set out in the above-quoted Commission, are as follows:—

GOVERNMENT NOTICE NO. 194—

“To inquire into the general economy of farming in the Highlands having regard to capital invested and long- and short-term financial commitments, whether secured or unsecured; excluding farming enterprises solely concerned with the production of sisal, wattle, tea and coffee.”

In fact, three separate Commissions were issued at the same time and, as the terms of reference are to a certain extent interdependent, it seems appropriate to quote the terms of reference of the other two Commissions:—

GOVERNMENT NOTICE NO. 195—

“The ascertainment of a fair price to the producer for the 1951 crop of maize and wheat respectively, having regard to the need to ensure that such price shall provide a reasonable profit to the efficient producer, and in the case of maize that its basic importance in the economy of the Colony should not prejudice the ascertainment of a fair price.”

GOVERNMENT NOTICE NO. 196—

“The ascertainment of a basis for the calculation annually of a fair price to the producer for maize, wheat, oats and barley, and such other farm products, the prices of which are controlled by the Government having due regard to the need to ensure the maintenance of soil fertility, a balanced and stable agricultural industry and prices which provide a reasonable profit to the efficient producer of any such agricultural product.”

4. I have already presented my report on the inquiry into the prices for the 1951 maize and wheat crop. The report was published in June, 1952, and in it I made certain recommendations regarding the policy to be adopted for the control and fixing of prices for primary produce; but as consideration of the economy of farming must inevitably raise questions of price fixation, it will be necessary again to refer in this report to some of these problems.

MEETINGS

5. I have paid two visits to Kenya in connexion with the inquiry, from the 31st January to the 4th May, 1952, and again from the 27th September, 1952, to the 26th January, 1953. Except for the period the 27th March to the 4th May, 1952, which was devoted to the 1951 maize and wheat price inquiry, the rest of the time was spent in hearing evidence on the general inquiry, in visits to farms and in the compilation of this report.

6. The Inquiry was opened in Nairobi on the 19th February, 1952. Formal sittings were held subsequently at the following places:—

Kitale	...	...	3rd, 4th and 5th March.
Eldoret	...	...	6th, 7th and 8th March.
Kericho	...	...	10th and 11th March.
Molo	...	...	12th March.
Nakuru	...	...	13th, 14th and 15th March.
Gilgil	...	...	17th March.
Thomson's Falls	...	...	18th and 19th March.
Nanyuki	...	...	20th and 21st March.
Nairobi	...	...	25th and 26th March; 8th, 9th and 30th April; 3rd and 4th December.

In addition, a considerable amount of time was spent in informal discussions with Government officials, farmers, representatives of the producer boards, banks and various commercial firms interested in agriculture.

7. During my second visit to Kenya an extensive programme of visits to farms was carried out in October to December, when I saw some 80 farms situated in the Trans Nzoia, Uasin Gishu, Molo, Nakuru, Subukia, Rongai, Naivasha, Kinangop, Thomson's Falls, Laikipia, Nanyuki, Nyeri and Machakos districts.

WITNESSES

8. Invitations to give evidence were issued to District Production and Manpower Committees which were asked to furnish the Commission with information by means of replies to a specially prepared questionnaire (Appendix "B"), which formed the basis for discussions at subsequent formal meetings. The questionnaire was also circulated to a representative cross-section of farmers summoned to give evidence before the Commission. These and many other voluntary farming witnesses were also asked to complete a specially prepared proforma of agricultural income (Appendix "C"). I must express my appreciation of the time and trouble expended by farmers, accountants, the banks and prominent business firms in providing me with a wide variety of statistical information without which this report could not have been written. I am especially indebted to those farmers who placed their audited accounts unreservedly at my disposal.

9. Details of the names of the various witnesses, embracing almost every aspect (within the terms of reference) of the agricultural life of the Colony, who tendered either oral or written evidence, are given in Appendix "A". I am conscious that this list, formidable though it is, is not fully comprehensive of the many farmers and others whom I had the pleasure to meet during my travels. To those whose names are not quoted, but who gave the benefit of their advice, I tender my apologies.

HISTORICAL

10. In the absence of any large mineral deposits, Kenya is economically dependent upon the proper development of the land, and, although the Colony as it now appears on the map of Africa is a young country, tremendous developments have taken place in all branches of agriculture (in its widest sense) in the 50 years since white settlement in the East African Highlands was first given official encouragement by H.M. Government. Much planning and research remains to be done, as will be evident from this report, but the pioneering efforts of those 50 years have successfully established the broad basis of the agricultural economy of the European areas, and it would be difficult for the casual visitor to the Molo Highlands to realize to-day that a landscape which must conjure up nostalgic memories of Wiltshire was, within living memory, virgin country, and that the first settlers had no knowledge or guidance as to what crops would grow at the different altitudes or whether animal husbandry held out better prospects than cereals.

11. The history of agriculture in the White Highlands has been recorded in a number of publications,* and this report is not the place in which to recount it, but no inquiry of the nature indicated in the Commission would be complete without some reference to the principal events governing the pattern of the agricultural life of the Colony as it is to-day.

12. During its comparatively brief lifetime European agriculture in Kenya has had to experience the hazards of the world wars of 1914/18 and 1939/45, locust invasions and the two slumps of 1921 and 1931 which arrested settlement and led to many bankruptcies. Prices for cereals remained low throughout the period between the wars and, in order to ensure even a minimum livelihood, many farmers were constrained to plough up more and more land for cereals, so that the decade 1921/31 was one of considerable physical expansion and the acreage under cultivation was increased from 207,000 to 659,380 acres. Unfortunately, following the common pattern in every new country—pioneering and monoculture frequently went hand in hand and much of the agricultural expansion was achieved at the expense of the soil. The situation had already become sufficiently serious in 1939 through the inability

* See Bibliography.

of many farmers owing to lack of capital to break away from cereal monoculture in consequence of the lean years before the war, when the price for maize fell as low as Sh. 1/50 a bag in certain districts. The Government took powers under the Land and Water Preservation Ordinance in 1940 whereby the Director of Agriculture was able to issue closure orders in respect of worn out and eroded land; but the situation was inevitably aggravated by the priority which was of necessity given to grain production in the 1939/45 war, with which was tied up the whole system of short-term credit facilities and Guaranteed Minimum Return advances.

13. Up to 1940 the agricultural industry was given complete freedom of action, although in 1930 and 1931 the Legislature authorized the appropriation of sums totalling £143,000 to encourage the continued production of cereals, and in the Maize Subsidy Repayment Ordinance of 1931 the Governor was given power to declare the f.o.r. price of maize. Of 22 principal Ordinances concerned directly or indirectly with European agriculture (but excluding plantation crops) enacted during those 40 years only the following have found a permanent place on the Statute Book:—

	<i>Year</i>
Diseases of Animals	1905
Cattle Cleansing	1920
Agricultural Produce (Export)	1921
Crop Production and Livestock	1926
Water	1929
Sale of Wheat (since repealed)	1930
Agricultural Advances	1930
Land and Agricultural Bank	1931
Farmers' Assistance (no longer operative)	1936
Plant Protection	1937
Pyrethrum	1938
Flax (now suspended)	1939
Land and Water Preservation	1940

14. Early in World War II it was decided that a major part of Kenya's contribution to the British war effort should be the production of food for East Africa, when the non-native population was considerably increased by troops from overseas and refugees and prisoners-of-war in large numbers. In 1942, therefore, the Increased Production of Crops Ordinance was enacted. This Ordinance, although its application was restricted to certain cereals and did not extend to livestock production, has provided the main statutory incentive for the rapid progress achieved in the past ten years. A Board, representative of both farming and plantation interests, had been re-established in 1939 following on an earlier Board of Agriculture which lapsed during the 'thirties. The Board's main duties were to advise the Government on the best means to encourage production in the European areas, and the 1942 Ordinance provided the necessary powers whereby Government might implement its policy through the medium of the Board.

15. The Ordinance enables the Board to issue orders to farmers to plant certain crops, whereupon the farmer is guaranteed a minimum return per acre provided he observes certain principles of good husbandry; it provides for guaranteed prices to farmers for such crops, for short-term finance by means of advances against the minimum guaranteed returns, on which interest is charged at 4 per cent; and, in approved cases, free grants were formerly payable to farmers for the breaking of new land. Their issue was suspended in 1945. At the present time the Ordinance applies to wheat, maize, oats, barley, sunflower and linseed, although when the Ordinance was first enacted rye, flax, potatoes, pyrethrum and vegetable seeds were also scheduled.

16. Although the Ordinance was introduced as a temporary war-time measure, it has since been realized that many of the provisions must remain in any planned economy and, pending the introduction of the consolidating Agriculture Bill, the Increased Production of Crops Ordinance has been renewed annually.

17. The post-war Development Committee which reported in 1946 laid down that closer European settlement was essential for the fuller development of the economic resources of the Colony. £1,600,000 was allocated by the Development Committee for this purpose and was approved by the Legislature and also by H.M. Government. In 1948, the European Agricultural Settlement Board was established by statute to give effect to this policy.

18. The number of settlers increased substantially. In 1942 the area of alienated land in the Highlands amounted to 6,335,274 acres, out of a total area of 10,240,000 acres including 2,624,000 acres of forest and also inland waters. This acreage was divided into some 2,500 farm holdings and approximately 3,000 Europeans were engaged in agriculture. To-day, ten years later, out of an alienated area of 7,372,880 acres, there are approximately 3,000 agricultural holdings (including plantation crops) and the number of Europeans directly engaged in agriculture has risen to 3,500 men and 500 women. Other details are given in paragraph 30 below.

19. In accordance with the national policy laid down early in the war, production was very greatly increased during this ten-year period. In the case of wheat, of which there were 122,300 acres under cultivation in 1942, the acreage had risen to 285,000 acres in 1952. Similarly maize, which after reaching a record figure of 215,000 acres in 1928 had dropped to 81,500 acres in 1942, rose again to 147,000 acres in 1952.

20. There were also appreciable increases in livestock and livestock products. 4,000,000 gallons of whole-milk were marketed in 1944 (the first year in which there were any reliable records), whereas the sales for the year ended July, 1952, amounted to 9,700,000 gallons. The increase in the sales of butter-fat during the period 1942/52 was from 4,100,000 to 7,570,000 lb. Some 15,000 head of cattle, 28,000 sheep and 30,000 pigs were purchased for slaughter from European sources in 1942. The corresponding figures for 1952 are 44,659 head of cattle, 60,530 sheep and 61,008 pigs.

21. The success of the national policy of stimulating the production of essential food-stuffs as Kenya's contribution to the war effort was amply borne out by the fact that East Africa became virtually self-supporting, except in the following years when it was necessary to import:—

<i>E.A. Cereals</i>			<i>Maize</i>		<i>Other Cereals</i>
<i>Pool Year</i>			<i>(tons)</i>		<i>(tons)</i>
1943/44	...	...	—	...	103,700
*1946/47	...	...	6,062	...	—
1949/50	...	...	1,770	...	—

This result could not have been achieved in a new country without the lead given by the European farming community, and the stimulus given in the stress of war has had profound and far-reaching effects upon the economy and development of what is and so far as can be foreseen must be a predominantly agricultural country, and which it must be primarily Government's responsibility to continue to develop rapidly in the interest of the country as a whole.

PRESENT ORGANIZATION

OFFICE OF THE MEMBER FOR AGRICULTURE AND NATURAL RESOURCES

22. In 1945, in accordance with a general reorganization of the administrative machinery of the Colony, the "Membership System" was introduced, including the appointment of a Member for Agriculture and Natural Resources. The Member is an *ex officio* member of the Governor's Executive Council and is responsible to the Legislature for the expenditure of public funds on agricultural, veterinary and forestry works, game and fisheries, water supplies and all settlement. He is also responsible for stimulating and guiding all agricultural developments.

23. The Member presides over a self-contained branch of the Central Secretariat and is assisted in technical matters by the Directors of Agriculture and Veterinary Services, the Chief Conservator of Forests, the Game Warden, the Hydraulic Engineer of the Public Works Department through the Director of Public Works, the Board of Agriculture and a number of advisory or executive committees or boards, which are detailed in a later section of the report.

*Note.—This import of maize was subsequently repaid to the Union of South Africa in kind.

DEPARTMENT OF AGRICULTURE

24. The activities of the Department of Agriculture cover the field of agricultural research, both in the laboratory and the field, soil conservation and protection of the fertility of the soil (partially enforced by statutory powers under the Land and Water Preservation Ordinance), the education of potential farmers and the planning of agricultural extension work. The department also provides the grading and inspection services for exported produce and the Government plant-protection services.

DEPARTMENT OF VETERINARY SERVICES

25. The Department of Veterinary Services is responsible for the research into and control of the various diseases affecting livestock, and to that end undertakes the development and preparation of vaccines and sera at the Kabete laboratories. In combination with private practice the Department also carries on veterinary extension work and performs some of the functions of animal husbandry. Special branches of the Department operate the Government Hides and Skins Improvement Services and also a buying and marketing organization for livestock from the African areas. I draw attention to this last function of the Department for reasons which are dealt with in paragraphs 115 and 187 of my report.

BOARD OF AGRICULTURE

26. Under the Increased Production of Crops Ordinance the Board of Agriculture is empowered to order farmers to plant scheduled crops, to authorize advances and payment of guaranteed minimum returns, etc. To perform these functions the Board works through District Production Committees and Sub-committees, bodies of local farmers, who exert a strong influence on Kenya farming. The functions of the Board are extremely wide, comparable to those of the War Agricultural Executive Committee (now County Agricultural Executive Committee) in the United Kingdom, but including also activities associated with the well-being of the farmer and the farming community as a whole, activities which in most countries are the responsibility of the farmers' own organizations. In addition, the Board is responsible, through the district committees, for the collection and collation of farm statistics and, more recently, for the administration of the rehabilitation loans for livestock development (*see* paragraph 50).

LAND AND AGRICULTURAL BANK

27. Long-term agricultural loans are administered by the Land and Agricultural Bank, which was established in 1931 with an initial capital of £240,000. The authorized capital of the Bank is now £750,000, but the Bank has authority to operate on an overdraft of £330,000, thus raising the effective total capital to £1,080,000. The Bank is empowered to issue loans up to a maximum of 60 per cent of the Board's valuation of the land and permanent assets of a farm, with a ceiling of £5,000 to any one farmer. Loans are repayable over 30 years in equal half-yearly instalments including amortization and interest on the outstanding balance. The original rate of interest was 6½ per cent, but the rate was reduced to 4½ per cent in 1946 and was made applicable to all previous loans. The rate was raised again to 5 per cent in November, 1952, in respect of all new loans. In addition, the Bank operates as agents for the official short-term credit facilities afforded under the Increased Production of Crops Ordinance, and also for certain development loans as in the case of the Land and Water Preservation Ordinance.

EUROPEAN AGRICULTURAL SETTLEMENT BOARD

28. Two parallel schemes were started in 1945 to assist in the settlement in Kenya of ex-servicemen:—

- (a) An assisted ownership scheme; and
- (b) A tenant farming scheme.

The former scheme was soon found to be unnecessary, as those new settlers, who had sufficient capital with which to buy their farms, were able to obtain their loan requirements from the Land Bank. This scheme has therefore since been closed.

The second scheme has proceeded in two phases:—

- (i) Under the old arrangement the European Agricultural Settlement Board owned the land and paid for the permanent improvements thereon, and in addition loaned money to the tenant, £ for £ with his own capital, for stocking, purchase of implements, working capital and living expenses until the farm became self-supporting.

- (ii) This is the more customary landlord and tenant scheme, under which the European Agricultural Settlement Board leases farms to selected tenants, constructs or pays for the construction of the improvements thereon, but does not undertake to make loans to them.

29. In 1948 the European Agricultural Settlement Ordinance was enacted, and the Board was provided with a fund of £1,600,000 for the purpose of buying land, developing the farms and for loans to tenants. The Board pays the Government 3 per cent per annum on the funds provided and charges tenants with interest on loans and rent on their farms at $4\frac{1}{2}$ per cent, the additional $1\frac{1}{2}$ per cent being charged to cover the administrative expenses of the Board.

30. The Board is now responsible for an area totalling 386,000 acres and administers the day-to-day problems arising out of the establishment of:—

- 23 assisted owners (scheme now closed).
- 181 tenants under the original tenant farmer scheme.
- 25 tenants under the revised scheme.

In addition the Board, which organizes through the medium of the East African Office in London publicity on behalf of European settlement in and the flow of capital to Kenya, has been responsible for settling some 100 men and their families under a new scheme for farm employment.

LAND BOARD AND LAND CONTROL BOARD

31. A Land Board appointed by the Governor considers all applications for Crown land for agricultural purposes outside the Coast Province and submits its recommendations to the Governor in Council, who is required to submit to the Secretary of State for approval any proposal to alienate more than 7,500 acres as one block. These recommendations always receive the prior consideration of the Members for Lands and Agriculture. The Land Control Board, which has a majority of members appointed by the European Elected Members of Legislative Council, considers all transfers of agricultural land in the Highlands. It is a statutory board and exercises certain powers in accordance with the Land Control Ordinance (Cap. 150).

WATER RESOURCES AUTHORITY

32. The Water Resources Authority is the statutory body responsible for tendering advice to the Member for Agriculture and Natural Resources on all matters concerning water development. Technical advice is supplied both to the Member and to the Authority by the Hydraulic Engineer of the Public Works Department, which is the executive Department concerned with water.

33. The Water Resources Authority is advised by five Regional Water Boards representing drainage areas, which consult the staff of the Hydraulic Branch in technical matters.

OTHER ORGANIZATIONS

34. In addition, there are a number of official and unofficial organizations concerned with agricultural production and marketing, many of which have statutory sanction, for which the Member for Agriculture is either ultimately responsible or with which he and his staff work in close collaboration:—

	<i>Nature of Authority</i>
The Maize and Produce Control	Defence Regulations.
The Kenya Meat Commission	Ordinance.
The Pig Industry Board	Ordinance.
The Pyrethrum Board of Kenya	Ordinance.
The Wheat Board	Ordinance.
The Kenya Farmers' Association	Co-operative Body.
The Kenya National Farmers' Union	—
The Kenya Co-operative Creameries	Co-operative Body.
The Kenya Poultry Produce Co-operative Society	Co-operative Body.

Mention must also be made of the Kenya Sisal Board, the Coffee Board, the Coffee Marketing Board, the Tea Board and the Wattle Producers' Advisory Committee, although the activities of these organizations are outside my terms of reference.

35. The form of membership of the various producer boards varies considerably, but as a general rule it can be stated that the Boards are composed in part of producer representatives of the industry, sometimes elected and sometimes on appointment by Government, various Government officials serving *ex officio* and other persons as may be appointed from time to time.

36. Milling is in the hands of private trading companies, but both price and distribution are subject to Government Control.

MAIZE AND PRODUCE CONTROL

37. The Maize and Produce Control operates under the authority of Defence Regulations, subject to the general directions of the Member for Agriculture and Natural Resources. Its essential functions, which have been fully described in the recently published report of a committee under the chairmanship of Sir William Ibbotson, are "to purchase maize at prices fixed by the Government, to collect and store it until it is required for consumption, and to ensure that sufficient quantities are available for consumption in the right places and at the right time". The Ibbotson Committee reached the conclusion that "in the interests of stability, both from the point of view of the consumer and the producer, the controlled marketing of maize must continue, but that the time had now come when control should cease to operate under Defence Regulations and that the administrative functions of control should be vested in a Statutory Central Board responsible to the Member for Agriculture and Natural Resources".

38. The price of maize has hitherto been negotiated with Government by the Board of Agriculture on behalf of the maize growers. In my report on the prices to be paid for the 1951 maize and wheat crop I have pointed out that experience in the United Kingdom clearly indicates that it is better for a body such as the Board of Agriculture, which has most important administrative functions to perform, to be outside the whole question of the price argument.

39. During the war and up to July, 1952, an East African Cereals Pool operated to ensure the maintenance and distribution of supplies in East Africa, and any surplus grain was exported at the higher world prices prevailing through the Pool and profits or losses charged to the Government account. The Pool was wound up in July, 1952, and is being replaced by an interterritorial agreement to ensure self-sufficiency in East Africa.

KENYA MEAT COMMISSION

40. The Kenya Meat Commission was established by statute in 1950 to take over the functions of the Meat Marketing Board, which succeeded the Livestock Control, a war-time buying organization. The Commission has certain exclusive rights in connexion with the purchase of cattle and small stock, excluding pigs, and the operation of abattoirs, etc., for the slaughtering and processing of such stock both for local consumption and for export. The central factory and abattoir at Athi River modelled on the Southern Rhodesian pattern is expected to start operations this year.

PIG INDUSTRY BOARD

41. In 1945 recognition was given to the successful organization of the pig industry by the producers by the establishment of a statutory Pig Industry Board. The Pig Industry Ordinance bestowed restrictive rights upon the Board as regards the sale and purchase of pigs, and by empowering the Board to issue licences to pig producers gave the Board very considerable control over production. There were 925 licensed pig producers as at the 30th June, 1952. The Board operates, so far as baconer pigs are concerned, through the Uplands Bacon Factory (a statutory company) and for porker pigs through the Kenya Cold Storage Company.

42. The prices of livestock or slaughter stock are controlled by the Government which so far as meat is concerned may seek the advice of the Kenya Meat Commission. As regards pork there is, during the present year, an agreement between Government and the Pig Industry Board whereby the Board has discretion to alter the wholesale price by $7\frac{1}{2}$ per cent either up or down (this follows a similar agreement last year). In addition, the Board contracts direct with the Ministry of Food in the United Kingdom for the supply of baconer carcasses.

KENYA CO-OPERATIVE CREAMERIES

43. The Kenya Co-operative Creameries was established in 1931 and handles the bulk of the dairy production in the European areas. Present membership is 1,837 and six creameries are now in operation. There are some smaller concerns, such as the Milk Producers' Association and several large private dairies, but it is through the Creameries that the industry negotiates with Government the prices for milk, butter, cream and cheese. Under an existing agreement with Government the Creameries is permitted to adjust the wholesale prices of dairy products by 10 per cent up or down during the year.

PYRETHRUM BOARD

44. The Pyrethrum Board is entirely responsible for the control of production and marketing of pyrethrum, the great bulk of which crop is exported from East Africa.

KENYA FARMERS' ASSOCIATION

45. The Kenya Farmers' Association, which is a farmers' co-operative and has a membership of 3,399, acts as the Government Agents for the handling of European crops scheduled under the Increased Production of Crops Ordinance. In the case of maize the Association operates as Agents for the Maize and Produce Control, and has been appointed to act in a similar capacity for wheat on behalf of the newly constituted Wheat Board. The Association maintains co-operative stores in farming centres. It has a share capital of £1,250,000 and a turnover of £5,167,000; this latter figure is, however, inclusive of the operations of Government Cereals Finance, some details of which are given in Appendix "D". So far as the marketing of wheat is concerned, the K.F.A. works in close co-operation with Messrs. Unga, Ltd., the principal milling concern of the Colony, in which the majority of shareholders are also members of the farming community.

KENYA NATIONAL FARMERS' UNION

46. The Kenya National Farmers' Union came into being in 1947. Membership, which is confined to individual farmers, now stands at 1,800. The objects of the Union are, *inter alia*, to promote and protect the interests of those engaged in farming in Kenya, to advise on all questions affecting agriculture, including prices, employment of labour, land tenure and taxation, and to advise the Government on the development of markets for agricultural products.

PREVIOUS COMMISSIONS AND INQUIRIES

47. The economic difficulties in which the Kenya farmer has found himself from time to time have led to a number of previous inquiries and Commissions. It was in consequence of the recommendations of the Economic and Finance Committee set up in 1922 that maize came to take its place as one of the principal agricultural crops of Kenya. In 1929 a Commission was appointed "to consider the progress of the main branches of the agricultural industry since 1920, and make recommendations as to the means whereby production might be increased and accelerated and the provision which should be made for augmenting departmental or other services calculated to advance the industry and the share, if any, which should be borne by organizations or undertakings representing or concerned with agricultural interests or production; and finally, the formation and function of advisory, consultative and other bodies in connexion with the agricultural industry". The recommendation of the Committee that an Agricultural Board should be appointed was put into effect in the following year although the Board lapsed shortly afterwards. During the rest of that year, 1930, the Board investigated numerous local agricultural problems including the question of agricultural credits, costs of production of crops, financial assistance to producers and the organization of the marketing of dairy produce. In 1935 a Committee was set up to explore the possibilities of lightening the burden of agricultural indebtedness. The Committee reported early in 1936 and as a result of its recommendations an Ordinance was enacted providing for the constitution of a Farmers' Conciliation Board with certain powers for the assistance and relief of farmers.

48. It became manifest in the light of the experience gained during the war years that, if the pace of economic and social development was to be accelerated, the boosting of production would not be sufficient in itself and that no effort should also be spared to preserve and develop that land from which Kenya derived its main wealth. The Development Committee gave official recognition to this consideration by allocating £8,700,000

to the development of agricultural, livestock and water resources, a sum which was augmented five years later with a further allocation of £2,500,000. Thus of the total revised development programme of £41,000,000, £11,200,000 is devoted to the development of natural resources, rather more than half of which is expendable in the African areas. So far as the European Highlands are concerned, the development funds are being expended on soil conservation, of which the farmer pays 50 per cent of the charges, and on agricultural and veterinary research, including agricultural experimental stations and animal health improvement centres and pasture research.

49. During and after the war several independent visitors to Kenya, with expert knowledge of the problem, emphasized the dairying potential of the Kenya Highlands, and it was realized that, if they were to get the best out of their land, many farmers must be encouraged to switch over to mixed farming. But, although much private capital and energy were being put into farming development, and notwithstanding that farmers were receiving a substantial measure of assistance through the medium of Guaranteed Minimum Returns, fertilizer and stockfeed subsidies (since discontinued), there were some farmers who were not in a financial position to afford the requisite improvements in capital installations, livestock, etc., and many were unable to progress as speedily as was desirable in the country's best interests.

50. It was to assist such farmers to stock themselves up with cattle in the interests of the promotion of mixed farming that in 1951 the Legislature approved the creation of a Rehabilitation Fund of £1,000,000, loans from which bear interest at $4\frac{1}{2}$ per cent.

51. The question of farming indebtedness was slightly obscured by the boom conditions operating immediately after the war, but in 1950—in consequence of the substantial increase in the costs of production—the Board of Agriculture formally requested the appointment of a representative Committee to investigate the agricultural indebtedness of the non-native agricultural community. It was this request which led, after much local negotiation, to the decision to appoint this present Commission of Inquiry, of which the terms of reference were appreciably expanded to their existing form.

AGRICULTURAL INDEBTEDNESS

INTRODUCTION

52. I intend in this chapter to refer to financial commitments as agricultural indebtedness. The term "indebtedness" is often misunderstood by the uninformed and is regarded as a sign of extravagance. In a productive concern such an assumption is invalid. Indebtedness, for the purpose of this report, is defined as the borrowing of capital to allow economic production to continue or be extended, credit facilities being obtained on a commercial repayment basis, including the payment of interest.

53. The financial characteristics of a loan include the provision of reasonable security by the borrower and a system of repayment over a period of time. The economic characteristics of a production loan are that the enterprise in which the loan is invested will reap a surplus which will allow the loan to be serviced and repaid.

AGRICULTURAL CREDIT

54. There are some special characteristics of agricultural credit which are of importance in the European areas of the Kenya Highlands. Agricultural concerns are usually small organizations and there are a large number of producers. It is not easy, therefore, to obtain capital by floating issues on a money market. Another characteristic is the difficulty of separating the firm and family business affairs. Loans provided for production purposes might be used for improving standards of living, including the provision of better housing, motor cars, etc. In addition to the slow turnover of working capital, there are also those extraordinary problems connected with all agriculture, including the climatic risk, the problems of disease, the fluctuation in the value of land, and the rather wide fluctuations in market prices.

55. Agricultural credit is usually divided into three main categories, (a) short term, (b) intermediate, and (c) long term,

56. Short-term credit is often of less than 12 months' duration for which formal security is not always needed, the money being required to finance the production and harvesting of the present crop. Intermediate credit is granted for one to three years' duration and is often covered by a chattels mortgage. Long-term credit is often granted for more than four years and is usually secured by a mortgage on land and is for the improvement of the capital assets of the concern.

57. Short-term credit should be used, in general, for the purchase of fertilizers, seeds, transport, wages, and those other expenses incurred in the production and harvesting of a current crop, and intermediate credit for the purchase of machinery and livestock. Long-term credit is, in general, required for the provision of fixed assets including buildings, the purchase of land and the long-term improvement in the assets.

58. Indebtedness is not a sign of inefficient production; it may be, on the contrary, a sign of most efficient production. If the credit is invested in sound projects resulting in increased production sufficient to repay the debt plus interest and give a profit to the enterprise, then such indebtedness is economically sound, but the credit terms must be of such a nature that the enterprise feels secure against recall at short notice. In addition, the loan charges should not be heavy. It is vital that there should be security for the farmer, and knowledge that sufficient funds are available for the satisfactory financing of short-, intermediate-, and long-term projects. Expensive and unsecured loans can lead to bad farming and land mining when the farmer is hard pressed.

59. Agricultural credit should not be granted merely against collateral. It is important that not only should there be security, but that the credit granted will result in increased production or improvement in the real resources of the enterprise.

TYPES OF CREDIT

60. In studying the farming indebtedness in the Highlands, I have attempted to examine the matter in terms of short-, intermediate- and long-term credit. As in all my other investigations, I have been hampered throughout by the lack of sound statistical data. I realize that grand totals for the farming community of the Highlands cover a large number of farmers who made no use of agricultural credit, and others whose demands were great; the individual problem cannot be seen in crude arithmetic averages. To examine the position fully would have required a special investigation into the activities of a number of farmers; such an investigation is not justified.

61. Some of the statistical data that I have been able to collect is limited in its use because of the inclusion within its coverage of what may be termed the plantation farmers. The agricultural industry is taken to include the mixed farmer, dairy and beef producers, and plantation farmers, but my terms of reference exclude the plantation enterprises. In the case of commercial bank overdrafts, it was impossible to obtain a division in spite of the co-operation of the banks.

62. I have studied the problem of capital indebtedness in the Highlands in relationship to the gross returns obtained by the farmer. I have found nowhere an adequate estimate of capital investment in farming in the Highlands and, therefore, the conservative estimate of £40,000,000 used elsewhere in this report has been taken. The opportunities for obtaining credit are many for the farming community and they are rather complicated in their application. I have taken the following and examined them in the course of my study.

63. The Guaranteed Minimum Return to the farmer provides a means of short-term credit. The system based on information provided to me by the Land Bank is described in the next paragraph. This scheme applies only to non-plantation farmers.

64. Farmers can obtain advances of up to 80 per cent of the Guaranteed Minimum Return for the scheduled crops for which they have been given planting orders. These crops are wheat, maize, barley, oats and one or two others of minor economic importance. This maximum advance works out in practice at £4 per acre for wheat and maize though there is provision for an advance of £5 per acre. The loans are only granted for approved purposes, production costs, and are paid through the Land Bank and recovered from the crop proceeds by the Land Bank in co-operation with the K.F.A. Frequently farmers apply for advances early in the crop year and do not draw against them subsequently or only draw part of the amount approved.

65. In 1951 about 30 per cent of farmers growing cereals applied for advances, some making more than one application, and the amount drawn was about 15 per cent of the value of the crops subsequently sold off the farms, i.e. £570,000 compared with £3,882,000.

66. These advances are automatically repaid when the crops are sold; the maximum duration is therefore one year.

Year	No. of Advances	Amount Advanced £'000	Index 1947=100
December, 1942 ..	242	37	
1943 ..	385	73	
1944 ..	337	59	
1945 ..	360	84	
1946 ..	358	75	
1947 ..	353	90	100
1948 ..	413	134	149
1949 ..	593	236	262
1950 ..	914	410	456
1951 ..	1,063	574	638

67. The Kenya Farmers' Association also provides credit facilities to its members who are mainly cereal and mixed farmers. A study has been made of the amounts outstanding to the K.F.A. at July of each year, which is the end of both the crop and the K.F.A. financial years. At July, indebtedness to the K.F.A. appears to be at its peak; if February had been taken, indebtedness would have been half, that being the time of minimum indebtedness. The K.F.A. fixes a maximum credit level for each farmer at the beginning of their financial year; this level is based on the farmer's assets and past performance. Applications for increases have to be agreed by the Board of Directors.

68. Loans and advances to the agricultural community by commercial banks cover both plantation and other farmers, and the proportions are not known. The Rehabilitation Scheme was designed to assist the change over of farming from monoculture to mixed. Loans have been granted in the main for the purchase of livestock and the provision of facilities, e.g. dips, fencing, water supplies, etc. The amount granted to the farmers during 1952 was £226,565 of which £177,209 was for the purchase of livestock. Repayment of these loans is made over a period of 15 years.

69. These credit facilities represent the short- and intermediate-term indebtedness. Indebtedness to the K.F.A. in February, the minimum position, is presumably of an intermediate nature. In addition, there are the long-term credit facilities mainly provided by the Land Bank of Kenya. Among the functions of the Land Bank is the provision of intermediate- and short-term credit, although almost all the outstanding advances are in respect of long-term credit.

70. I have examined the position in regard to long-term credit and have observed from the reports of the Land Bank that, in general, there has been over the years from 1946 a tendency for borrowers to repay amounts outstanding from pre-war and early war years. To the best of my knowledge the position appears satisfactory in regard to long-term credit. The amount of loans outstanding at the end of 1951 was approximately £1,000,000. I have no information on private mortgages, but I have not had evidence brought before me to suppose that the facilities available for long-term credit are not satisfactory. I shall therefore deal, in the rest of this chapter, with the problems of short- and intermediate-term indebtedness.

ECONOMIC ANALYSIS OF CREDIT FACILITIES

71. A study of the opportunities for credit emphasize the short-term nature of such credit facilities. The Guaranteed Minimum Return advances are for the current year only and must be repaid when the crop is sold. To this extent this credit facility is not similar to those provided by the K.F.A. and the commercial banks. This credit should be used for

the financing of the current crop and the provision of working capital only. Many of the farming community do not seem to make use of the Guaranteed Minimum Return advances. From the statistics provided to me, I have estimated that Guaranteed Minimum Return advances represent some 15 per cent of the gross returns to farmers from cereal crops during the year, and that some 30 per cent of farmers growing cereals take up these advances. These figures suggest that the majority of farmers do not require advances under the Guaranteed Minimum Return scheme. For those making use of the scheme, the amount of advance averaged £1,000 in 1951. I have been told that many of the farmers taking up advances under the Guaranteed Minimum Return scheme are new or are monoculturalists in the Uasin Gishu and the Trans Nzoia.

72. I deal next with overdrafts with the K.F.A. They can be maintained only with the approval of the Board of Directors and with suitable collateral being provided. These overdrafts have increased greatly from 1947 to 1952, multiplying by roughly five times. Up to 1949 the movement of the index of K.F.A. overdrafts was not greatly in excess of the index of farmers' gross returns (1947 = 100) but in 1951 and 1952 the increase in the first index was much greater than in the second. These overdrafts may well extend from one year to the next and in spite of being short-term credit would in economic terminology qualify for the term intermediate.

73. Bank overdrafts to agriculture cover plantation farmers as well as those included under the terms of my Commission. The increase since 1947 has been at a slower rate than the increase in K.F.A. overdrafts. There was a great increase between 1947 and 1949 believed to be due to bad harvests and since then only small increases have been recorded.

74. If commercial bank and K.F.A. overdrafts are combined and compared with the estimate of gross returns to non-plantation farmers, it will be seen that since 1950 overdrafts have represented less than half of gross returns. Overdrafts at February would form an even lower proportion.

75. Inasmuch as the bank overdrafts are of a short-term nature, they can be considered with the Guaranteed Minimum Return scheme and the K.F.A. overdrafts. Intermediate credit can be obtained against a chattels mortgage from the Land Bank, but the amount recorded as outstanding is extremely small, showing that few farmers use this facility.

76. It has been difficult to assess the position of indebtedness to traders, not because of the lack of co-operation but because of the difficulty of analysing the information provided. The statistics I have obtained on machinery and hardware indicate there is very little long-term indebtedness to trading firms. The farmers do not seem to be using this method of financing their production. The indebtedness to these traders represents two to four months' sales.

77. From the information available to me, it would seem that there is a tendency for indebtedness to the banks and to the K.F.A. (*vide* paragraph 45 and Appendix "D", Government Cereals Finance) at the end of July and the crop year to be some 30 to 40 per cent of gross returns for that crop year. In February overdrafts would be a much lower proportion of those gross returns. There has been considerable increase in credit granted by the K.F.A., the amount of which at the end of 1951 was considerably greater than the total advances given under the Guaranteed Minimum Return scheme during that year. This information refers to the position at July, the end of the crop year when short-term indebtedness is at its maximum. The amount issued per annum under the Guaranteed Minimum Return scheme has increased much faster than the value of gross returns from crops, and in 1951 amounted to 20 per cent of the indebtedness to the K.F.A. and the commercial banks.

78. Such statistics as have been made available to me are given below:—

Statistics of Agricultural Income and Indebtedness

Gross Income is based on Kenya Farmers' Association payout for cereals and pyrethrum, Kenya Co-operative Creameries payout for butterfat and payout for slaughtered cattle and pigs. This is about 80 per cent of total gross income from sales of non-plantation farmers.

Indebtedness is based on overdrafts at commercial banks and K.F.A. at June or July each year. At this time of the year such indebtedness appears to be at a maximum. In February overdrafts at K.F.A. are about half those in July.

Year Ending July	I Gross Income		II Indebtedness* K.F.A. Overdrafts		III Bank Overdrafts		IV Bank and K.F.A. Overdrafts		Ratio of Col. IV to Col. I
	£'000	Index	£'000	Index	£'000	Index	£'000	Index	Per cent
1947	2,927	100	218	100	818	100	1,036	100	23
1948	2,426	83	475	218	1,768	216	2,243	217	92
1949	3,767	129	589	270	1,935	237	2,524	244	67
1950	5,076	173	572	262	1,307	160	1,879	181	37
1951	6,303	215	827	379	1,902	233	2,729	263	43
1952	Estimate 7,276	249	1,109	509	2,126	260	3,235	312	44

Year	Index of Gross Income	Index of Indebtedness
1947	100	100
1948	83	217
1949	129	244
1950	173	181
1951	215	263
1952	249	312

NOTE.—*Indebtedness to K.F.A. is partly covered by members deposits, but these are not used for annual purchases by farmers—they are savings deposits. Farmers with overdrafts are not likely to have deposits as well.

Land Bank

December	LONG-TERM LOANS ISSUED		SHORT-TERM LOANS ISSUED		PRINCIPAL OUTSTANDING
	No.	Amount £'000	No.	Amount £'000	£'000
1947	118	169	16	5	656
1948	117	199	16	7	692
1949	161	300	16	6	911
1950	140	249	31	13	1,046
1951	117	200	12	5	1,070

CONCLUSION

79. No information is available regarding private mortgages and other means of finance, local or retail indebtedness or, of course, of the indebtedness of individuals. The total short- and intermediate-term indebtedness is, however, amply covered by gross revenue, while long-term credit represents only a fractional percentage of the value of the land and fixed equipment.

It is apparent that short-term credit is being used for financing activities of an intermediate nature, and that little use is being made of long-term credit. The conditions and rates of interest for the various Government-sponsored agricultural and settlement loans should be considered as a whole and be actuarially related. At the same time procedure might well be standardized.

GENERAL CONSIDERATIONS

80. The terms of reference of this inquiry are confined to the European Highlands, but any consideration of their future must be based on the requirements firstly of Kenya as a whole, secondly of East Africa, and lastly on the demand for food in other countries both within the African continent and further afield.

81. The time factor is all important, and I am firmly convinced, after seven months' investigation, that having regard to the fertility position in the African reserves as a result of traditional African methods of farming, and notwithstanding the valuable work being carried out with the assistance of development and betterment funds, any rapid increase in production must be looked for from European farming in the Highlands.

82. From this standpoint alone I have felt justified in assuming that the rapid development of the past decade should be continued and accelerated in order to bring the European Highlands into a state of full production as soon as possible. This would appear to be the only realistic and sane approach, and the whole of this inquiry is based on this assumption, which is reinforced by the fact that the development of the economy of the country demands an immediate increase in the national income.

83. The soil and the climate of the high altitude land of Kenya are favourable for plant and animal growth. There are probably few areas in Africa which are less subject to extremes of temperature or unexpected long drought periods. Although it lies on the equator, the high altitude of the Highlands tempers extremes in climate which may be said to be sub-tropical in character.

84. The east of the Rift Valley is subject to the normal monsoon double rains, but to the west of the valley it is subject to the Lake Basin rains with normally six to seven months' rainfall and only from three to five months of drought effect.

85. The land may be divided into two farming types in the light of present knowledge. Firstly, there is the land which is not normally ploughed owing to low or possibly uncertain or uneven distribution of rainfall. This area forms the ranching zone. Secondly, there is an area in which ploughing and regular rotational growth of crops should be the normal practice and which forms the mixed farming zone.

86. Appendix I reproduces a section of the survey map of Kenya covering the Highlands, and showing the contours and main topographical details. Appendices II, III, IV and V, which should be examined in conjunction with the key map at Appendix I, show respectively the soil types (Appendix II), an explanation of which is given in Appendix "E", the prospect of a 30-inch rainfall expressed in terms of probability (Appendix III), the main areas of vegetation (Appendix IV), and the principal farming zones (Appendix V). (As regards Appendix V *see also* paragraphs 161 to 164.)

It will be seen that water is the critical and controlling factor in determining the farming potential. It should be properly expressed in terms of rainfall and distribution for crops, and in terms of availability for livestock.

87. The pioneer development of any new country follows a common pattern. In the majority of cases the pioneer is short of capital for development and is in need of an early cash return. He will of necessity start by clearing those areas of land which appear to be the easiest to work and the most profitable. Where rainfall is sufficient he will attempt the growing of those grain crops which would seem likely to be suitable. Having found a crop which gives satisfactory yields, he will continue to grow this on the land originally cleared as long as the yield continues to show a profit. He will then abandon that land and move on and clear further areas. Such monoculture inevitably brings about soil erosion.

88. In the Kenya Highlands as a whole the easiest areas have been cleared either for crops or stock, but it is only in recent years that attention has been focussed on the need for a balanced system of farming to maintain and increase soil fertility. Indeed, the adoption of alternate husbandry is still in its infancy. Large areas are still cropped mainly with wheat or maize, producing year by year diminishing yields, with the livestock maintained on the unploughed portion of the farm.

89. There is already ample evidence from Kenya of the high productivity of the ley and of its value in arresting the wasting of soil, and evidence is also accumulating of its value to succeeding tillage crops. It may be said, therefore, that there is more than faith,

and the almost universal value of the alternate husbandry system in other countries, to support and justify its adoption alike in the European Highlands and the African reserves.

90. The adoption of alternate husbandry as a general practice constitutes a major and costly operation, requiring in many cases fresh knowledge and skill on the part of the settler, considerably more capital and an initial time lag before obtaining a full return. It is not surprising, therefore, that the settler who is an established wheat or maize grower will prefer to continue growing his particular crop on an ever-increasing acreage in order to make a living and that he is hesitant to start on alternate husbandry, of which system he has no experience and which in any event entails a highly integrated plan of farm management. The fundamental changeover of the farming system emphasizes the need for further research and more intensive advisory work. Soil conservation measures need to go hand in hand with the establishment of leys to arrest land deterioration and build up a higher fertility status.

91. Finally, the range of farming efficiency from farm to farm is possibly even greater in Kenya than in most other countries. This is frequently ascribed to the lack of farming background possessed by many settlers. But there are far more important factors, such as the extreme variability of natural conditions and the complete lack of knowledge of farming possibilities in the early years of development and even to some extent at the present day. It is well to remember that a settler starting in virgin Africa needs to be a man of very considerable resource, possessing the ability to foresee the potential, and to carry out or teach others to carry out all developments. The ideal settler should be a builder, a mechanic and a first-class organizer of labour in addition to possessing farming skill. The great majority of settlers have every intention of remaining and of improving their holdings over the years, and this attitude is even more marked in the first generation of Kenya-born young men. They regard themselves as citizens of Kenya and their homes, in the natural order of things, as theirs to live on and develop.

FARMING APPRECIATION

92. A brief review of both practical farming and technical experience is necessary before considering the present or future economy of the industry, and indeed the adoption of the most suitable farming system is basic to any degree of economic success.

I—CROPS

(a) Ranching Areas—Grass

93. In the ranching areas clearly the natural herbage, which is generally of low-feeding value, must form the basis, and improvement must come from paddocking and the raising of the fertility status by more intensive stocking. Fencing and a distributed water supply constitute the first essential to improved farming.

94. At the present time the capacity of the natural turf will vary from one head of cattle to every 25 acres in a low rainfall and newly alienated area such as North Laikipia, to the other extreme of one beast to six acres in certain low rainfall areas adjoining the Rift Valley where a permanent star grass sward has developed as the result of regular and rotational grazing. This heavier stocking, particularly in the Naivasha area, is only made possible by the growth of irrigated lucerne—which is essential as a food supplement in the dry season. The same conditions apply in the Machakos district, where in addition to lucerne, small areas are ploughed for forage crops which are ensiled or made into hay. This type of practice might well be developed and would result in far heavier stocking of the land than could otherwise be risked.

95. In general it must be clear that the “extensive” nature of production in the dry areas does not justify heavy expenditure on grass improvement although there are examples of successful cultivation and the planting of star grass splits. As a factual measure of the improvement already effected, records of output on some of the longer established ranching estates show that under expert management output has been more than trebled during the last 20 years.

96. In some areas dense bush is developing to the detriment of the grazing, in certain cases to the extent of being practically impenetrable and putting the land out of effective action. This has become a serious problem as a result, presumably, of the prohibition of annual burning, the extermination of wild animals, the control of others such as the goat, and, in certain cases, in consequence of overgrazing. An interesting example of organized bush control may be seen on a property north of Eldoret, where giraffe and goats have been

introduced and have produced striking results in bush control as compared to the adjoining land. Other methods of control might possibly be to introduce periodic burning every four or five years, destruction of bush by the use of specially designed mechanized implements based on the principle of the Dutch hoe, or even, of course, removal by hand labour, although this is becoming increasingly expensive.

97. The degree of improvement in the ranching area must depend on the nature and cash value of the output, and there is considerable variation in the dry areas both from a physical and a proximity standpoint. As an example, the areas which are in a position to supply whole-milk to Nairobi or Mombasa can clearly afford to become intensified to a greater extent than those which are far distant and are limited to beef production from the native breeds.

98. There are one or two areas which appear, as the result of some soil deficiency, to be unsuitable for regular cropping although rainfall may be as high as 45 inches. I refer particularly to the Lugari area in the south-west of the Trans Nzoia which is concentrating on grass and the production of cattle; stocking can be maintained at the rate of one animal to four acres, and in this area satisfactory natural regeneration from ploughed land normally follows and further improvement will result from close grazing.

(b) Mixed Farming Areas

99. PERMANENT PASTURE.—In the mixed farming areas reversion, where land “tumbles down” after cropping, produces mostly worthless grass with certain exceptions such as in the Turbo-Kipkarren district, where star grass emerges following a system of grazing control, and in certain high altitude areas such as Molo and the Kinangop where Kikuyu grass grows naturally. Kikuyu grass develops an exceptionally productive thick sward where a high fertility status is built up by close grazing, mowing and surface treatment. Intensive stocking of over one beast to an acre may result, and the only problem presented is when the Kikuyu sward is cultivated with the object of growing the next crop in the rotation.

100. SOWN LEYS.—The ley is clearly the pivot of the arable rotation in the alternate husbandry system and, in consequence, large areas of sown leys will require to be developed over the majority of the ploughable area. The acreage under sown leys shows that something more than a promising start has been made. In 1946 the total acreage was 12,487, in 1951 23,393 acres and in 1952 the projected acreage is 61,627.

101. Pasture research and experimentation has recently been started on a comprehensive scale (*vide* Appendix “F”) and must be deemed to be of first priority. There is a wealth of indigenous species for trial and selection—quite apart from the possibilities of imported varieties—and there seems little doubt that rapid progress should be made in the field in regard to both grasses and legumes in a comparatively short period of years.

102. Although research and experimentation is only in its infancy, yet at the present time either molasses, star or Rhodes grass, appear to satisfy immediate requirements at all but the highest altitudes (above 7,000 ft.). At the higher levels exotic grasses such as cocksfoot grow well, and inclusion of either lucerne or serradella in seed mixtures appears promising.

103. The productive or carrying capacity of sown leys is at present quite remarkable, and cases have been seen where one beast or more may be carried per acre with good livestock gains or milk yields, and with a grazing period of up to nine months in the year. In one instance an average yield of some 670 gallons per annum was being maintained in a herd and the ley was carrying $1\frac{1}{2}$ cows per acre. Moreover, supplementary feeding was only given to any cow yielding more than 3 gallons at the rate of $3\frac{1}{2}$ lb. for the fourth gallon and upwards. The results of scientific research should enable greatly increased stocking to be practised, and what may fairly be described as phenomenal figures reached.

104. The basic principles of ley management as practised in the United Kingdom appear to apply to Kenya, but scientific investigation is required not only in the selection of suitable varieties of plants for the varying conditions of height, rainfall and temperature, but—what is possibly more important—in the techniques of ley establishment, utilization and of cultivation in preparation for the succeeding crop. Seed production needs careful development in order to ensure a supply of cheap seed, which is true to type and with a satisfactory germination capacity. Possibly schemes similar to the certificated schemes developed in the United Kingdom might be applicable.

105. **TILLAGE CROPS.**—In the mixed farming areas wheat, barley and oats are generally grown above say 6,500 ft., and maize at below this level, although there is a range of conditions suited to all these crops.

(i) *Wheat.*—The statistics, supported by figures of sales, show that the average yield in the Kenya Highlands is only 1,000 lb. of grain per acre, and this must be due to monoculture of an appreciable area and in many cases over a long period of years. Disease such as “take-all” markedly lowers the average yield under these conditions. It is realized that even this yield is high in comparison with that of many other countries in Africa. The breakdown of statistics shows that during the last ten years the percentage of farms producing less than four bags (800 lb.) varied from 67.3 per cent to 21.5 per cent. There is sufficient evidence to show that wheat grown on recently broken land or following a ley will produce 15 bags per acre (3,000 lb.) or over, and it seems reasonable to assume on a conservative basis that with the introduction of the ley as a regular crop in the rotation the average yield should be increased within a decade from five bags to eight bags (1,600 lb.). This should amply safeguard internal requirements and the surplus could face the competition of the export market unaided.

Continuous work has been carried on by plant breeders, over a period of years, with a view to producing a succession of new varieties giving improved yields which are more resistant to fungus diseases such as rust and which are shorter strawed. Such work must obviously go on, as disease resistance is seldom maintained in any variety or hybrid over a period of years. More attention should also be given to baking quality.

(ii) *Barley.*—The increased use of barley as a cash crop is undoubtedly justified on yield alone. It is particularly suited to light land, but it is also a sound alternative crop to wheat, and it should certainly be used in any rotation where three or even four cereal crops are taken in succession. There is every reason for supposing that the demand for malting barley will increase, and the requirements of the expanding pig industry will absorb at least double the present acreage—even assuming on a conservative basis a 40 per cent increase of yield as the result of rotation. Recent trials have indicated that imported varieties, notably certain Scandinavian barleys, give increased yields.

(iii) *Oats.*—This crop has proved very adaptable under Kenya conditions. It can be grown as a pioneer or catch crop following the break up of virgin land, or ploughed land after long ley, or as the main crop. It can be used for any convenient combination of grazing, silage or hay, in which case more than one growth will be produced, or it can be harvested as a normal grain crop.

(iv) *Maize.*—As with wheat the average yield of maize in the Highlands of under eight bags per acre is undoubtedly low and due to similar causes. It is appreciated also that this average is above that of certain other countries in Africa. Yields of maize of up to 30 bags per acre have been recorded and on a conservative basis an average of 12 bags (2,400 lb.) should be achieved in ten years. In the case of the maize, the yield can almost certainly be improved by the plant breeder through the introduction of a range of hybrids suited to the varying Kenya conditions. This is inevitably a long-term project. If the experience of Southern Rhodesia was to be repeated an increase of some 30 per cent may be expected. The mechanization of the maize crop has not so far proved successful, although further experimentation might be carried out on the increase of the distance between rows from 3 ft. 6 in. to 6 ft. in order to allow for later cultivation by implements; a correspondingly larger number of plants will be left in the drill. Again there are farms where such practice has been adopted, and it has proved successful in Rhodesia. This practice also permits the successful undersowing of the maize crop with a variety of forage plants such as napier grass and dolicos beans or marrow stem kale. The undersowing of maize might well be more widely adopted both to supplement grazing in the dry weather and to benefit the land by treading and manuring of the animal.

(v) *Sunflower.*—Sunflower has been regularly grown in the maize area and provides a sound alternative cash crop, in addition to its possible use on the farm as a source of oil and protein for animal feeding. The acreage under sunflower is increasing, and it may be anticipated that it will further increase.

106. **FORAGE CROPS.**—Lucerne, preferably but not necessarily irrigated, napier grass, Sudan grass, dolicos beans, marrow stem kale and practically the whole range of forage crops from comparable climates appear promising and should be developed.

107. **OTHER CROPS.**—Further trials should be carried out on linseed, which at present shows a low average yield, but which makes excellent preparation for wheat entry. Finger millet in certain light land areas may be mentioned amongst other possibilities. It will be appreciated that the possibilities of alternative crops can only have been initially explored.

108. **FIBRE PLANTS.**—New Zealand flax has been successful especially in the high area of Kaptagat, and flax is grown in various parts; there would appear to be room for further experimentation on hibiscus, ramie, etc.

109. **PYRETHRUM.**—Pyrethrum produces the highest cash return on any crop when grown at altitudes above, say, 7,000 ft. At the present time of rapid development of many farms this return provides the main source of profit to enable such development to be carried out. Its acreage is limited by the amount of labour available on the farm.

110. **GREEN MANURING.**—The value of green manure requires further investigation as, according to present information, the beneficial results are by no means certain, although striking results have been seen in certain areas, particularly in the Uasin Gishu from the ploughing in of sunflower, lupins or sun hemp.

111. **FERTILIZERS.**—Phosphatic fertilizers produce large yield increases and their use should be increased even at what appear to be exorbitant prices, and their application to sown leys should become general practice. The Highland Fertilizer Scheme produced a great deal of information on manuring, but there are clearly anomalous and unexplained responses, and it is difficult to understand the Ph determination. Further work is called for on the use of the main ingredients.

112. **TRACE ELEMENTS.**—It is reasonable to suppose that trace element complexes may affect both crop and animal nutrition. This whole question should receive thorough investigation, and it is understood that laboratory facilities are available at the East African Research Organization.

Apart altogether from the anomalies referred to in the previous paragraph, there are certain areas which are known to be deficient in cobalt or copper, and in the case of the animal there is marked benefit in the feeding of a mixture containing a wide range of minerals. Furthermore, there is a definite increase of milk yield in other areas when borehole water is used as compared to surface or dam water, possibly due to the mineral content of the water.

113. **CULTIVATION.**—Under what may be termed average mixed farming conditions, the nature, number and timing of field cultivations varies greatly. Some study should be made of the detailed work carried out by certain successful farmers. I am left with the impression that unnecessary work is undertaken by many, which may at times even result in reduced yields; and as in other countries the correct time of any operation is probably the greatest single factor. Experiment is needed to develop a successful technique for dealing with marginal dry areas, and in particular for the conservation of water resulting from heavy rains and of reducing "wash".

114. **WEED KILLERS.**—The use of selective weed killers will obviously increase. Although low-volume spraying will not provide anything approaching a complete answer to weed growth—which must come primarily from good cultivation—yet, in a climate such as Kenya possesses, the rapid and luxuriant growth of weeds following rain can often be most conveniently dealt with by this means.

II—LIVESTOCK

115. The present number of cattle, which is estimated at 570,000, is wholly insufficient to deal with the present output of grass and, on the assumption that alternate husbandry is generally adopted, it will have to be increased by at least 250 per cent in ten years. This aspect is dealt with later in the report, but the immediate implication is that, at the present time and probably for some years to come, disposal of breeding cattle by culling must from a colony-wide standpoint be restricted to those animals which cannot breed, and that every effort must be made to prevent wastage of female cattle. The Boran or native cattle are more resistant to disease than either the exotic breeds or "grade" cattle; they do well under adverse conditions, including scarcity of water, and they are less susceptible to the whole range of breeding disorders. It is wise to use them on any farm until it has been "cleaned up", and it is equally sound for any farmer who is inexperienced in stock management to start with these cattle whether he intends later to develop into either beef or milk production.

Probably the worst feature of the cattle at the present time is the large number of poor quality "grade" cattle produced as a result of indiscriminate breeding with a succession of bulls of different breeds and of low standard.

(a) Beef Cattle

116. The virtue of the Boran breed under all conditions up to an altitude of about 7,700 feet is undoubted, and great strides have been made in the selection of animals to bring about more rapid growth. Pure-bred Boran steers are commonly brought out at five to six years old, and the Kenya Meat Commission figures record pure-bred Boran steers reaching dressed carcass weights of up to 630 lb. at four years old and of Red Poll X Boran steers weighing 600 lb. at 3½ years of age. In all cases these results are obtained on grass alone without feeding of additional bulk or concentrate foods. A few years ago the average age of pure-breed Boran steers was nearer seven years.

117. Both the Boran and the native cattle must, therefore, form the basis of beef production, either pure or when crossed with the European beef or dual purpose breeds. The whole art of breeding lies in the introduction of the optimum amount of exotic blood, without detriment to health or fecundity, to suit the particular conditions of the farm in question. For example, under ranching conditions it may be possible to introduce two top crosses of the European breed and then to back-cross to the Boran bull, but the extent of the introduction of the exotic blood will depend entirely on the individual circumstances of the farm. As the question of meat for export comes more into the picture, it will be worth while paying a higher price for lighter weight, well finished and younger bullocks weighing from 450 lb. to 550 lb. cold-dressed weight. In the case of crosses with dual purpose breeds, beef production can be combined with butterfat production, and this is being carried out successfully by yarding the calves throughout the night and hand-milking only in the morning; this is even done in certain cases with pure Boran cattle, which have been selected for milk production.

118. Analysis of the throughput of the abattoirs during the most recent 12-months' period shows that approximately two-thirds of the animals come from the mixed farming areas. This figure is surprising. With the introduction of the ley as a regular part of the mixed farming system, its contribution to beef production will be further increased, and every attempt should be made to rear the steer calves of the dual purpose or dairy breeds, such as the Friesian and Ayrshire. In general, the intensive mixed farm of the future will be too small economically to maintain a breeding beef herd, and a system of fattening of store animals imported from ranching areas and the African reserves should be introduced. It is appreciated that, when stock is transferred in this way, disease presents a serious but a diminishing problem.

(b) Dairy Cattle

119. The high-altitude areas are particularly suited to the European pure-bred breeds of dairy cattle, but over the majority of the Highlands grade cattle, i.e. European crossed with native or Boran, are not only more suitable but must perforce form the vast majority of the dairy cow population. As with beef cattle, the extent of the introduction of European blood will have to be regulated by the particular conditions of the farm.

120. The market for whole-milk is a limited one and any large consumption is clearly confined to such towns as Nairobi and Mombasa, although more recently a considerable and developing market has been opened up in Uganda.

121. Cheese-making has been developed to satisfy local demands, but milk surplus to liquid requirements is generally separated and the cream used for butter-making. Any large expansion of milk production will clearly bring about greater dependence on export, and it may be assumed that this will generally take the form of either butter or dried milk.

122. The question of the optimum level or levels of milk-production is one to which a great deal of attention has recently been given, and it would appear that there are three types of dairying which are most likely to be profitable: Firstly, extensive dairying with native or low-grade cattle, involving a minimum of expenditure and providing a low return per animal or per acre; and secondly, a medium standard of production of from 15 to 18 lb. of milk per day with grade cattle, provided that additional feeding is confined to home-grown foods, a high proportion of which consist of bulk foods such as silage and hay, as well as grazing of catch crops; thirdly, intensive production and the free use of concentrates,

where the average annual yield is from 750 gallons per cow upwards. There is a tendency at the present time on many farms freely to use home-grown and purchased concentrated food where yields are of the order of 500 gallons, and such practice will clearly result in loss. The overall profit from butterfat production is not high, and it requires considerable skill in planning and operation. From a profitability standpoint it must be considered with pigs as one enterprise.

123. Generally speaking, intensive or semi-intensive milk production requires considerable supervision in order to contend with the disabilities and diseases in Kenya, amongst which are a group which adversely affect breeding. An even greater loss occurs with calves and, unless conditions for bucket-feeding can be kept scrupulously clean, with smaller herds and by means of constant supervision, it would appear sounder to rear by the method of suckling with nurse-cows. Calf-rearing appears to be extravagant, and 100 gallons of whole-milk per calf is commonly used during the period of weaning. Economy in this direction can be effected by the use of alternative foods, which are becoming increasingly available, although it is realized that after the initial weaning period heifers depend entirely on grazing and are frequently calved down at from two years to two years and six months.

(c) Sheep

124. The sheep population in the Highlands is very unevenly distributed and has been substantially static over recent years. There are a few large flocks confined to the higher altitudes, and a comparatively large number of small flocks of possibly 50 to 100 sheep distributed throughout. The exceptionally high prices for wool have unbalanced sheep husbandry all over the world in recent years but, assuming that mutton or lamb become again the main consideration, there would appear to be room for a very considerable increase in the sheep population. This need will be emphasized in the future with the projected increase of ley grazing, and there is no reason why sheep should not become an integral part of the mixed farms, where they would normally graze after the cattle without materially affecting the numbers of the latter that can be carried. The factors operating against sheep have been, firstly a lack of knowledge of sheep management both on the part of the farmer and the veterinary surgeon, secondly, that growth is restricted in many situations where it is necessary for protection against wild animals or theft frequently to confine the sheep within night *bomas*, with consequent reduction of the period of grazing and also a large increase in infection with internal parasites. There is no doubt that at the present time losses are frequently severe and that there is need for more veterinary specialized staff for sheep diseases. Wet seasons and too long a growth of grass are liable to cause trouble with sheep. Present prices reflect a scarcity of breeding animals and the native sheep make an excellent foundation, particularly the whole-coloured dark red Masai type of ewe. Native sheep are hardy, and with careful management the lambs will grow larger than their dams. The best breed of rams for crossing needs further investigation, but both the Corriedale and the Romney have proved successful. On outside experience it should be worth experimenting with the Border Leicester as a first cross, followed by one of the "Down" breeds such as the Suffolk.

(d) Pigs

125. The quality of pigs in Kenya is notably high, and in the main the Large White breed is kept, although there are a certain number of herds of Wessex and Large Black sows which are crossed with the Large White Boar. The production of either bacon or pork in very large quantities would appear to offer one of the greatest opportunities to the Colony in the field of livestock.

126. Natural conditions are well suited to this animal in comparison with European conditions. For example, buildings can be greatly simplified and reduced in cost. I have seen excellent examples of mud and wattle, or wooden huts made from materials on the farm, which are satisfactory for breeding stock in paddocks. The solidly built stone Scandinavian type of fattening houses could with advantage be replaced by feeding yards, with a large saving in initial cost and, above all, a big reduction in the day to day labour looking after the stock.

127. Labour is relatively cheap, and less pig food is required in Kenya than in the United Kingdom owing to the higher temperature. Moreover, the cost of foodstuffs in relation to the selling price of the pig compares favourably with the United Kingdom. Feeding stuffs account for some 80 per cent of the cost of production of the bacon pig. Appendix "G" gives some figures of the costs of pig production at the Government Experimental Farm

at Ol Joro Orok. There is need for further experiment on the development of the Lehmann system of feeding, using bulk foods such as Kikuyu grass, edible canna (*see* Appendix "H") and possibly forage beet or, indeed, other crops.

128. The pig population is one that could be rapidly increased, and it is to be hoped that the projected new Uplands factory with a throughput of 4,000 pigs per week will be fully utilized long before the end of the ten-year period. Finally, the link-up of increased numbers of pigs with an increased dairy cow population and a supply of skim milk is a natural one.

(e) Poultry

129. Hitherto, poultry has not been developed on a commercial scale, except on a few isolated farms, although the information supplied by the Kenya Poultry Produce Co-operative Society shows that during the past five years its membership has almost doubled, and that annual egg production has increased fourfold to over 500,000 dozen in 1952 and that the rate of increase is accelerating. It would appear that the internal market has so far been satisfactorily provided from the African reserves, and the expansion of poultry-keeping within the reserves is likely to satisfy the increased demand for the immediate future. The development of the poultry enterprise on the general European farm will, therefore, depend on finding export markets at satisfactory prices. It seems likely, as judged by current prices in Uganda, Tanganyika, the Rhodesias and the Belgian Congo, that this may well be the case, and every effort should be made thoroughly to explore these markets.

130. So far as I have been able to ascertain, although there is a large demand for shell eggs in the United Kingdom and possibly for table poultry, the cost of freight from the Highlands to Mombasa and then by sea is likely to make this outlet unremunerative. It should be clearly borne in mind that the potential value of the year-old bird, when it has finished laying, is a major factor in determining what is an economic price for eggs, so that the markets for dressed poultry must be sought at the same time as those for eggs. In general terms, poultry-keeping should be a profitable enterprise under Kenya conditions in a similar way to pig-keeping, although the transport of eggs is clearly more expensive than that of bacon. There is every reason indeed to suppose that a rapid and considerable expansion of poultry on European farms will be effected assuming that satisfactory outlets are discovered.

131. It is imperative that an adequate technical staff should be appointed, consisting not only of specialized veterinary officers, but of poultry advisers to carry their advice to the farmers. There is, generally speaking, a complete lack of knowledge on the part of the settler at the present time; for example, there appears to be an almost mystic faith in the merits of the "deep litter" system amongst the inexperienced. It is a perfectly sound system, but certainly not the only one that should be considered, and it does not provide a method which is fool-proof in the face of mismanagement. It will also be necessary to integrate the rate of expansion of the poultry industry with the available food supply, as the present production of cereals is insufficient for the projected expansion of cattle and pigs, let alone poultry.

III—HORTICULTURE

132. Natural conditions are suited to the growth of a wide range of sub-tropical and temperate fruit and vegetables.

133. FRESH PRODUCE.—There are a few successful specialized fruit and vegetable growers, but generally speaking there is little commercial production in the European areas, and internal requirements are met at the present time largely from the African reserves, trading through Asian retailers. Asians are the main consumers both of vegetables and fresh fruit. The ships' trade and out-of-season luxury crops offer limited opportunities for fresh produce and a small export trade in fruit to Uganda has been built up by individuals.

134. CANNING.—The growth of pineapples suitable for canning has produced promising results, and there are two recently established factories in action which are rapidly expanding.

In regard to a more varied programme for canning, there seems no reason to doubt that crops such as asparagus, tomatoes, beans, beetroot, carrots, peas and strawberries can be produced to compete with production in other countries, and that the canning costs can also be competitive, but I understand that the present deterrents are the price of tinplate and the cost of long distance travel by rail, firstly of the tinplate, and secondly of the canned product.

135. The development of the canning industry will constitute a highly specialized enterprise which, except in the case of pineapples, is dependent on irrigation. So far as can be foreseen at present its scale will depend entirely on the industry's ability to compete in the export market, but the chances of success are difficult to assess. A comprehensive start has been made in experimentation and further increases of staff will presumably depend on the progress of the industry.

IV—MACHINERY

136. There are still a few farmers using ox teams for regular field cultivation and getting the work done at much lower cost than by tractor. For much of the internal carting on the farm the ox cart is far cheaper than the tractor and trailer; but looking at the problem as a whole, mechanization has come to stay.

137. Farmers throughout the Highlands are of the opinion that the purchase price of machinery is too high, that the supply of spare parts is inadequate and that service is not only expensive but inefficient. Certain specific items of evidence appeared as such to justify these contentions, but it would clearly be unwise to offer a general opinion. On the other hand prices are subject to control. Active negotiation between the main farmers' organizations and not only the dealers but also the manufacturers offer the best chance of improving the position.

138. There has been for a long period of years what is termed as a "sellers' market", and any change in the balance of supply and demand will obviously make for keener business. It must be remembered that the Kenya Highlands is not large in area, the number of farms and, therefore, the business potential is comparatively small, and the fact that farms are scattered over a wide area makes service difficult. The position will naturally improve as the number of farms increases.

139. It is apparent that the farmers who service and repair their own machinery are able very considerably to reduce the cost of field operations and to get machines in action with the minimum of delay. Most farmers have adequate workshops, and the larger units organize comprehensive repair facilities under European supervision, which amply repay the outlay.

140. I am left with the impression that a number of farms are over-mechanized and that too much money has been spent on tractors and field implements—even allowing for the margin necessary to compensate for the delay in dealing with repairs. On the other hand, with the introduction of the alternate husbandry system, new machinery will be needed for forage, harvesting and preservation.

141. In conclusion, it should not be overlooked that Kenya has been relatively successful in obtaining dollars for the purchase of the range of American machinery which is not successfully produced in the United Kingdom—at any rate when compared with the allocation to the British farmer.

V—LABOUR

142. The supervision of each enterprise and of all operations on the farm must be carried out by Europeans. While the requisite technical skill is frequently available, it is rare to find Africans who are prepared to accept and maintain responsibility for any length of time. The happiness of the Africans, the amount of work performed, the length of hours of work vary from farm to farm. It is obvious that a great deal depends on the ability of the settler to handle men. Patience, firmness and sympathetic interest in the employee's family appear in Kenya, as everywhere else, to produce the best result. The provision of meat, separated milk and other supplies and the interest of the settler's wife in the welfare of the labour mean more than money.

143. The squatter system has been the subject of intense and acrimonious debate. The argument in favour of the system is that it provides a home on the farm with some opportunity for the employee to grow his own crops and keep his own stock, and therefore helps to "anchor" key labour to one farm. This argument is undoubtedly valid. Provided always that the acreage for each family is limited so that any income they derive from their own holding is merely ancillary to a reasonable wage, and provided also that a large area of land is not put out of action for general productive purposes, the system appears sound. In other words, a controlled squatter system should continue and its success will be increased by help and advice from the farmer.

144. African labour is by no means cheap, as—owing to its uncertain and migratory habits—it is frequently necessary to carry a greater labour force than should be necessary. Therefore, from a business standpoint more attention must be given to its economical use and organization and supervision on the farm (*vide* paragraph 180). It would appear from the costs of production and balance sheets that the all-in cost of labour amounts to two-thirds of that on the British farm expressed in terms of effective output. Should cash wages be increased by amounts up to 50 per cent, the effective cost of labour in the production of any farm commodity will not be so much lower than that of the United Kingdom.

145. The 1951 returns show that the following numbers of Africans were employed solely on the farms in the mixed and ranching zones of the Highlands—

Men	...	...	...	...	...	...	...	70,979
Women	...	...	...	...	...	...	...	16,386
Juveniles	...	...	...	...	...	...	...	18,864

inclusive of permanent and casual labour.

VI—FARM MANAGEMENT

146. Kenya has now reached the stage of development when far more attention must be given to farm management. Farm management is a most difficult and complex study, and to be successful must be concerned with many aspects and with many problems of agriculture. When successful, it is the ultimate test of good farming.

A—Land Utilization

147. From the point of view of the country as a whole, farm management must be associated with optimum land utilization and a fulfilment of the partnership with the African in the employment of a considerable labour force. To make the position clearer, it may well be that from the standpoint of personal gain extensive systems of production employing less capital and less labour would in many cases produce comparable or even greater profit than intensive methods and, conversely, further adoption of mechanization with the consequent reduction in the numbers of employees might well produce a similar result. However, the future of the Colony depends on maximum development of the Highlands and the whole aspect of this report and approach to this subject is based on this premise.

148. The best utilization of land and other resources leads to the application of planned farming. It is interesting to note the initial success of some of the earlier farm units, which have been developed by settlers in the Highlands in co-operation with the Government technical staff. These farms should act as demonstrations of up-to-date systems suited to the particular area in which they are situated. It is particularly striking, on visiting some of these farms, to compare the output obtained with that of surrounding holdings, and the further development of farm planning should be encouraged at all costs. Development in this direction involves not only willingness on the part of the settler, which appears to be readily forthcoming, but a sufficiency of competent and experienced technical staff. The layout of a farm in Kenya is complicated as compared to one in the United Kingdom by the need for dealing with soil conservation and drainage in addition to the normal objectives of producing a spread of suitable enterprises, and a lay-out and system providing for the economical operation of labour and machinery.

149. Appendix "J" contains a short summary of the main aspects of farm planning as carried out in Kenya at the present time, and Appendix VI and Appendix "K" show, firstly, an actual farm plan and secondly an account of its development and production since the inception of planning. It will be seen from the actual results that production has increased from Sh. 20 to Sh. 160 per acre in five years.

150. Appendix VII and Appendix "L" show another instance of a farm which has been planned, together with the initial description of the steps to be taken.

151. In connexion with the commencement of farm planning as an activity of the Department for Agriculture, it is interesting to note that the Royal Agricultural Society of Kenya started and conducted a successful farm competition in 1952, which was based essentially on the production aspect as a result of successful farm management.

152. The most important step that can be taken by every settler in Kenya is to concentrate on the layout, development and production programme of his particular farm with a view to increased production as well as to a reasonable profit, with an overriding regard to the maintenance and increase of the fertility status of the soil. One of the main

benefits of mixed farming lies in the increase in the number of farm enterprises undertaken and, therefore, of the spread of the risk to act as an insurance against the rise and fall of individual commodity prices in the future.

153. Greater intensification will naturally result in the reduction in size of the average holding in the Colony in those areas where rainfall is sufficient for alternate husbandry. There is a considerable volume of evidence to show that an area of 400 acres is sufficient to provide a satisfactory standard of living under favourable conditions and that the size of the mixed farm should be from 400 to 1,000 acres. This will involve the subdivision of the majority of existing holdings, but many farmers now occupying 2,000 acres or more would be better off intensively working the smaller area. The European Agricultural Settlement Board has provided a great deal of information on initial costs and the subsequent costs of development, together with the returns from the large number of mixed farms for which they are responsible and which have been developed since the last war.

It will be appreciated that in the dry ranching areas the economic farm unit must remain large, and as a guide it may be assumed that for beef production under this system no farm able to support less than 1,000 animals is likely to be economic.

B—The Financial Aspect

154. The number of financial statements submitted by farmers on the prescribed form (see Appendix "C") is limited and, even with the completed questionnaires obtained by the European Agricultural Settlement Board, the number is insufficient to make up a statistical sample.

155. Valuable information has, however, been obtained and has been supplemented by discussion of a large number of balance sheets and various commodity breakdown accounts which have been prepared. Although there are obvious objections to generalization, my overall impression is that the farmer who knows his job is making a profit of some 10 per cent on the capital invested, expressed in terms of present price levels, of which only a modest proportion occurs in the shape of cash profit. Most farms are developing, and the overriding problem is to find sufficient money for farm improvements.

The relation of net profit to gross turnover will naturally vary according to the type of farming. As some guide, the highest is likely to be 50 per cent in the case of beef ranching, and the average would appear to vary from 20 per cent to 33 per cent.

156. The average gross revenue is, of course, far lower than in the United Kingdom, owing partly to the fact stated elsewhere that no Kenya farm is yet fully developed and partly to lower price levels. Costs are also lower. The sales from a large number of mixed farms, which are within sight of being utilized to the full, amount from £6 to £8 per acre at current commodity prices. There are a number already more advanced, and a far greater number either in the earlier stages of building up or statically engaged in "extensive" farming.

157. The type of stock varies considerably in the ranching areas, and the highest gross revenue of some Sh. 60 per acre was produced where wholemilk is sold from dairy herds. Relatively high figures are obtained where milk and beef production are combined, or where a large flock of sheep is kept in addition to cattle. For beef production alone the two main factors affecting output are stocking capacity and rate of turnover depending on the rate of growth of the animal and the age of selling.

158. It will be convenient approximately to assess gross revenue, and the following figures serve as a useful guide to the annual output, expressed in money values:—

	£
A grade dairy cow—sales of 600 gallons whole-milk	51
A grade dairy cow—sales of 200 lb. butter fat	29
A steer for slaughter—600 lb. C.D.W. Standard Grade	30
A sow producing 14 pigs per annum as bacon	154
One acre of wheat averaging six bags or barley (8 bags)	15
One acre sown ley producing 350 gallons of milk (butterfat value)	21
One acre of pyrethrum	65

Adjustment is simple for greater or lesser output.

159. In regard to capitalization, I have had access to a large number of figures, including most valuable information as to recent years from the European Agricultural Settlement Board. There is ample evidence to show that in the case of farms of 1,000 acres or less £30 per acre will be required to enable them to be intensively developed. Other farming types fall into line below this figure.

160. In any study of the financial aspect of farm management, very real help can be obtained from the Agricultural Economist. It is hoped that the staff, which will shortly be appointed primarily for investigation in connexion with guaranteed prices, will be available to assist farmers in their individual problems.

GENERAL

161. (1) **AFFORESTATION** is outside the terms of reference of this inquiry, and no doubt the need for conservation and of a suitable planting programme is being given adequate consideration. It is of importance from the farming standpoint in connexion with the maintenance of the water table, and in another connexion to allow of land not required for planting to be converted into regular farm holdings.

(2) **TREES**.—The planting of shelter belts on farms should be expedited. Wind breaks are important in more open country, and shade for livestock is essential.

(3) The aggregated area of land which is little used is a very considerable one.

(4) As a final note on the appreciation of farming I would like to re-emphasize that the Highlands are capable of highly intensive production, and that they should act as a source of food for surrounding areas.

THE PRESENT POSITION

162. Appendix V, consisting of a map, divides the European Highlands into the following farming zones—

- (1) mixed farming based on maize;
- (2) mixed farming based on wheat;
- (3) cattle—dairy or beef ranching;
- (4) plantation crops;

and also quotes production figures in respect of various production committee areas (page 75).

163. The approximate areas of the first three zones with which this inquiry is concerned are as follows:—

	<i>Acres</i>
(1) Mixed farming—maize	1,390,000
(2) Mixed farming—wheat	1,815,000
(3) Cattle	3,440,000
Total	<u>6,645,000</u>

164. It will be appreciated that the area under plantation crops is for the most part confined to specific districts. Where, however, these crops do occur in other zones an appropriate deduction has been made in assessing the acreage.

165. As a matter of interest, the approximate acreage under plantation crops is between 500,000 and 600,000 acres and, in addition, there is a considerable acreage of forest reserves situated in the main in the higher altitudes of Kenya.

A—COMMODITY BUILD-UP

166. The valuation of production from European farming for the year 1951, exclusive of plantation crops, is as follows:—

	<i>£</i>
Wheat	2,868,000
Maize	1,492,000
Oats (excluding amount for feed)	4,000
Barley (excluding amount for feed)	50,000
Sunflower	212,000
Linseed and Flax	21,000
Pyrethrum	422,000
Milk	826,000
Butterfat	1,098,000
Meat	625,000
Wool	380,000
Pigs	519,000
Eggs	63,800
	<u>8,580,800</u>

These figures represent the net production of the area or the global gross income, e.g. sales of products, such as oats and barley, from certain farms which are subsequently sold as animal feeding stuffs to other farms are *not* included and deduction is made of the quantities retained for seed or feeding purposes on the farm.

B—CAPITAL AND GROSS OUTPUT

167. I have given very careful consideration to the best method of presentation both of production and of future potentiality, and I have decided to present the figures in terms of gross revenue per acre and of the capital invested, both quoted at present money values. In arriving at this decision it is appreciated that the effective acreage of farms varies from under 20 per cent in certain steep areas of rocky land to over 90 per cent in the case of flat areas of good soil. The approximate break-down of present production may be set out together with an estimate of the capital employed as follows:—

Present Position

	Total Acreage	Estimated Capital Invested Per Acre	Total Capital Invested	Estimated Annual Gross Turnover Per Acre	Total Gross Turnover
		£	£	£ s.	£
Zone 1 ..	1,390,000	10	13,900,000	2 00	2,780,000
Zone 2 ..	1,815,000	10	18,150,000	2 10	4,537,500
Zone 3 ..	3,440,000	2	6,880,000	0 8	1,376,000
	£ 6,645,000		38,930,000		8,693,500

168. It will be realized that the above overall break-down figures can only be approximate, and in the case of Zones (1) and (2) the present gross turnover varies from Sh. 15 to Sh. 600 and in the case of Zone (3) the turnover similarly varies from Sh. 2 to Sh. 60 per acre.

THE FUTURE

A—DEVELOPMENT POTENTIAL

169. From the two standpoints of practical farming and technical soundness there is an economically unanswerable case for rapid development. In view of the urgency of the position I have attempted to set out what might be done in ten years, and I am satisfied that, on technical grounds, this is capable of fulfilment. The primary importance of creating an atmosphere of real effort and of urgent application even justifies a forecast in terms of a ten-year target. Ten years is probably the minimum period in which the changed pattern of farming, based on alternate husbandry, can get into its stride, and a longer period introduces an increasing number of unknown factors. While it would be impracticable to hazard a guess as to precisely what commodities will be in demand in ten years, the overall picture would be as follows:—

(a) Zones (1) and (2)—Mixed Farming Areas

On the overall assumption that 40 per cent of the area is capable of being ploughed and brought into the alternate husbandry system, there will be an area of over 1,250,000 acres. Of this area approximately 50 per cent or some 640,000 acres at any one time will be under ley, and a similar acreage under tillage crops. The balance of Zones (1) and (2) will remain in natural grass, amounting to something less than 2,000,000 acres.

(1) From the livestock standpoint the total area of ley and grass should carry, on the basis of one beast per acre of ley, and one beast per four acres of grass, the equivalent of 1,000,000 head of cattle.

(2) The present total area of arable crops is approximately the same as the tillage acreage of the alternate husbandry rotation which will permit an increase in the acreage of cereals. It may also be assumed that the yield of cereals with which the vast majority of this acreage will be concerned will increase by at least 50 per cent.

(3) There will thus be ample coarse grain for stockfeeding to develop the pig industry by 300 per cent and to increase the poultry industry by 1,000 per cent or more, if this should prove economical.

170. It will be readily agreed that the figures in this forecast are based on the assumption of the potential arable land. The figure of 40 per cent has been arrived at after consultation not only with the various Production Committees, but with a large number of individual farmers, and I am satisfied that it is a conservative figure.

171. The range of estimated figures must in no sense be regarded as the final output, or the ultimate potential, but rather as the goal or target which is capable of being reached in ten years—with the possibility of subsequent further increase. On many individual farms the output will undoubtedly be exceeded.

(b) Zone (3)—Cattle Ranching

172. The potential increase in this area is clearly not so great but, from past experience and the fact that there are considerable portions of this area not yet fully stocked, it may reasonably be assumed that production will increase by nearly 100 per cent. It is permissible to look forward in ten years' time to an appreciable decrease in the age of marketing of stock, to an increase in milk production and in the carrying capacity of the grass. A cattle population of at least 300,000 head will be required.

One other general consideration should be mentioned; no account has been taken of the appreciable area of dry ranching land which, even in the light of present information, could with advantage be ploughed and laid down to improved grass after the growth of one, two or three cash crops. Furthermore, the experience of other hot climates both in Africa and elsewhere suggests that by the introduction of dry farming techniques it may well be that a considerable fringe of what has been classified as cattle ranching area will be capable of more intensive production.

B—1963 TARGET

173. The following is a summary on a conservative basis and at *present money values* of what might be the position in ten years' time:—

1963 Target

	Total Acreage	Estimated Capital Invested Per Acre	Total Capital Invested	Estimated Annual Gross Turnover Per Acre	Total Gross Turnover
Zone 1 & 2	3,205,000	£ 25	£ 80,125,000	£ s. 8 00	£ 25,640,000
Zone 3 ..	3,440,000	4	13,760,000	15	2,580,000
£	6,645,000		93,885,000		28,220,000

174. The ten-year programme of development requires therefore expenditure of £54,955,000 additional capital in order to increase annual gross revenue by £19,526,500 at the end of the decade.

175. It will be noted that the total acreage has not been increased, although it may be possible to realize a further build-up of farm land either by alienation or release by the Forest Department.

C—ESTIMATED CAPITAL

176. The present range, and every indication of probability on the more intensive farms at the present time, indicates that up to £30 per acre should be required for development of the alternate husbandry farm and, in so far as ranching areas are concerned, there seems little reason to doubt that the figure of £4 per acre may be regarded as reasonable. The following table gives the best indication that is possible of the additional requirements of capital, together with approximate sums required for imports on the average present-day mixed farm:—

	Per Acre	Proportion requiring to be imported
	<i>Sh.</i>	<i>Sh.</i>
(a) Fencing	40	28
(b) Water supply	40	25
(c) Buildings — mainly dairy, silos, stores	80	30
(d) Soil conservation	20	—
(e) Machinery	40	40
(f) Stock	80	—
TOTAL	300	123

It will be seen that £9 per acre will be required for fixed equipment and £6 for live and dead farming stock. It is of interest that of these sums only some £6 will require to be imported into Kenya.

For the ranching zone the additional £2 per acre required will be spent in the main on water and fencing.

REQUIREMENTS NECESSARY FOR THE SUCCESSFUL FULFILMENT OF THE TEN-YEAR TARGET

177. The requirements may be grouped under the following headings:—

(1) A SENSE OF SECURITY IN THE FUTURE OF THE EUROPEAN HIGHLANDS

178. This is fundamental to encourage present settlers fully to develop their properties over a period of years for themselves and their children. It is no less important to encourage immigration and to attract capital from outside the Colony. The issue rests entirely with the Governments of Kenya and Great Britain.

(2) INCREASED PRODUCTION ON FARMS

179. It is essential that there should be a firm intention on the part of the settlers to increase production of their farms to the economic maximum on farming systems increasing the fertility of the land. Primarily, it implies a full sense of duty towards both the land and the country on the part of the occupier, which it will be agreed is more difficult to create in peace than in war-time. The Production Committees and the Board of Agriculture as a whole could play a large part in creating this viewpoint amongst their constituents both by encouragement and advice, and this aspect is dealt with in a later section of this report.

(3) EUROPEAN IMMIGRATION

180. As already pointed out in paragraph 18 there are some 3,000 agricultural holdings (including plantation crops) in the European areas and about 4,000 Europeans who are directly engaged in agriculture.

Efficient production depends on adequate supervision by Europeans and, assuming that not only will farming become more intensive but that the number of farms will be increased by division of the larger holdings, there is certainly need for a large increase in numbers.

181. At the present time a Kenya official is attached to the East Africa Office in London to give advice to intending immigrants. A more ambitious and concerted effort would be justified in order to create a positive interest in the Colony.

182. There is a large number of farmers' sons who are likely to be unable to find farms at home, and also many older boys at secondary schools without prospects in England who know nothing of the life or the possibilities of Kenya. Active contact with the Agricultural Colleges, Universities, Farm Institutes, County Agricultural Committees and the farming organizations, would in my view result in considerable interest amongst the young men in the early twenties. Co-operation with schools should be equally productive in the case of the older boys aged from 16 to 18, and this would allow suitable young men to come to Kenya at the age of 20, following military service.

183. A scheme which would involve contact with the younger generation of the United Kingdom (and possibly other countries in Europe) on the one hand, and a system in Kenya of an initial course at the Egerton College followed by a period of apprenticeship on selected farms, would in my view be successful and should be seriously considered. The period of apprenticeship would lead to jobs as assistants, and later to managerships or independent farming. The European Agricultural Settlement Board could assume responsibility for the scheme both in London and in Kenya.

(4) WATER

184. A distributed system of water for every farm is essential and the speed of development of installation will need to be increased. In regard to the source of supply, dams and the tapping of springs or permanent streams are obviously the most economic supplies; but in certain areas boring will be essential, frequently to considerable depths and in certain cases with very great uncertainty. An increase in Government services for dam-making is called for, and serious consideration should be given to the payment of an initial capital grant towards the cost of distribution as well as of supply, such as has been operative in the United Kingdom since 1939. The newly constituted Water Resources Authority should accept responsibility for the provision of water in such areas as it is impossible for an individual farmer or a small group of farmers to develop an economic supply, and if this Authority was to go ahead at a reasonable speed, it would clearly need an increase of staff. Water is essential before development can take place.

(5) SOIL CONSERVATION

185. The present organization works well, but it may require supplementing in certain areas where a programme extending over a large number of years is envisaged with the existing equipment.

(6) DRAINAGE

186. There are large areas of wet land, much of which could be recovered at comparatively low expenditure by means of banks, cut-off drains and the setting up of the land when cultivated with open furrows. Other areas could probably be dealt with economically by mole draining. More attention should be given to drainage and quite clearly the questions of water supply, soil conservation and drainage are closely related.

(7) INCREASED LIVESTOCK

187. A brief résumé of future possibilities has been prepared by Mr. Hammond, the Director of Veterinary Services (Appendix "M"). I firmly believe that in order to make full use of the ley and permanent grass the numbers of cattle (excluding work oxen) must be increased by 250 per cent in ten years, which in round figures means an increase from the 1951 census figure of 570,000 to 1,250,000. The main source of increase must come from breeding within the Highlands but, in addition, the regular purchase of heifers from Somaliland and a scheme of buying heifers and store bullocks from the African reserves must be instituted and a sure annual supply maintained. A concerted attempt should be made to prevent the slaughter of female stock capable of further breeding, and to ensure the rearing of all worth-while calves. Consideration might be given to the financing from the public purse of a supply of store bullocks on lines similar to those operating in Southern Rhodesia. The target figure should be capable of attainment.

(8) OTHER PHYSICAL SUPPLIES

188. Any programme of intensification requires a sufficient supply of materials, such as galvanized piping, fencing, wire, etc., and it would be necessary, successfully to carry out the scheme, for a schedule of requirements to be prepared in respect of any material which is likely to be in short supply. Attention will have to be given to the preservation of soft woods for use as fencing posts to take the place of a diminishing supply of cedar.

(9) TECHNICAL INVESTIGATION AND ADVICE

189. There must be inevitably a large number of problems requiring investigation in any new country, and the extreme variability of physical conditions in Kenya appreciably increases their number. Amongst the major problems of first priority may be mentioned pasture research, extension of plant breeding to cover crops such as maize, trace element deficiencies in plant and animal nutrition, diseases of the various animals and, in particular, specialization in sheep and poultry.

190. In the field of advice or extension work the first need is for more staff and, in particular, for more experienced staff. This is essential at this period of development involving, as it does, a major change of farming system. Successful advisory work depends on the creation of confidence in the Agricultural Officer on the part of the farming community, and this can only result where the Agricultural Officer of an area remains in that area for a period of years. The optimum period is probably about ten years, and this would appear to be impossible of fulfilment within the present system of salary scales and the normal channels of promotion open to experienced officers through quasi-administrative or administrative posts. The key man in the advisory service is the Agricultural Officer of an area.

191. In the veterinary field there is obviously a need for more officers and professional veterinary surgeons, and the present system of paying a basic fee to private practitioners for professional services might well be extended. In addition, more officers are needed on animal husbandry.

(10) FINANCE

192. The tables of the present position and the 1963 target in paragraphs 167 and 173 represent approximate estimates of capital at present invested and that which will be required. It will be seen that this involves an infiltration of some £55,000,000 spread over ten years. Of this sum it is estimated that approximately two-thirds will be required for the development of fixed equipment, which is a national asset, and the balance in expendable working capital (*vide* paragraph 176). Expenditure in development will necessarily precede the increased gross revenue shown in the ten-year target. It must be appreciated that this development is taking place in a period of high costs of most necessities, and that it is occasioned by a major change of farming system, which further increases the period of lag in obtaining an economic return by the farmer.

(11) SOURCES OF CAPITAL

(a) Capital from Outside Sources

193. Capital should be forthcoming from outside Kenya provided that there is a return to normality, and encouragement is given to such investment in the Colony by the various known means. It would appear more than possible that the purchase of estates and the establishment of the landlord and tenant system might be introduced with advantage to all concerned. In the majority of cases, however, comparatively small sums of money are likely to be introduced by intending settlers. Money will also be forthcoming to the agricultural industry from sources within the Colony.

(b) Capital by Saving. Income Tax

194. The next immediately available source of assistance to the individual can be found in the acceleration of abatement of income tax in respect of approved development of fixed assets on the farm. It is true that in the case of every build-up of assessment for income tax the items of expenditure in question are abated over a varying, but in many cases a long, period of years eventually at the rate of 100 per cent. In order to allow the settler to plough back profit to the maximum extent possible during the ten-year period it is

suggested that the following items of capital expenditure should be abated at the rate of 100 per cent and should, in fact, be regarded as annual items of expenditure:—

- Supply and/or distribution of water.
- Soil conservation measures.
- Effective drainage.
- Erection of fences.
- Erection of dips.
- Construction of houses for employees or the occupier (within the limits of a prescribed reasonable maximum).
- Construction of farm buildings.
- Initial clearing of virgin land.

There should be an option enabling the occupier to spread such expenditure over periods up to ten years in cases where this would be advantageous. Precedents for such a procedure occur in practically all rapidly developing countries at the present time, as for example the Union of South Africa and the Commonwealth of Australia as well as the United Kingdom. (*Vide* paragraphs 198 to 202 regarding correlated Income Tax proposals.)

(c) Loan Capital

195. (i) **LONG-TERM LOANS.**—The present system operated through the Land Bank imposes a maximum of £5,000 in respect of any one holding and loans up to this amount, and subject to the normal safeguards, are granted. Such loans are in fact mortgages and the grantee has freedom of action in the expenditure of the advance.

I recommend that, subject to the dual safeguard imposed by Production Committee recommendations (paragraph 196 and 208) and valuation by the officers of the Land Bank, any maximum ceiling should be removed. At the same time loans should be limited to the specific purpose of the application to enable long-term development to be effected (e.g. buildings, water supply, drainage, soil conservation, fencing and dips) and suitable administrative machinery should be introduced to ensure this end.

(ii) **THE INTERMEDIATE-TERM LOAN.**—Rehabilitation loans have been in operation for the last two years and are primarily used for livestock. It is recommended that, in future, a consolidated loan of this type might be used for either livestock or machinery, and that eligibility should be based entirely on the need of the farm for production purposes and if these loans are limited to live and dead stock, a period of ten years should be sufficient as a maximum for repayment. Applications should include proposals for the consideration of the Production Committee, and the loans will take the form of settlement for purchases or expenditure and may be of the nature of a chattels mortgage.

(iii) **SHORT-TERM CREDIT.**—It will be seen that advances under the Guaranteed Minimum Return have risen steadily in recent years, which is a corollary of rapid development and lately of adverse seasons. There is every reason for tightening up short-term credit and for its limitation to specific purposes such as the purchase of fertilizers, seeds, feeding stuffs and other seasonal requirements for crops and stock.

Presumably the repayment of the short-term loan will be secured (as hitherto with Guaranteed Minimum Advances) as the first charge on the sale of the produce through the appropriate marketing board or co-operative society.

It will be realized that the purpose of a scheme of loans from public moneys is to provide credit at low rates of interest in order to increase agricultural production in a rapidly developing country. I do not propose making detailed suggestions as to interest rates, except that clearly the three types of loans should be on a comparable basis.

196. Later in this report, I have made recommendations regarding the future field activity of the Production Committees. It would be of considerable advantage if consideration of all forms of public loan could be carried out by one and the same organization, and so judged entirely on the basis of increased production for the fulfilment of the target.

197. Finally, with regard to increased capital required by the agricultural industry, it would appear sound if the money could be found from either outside sources, or from the adjustment of abatement on fixed equipment rather than from loans. I am convinced that the response of the farming community would follow such action and that the necessary funds for much of the day-to-day working capital on the farms would be found out of profits. The analysis of the additional capital required together with the amount supplied by importation in paragraph 176 give some indication of the position from the point of view of the Colony as a whole.

(12) INCOME TAX

198. In putting forward recommendations for variation of the rates of abatement for Income Tax there are one or two other considerations, which appear relevant:—

(i) The effect of a relatively high demand for taxation is frequently most seriously felt by the more progressive type of new settler, who in the great majority of cases is short of and can only accumulate capital out of profits in the first year or so by growing cash crops in order to find the means whereby he can later develop into mixed farming. Development out of savings is sound—individually and nationally.

(ii) Taxation is a deterrent to development in farming out of proportion to the actual sums of money involved. This is certainly true at the present time in the United Kingdom, and is possibly due to the uncertain nature of farming, and its dependence on such uncontrollable factors as seasons, the incidence of disease, etc. What is more serious is that the more intensive the farming system, and therefore the capital involved, the greater the disaster which may come from a variety of uncontrollable factors. The natural result is that many farmers become inclined to reduce the risk by conducting the production of their farms on more extensive lines.

(iii) In the Kenya Highlands all the land—apart from a negligible acreage of freehold—is the property of the Crown and let to occupiers on long leases. The lessee should, therefore, be given encouragement to improve the capital value of Crown property. If the fulfilment of the ten-year target is attempted, the next decade will constitute the period of major development, and it would appear sound to allow for the maximum abatement suggested for a period of ten years from its introduction, with exceptions to allow subsequent occupiers to benefit by an initial period of ten years.

199. The financing of organizations associated with farming in addition to increased capital required by the individual farms in the aggregate is inevitable. The development of water supplies under the ægis of the Water Resources Authority, for example, will require financial support. There will be a similar need for the development of enterprises such as the projected bacon factory, grain storage, activities of the Settlement Board, etc.; but in all these cases it may be presumed that interest will be paid and refund made in due course.

200. Further to the recommendations concerning income tax in paragraph 194 I should like to make the following additional recommendations:—

- (1) That a property tax on a similar basis to that of Schedule "A" in the United Kingdom should be instituted, based on the estimated *net* value of the property. A basis of assessment might be 5 per cent of the capital value less statutory charges, maintenance and approved development proposed in paragraph 194.
- (2) That the present option of the farmer to be assessed on a cash basis only, excluding opening and closing valuations in the case of a profit and loss account, should be discontinued. No doubt reasonable arrangements would be made in the case of taxpayers at present working on this basis.
- (3) That the basis of valuations of a breeding herd operative in the United Kingdom for taxation purposes and commonly known as the "fixed herd basis" should be introduced.
- (4) That in the case of private companies engaged in farming the present arbitrary allocation of a percentage of profit for assessment of taxation should be discontinued, and the assessment made in accordance with the facts of the case.

201. In regard to the recommendation at (1) of paragraph 200 I propose that the owner/occupier should be assessed either on the property tax or the profit shown in the profit and loss account, whichever is the greater, subject to the proviso that property tax should only be regarded as the greater if the average of the last four years of profit and loss account together with that of the year of assessment was less than the amount arising from the property tax. (Abatement for development expenditure being also a legitimate item of expenditure in the profit and loss account.) The owner of any farm property, who is not the occupier, should be automatically assessed. Property tax would produce revenue from an occupier who consistently operated his farm at a loss, whether as a result of little or no production from it, or in the case of a hobby farmer.

202. Property tax will, of course, involve valuation, but I am given to understand that all property will be required to be valued shortly for rating purposes (even though the house only is assessed for rating purposes), and presumably no duplication of work need be involved.

(13) THE MAINTENANCE OF A SATISFACTORY LEVEL OF PRICES

203. The maintenance of a satisfactory level of prices is essential to any plan of expansion. The system of guaranteed prices, collectively negotiated each year, should ensure a fair price-level for the main commodities.

204. Price guarantees apart, I have attempted to show in the report that, in the case of livestock and livestock products, the Kenya farmer should be able to face world competition, and that the position should be equally favourable for grains when yields have been increased as a result of a balanced system of farming.

DEVELOPMENT OF ORGANIZATIONS

205. Although not in the nature of direct requirements, there are certain matters and organizations associated with the industry the development of which is closely bound up with the fulfilment of the development plan, and I consider therefore that I should offer comment.

Board of Agriculture

206. The draft Agriculture Bill proposes the continuance of the Board and associated Agricultural Committees as an integral part of the peace-time organization. Both in the United Kingdom and Kenya such committees were created during the war to effect maximum food production, and they have done remarkable work. Their success in the future depends entirely on their being given an effective job to perform. The programme of ten years of intensive development outlined in this report will need real effort, and I can imagine none that could be more effective than that of the local Committees.

207. The Committees should be made to feel that they are responsible for trying to ensure that every farm is being planned to develop maximum economic production. Consideration should be given to local targets. The Farm Survey has proved in the United Kingdom to be the basis of such work, and each farm survey should be carried out by one or two members together with a technical officer. The completion of the survey might well take two years or so, but a start could be made on those farms known to be below standard from a planning standpoint.

208. Influence can only be exerted by means of advice (except in extreme cases), but it might be considered advisable to arrange that all applications for loans and abatements of tax should be initially recommended by the Committees as being sound developments from the production standpoint of the farm in question. In this way the greatest influence could be exerted, and the members of the Committees might well feel that they were making a real contribution to the development of the country on sound lines. It should be a comparatively simple matter to draw up survey forms suited to Kenya conditions, and some of those in use in the United Kingdom would serve as a guide.

209. The Board of Agriculture should continue to operate that section of the Guaranteed Minimum Return Scheme which provides compensation to the farmer for loss of crop through specific "Acts of God". Such a scheme might well be based on the farmer's annual return (paragraph 220) and little purpose would seem to be served by the issue of orders limited to scheduled crops. If orders to any farmers are deemed necessary, it would appear to be at least equally important to include, for example, the sowing of land to leys and the keeping of livestock.

The European Agricultural Settlement Board

210. The European Agricultural Settlement Board will become of increasing importance in connexion with both immigration and settlement. Already there is a waiting list of applicants for farms.

211. The expansion of the organization and possibly the granting of a measure of independence as a quasi-independent Corporation or Commission might be worth consideration. This would permit the issue of shares and subscription of capital from private sources.

The Land Bank

212. There would appear to be advantage in dealing with the Land Bank on similar lines and in the creation of an organization similar to the Agricultural Mortgage Corporation in London.

213. The suggestion that all loans should be subject to the primary recommendation of the Agricultural Committees is intended to ensure that public money is used for sound

development in the light of the overall picture. It is not intended that such action should curb the present independence or responsibilities of the Land Bank, but provide valuable co-operation in reaching the main objective.

Commodity Marketing Organizations

214. These may take the form either of Statutory Boards or Co-operative Societies. It will be realized that with increased production a higher volume of the goods will be sold outside Kenya. This fact will emphasize the need of "quality products" and will also mean active exploration of the best markets.

215. In regard to grain, the present system of storage allowances is expensive and the wastage on farms is serious. It is appreciated that the introduction of bulk handling (which avoids the use of bags) and storage is initially expensive, and that it may have to be introduced gradually for this reason; but there can be no doubt that it is economic in the long run. The provision of adequate farm storage may be worth exploring to reduce to some extent the requirements of central stores.

216. I have had long discussions on various aspects of this problem and have included a memorandum on the subject of Wheat Storage at Appendix "N". The magnitude of the storage problem may be found to justify the formation of a "Grain Corporation" (Public Utility) or its retention by the Government as is the case in certain of the Commonwealth countries.

Farmers' Organizations

217. There are only some 4,000 settlers in the Highlands, and a large number of local and other organizations. The purchase of farmers' requirements is mainly in the hands of the Kenya Farmers' Association (Co-operative), Limited, and the sale of commodities is, or will be shortly, in the hands of a series of co-operatives or marketing boards. There is, however, ample scope for one farmers' organization to interest itself in the general welfare of the industry. For example, there is an immediate need for it to negotiate regarding the supply and price of the farmers' requirements such as machinery. The Kenya National Farmers' Union will succeed, if it can convince the majority of the farmers that it can produce benefits which merit their active support.

218. There can be few countries of the size of Kenya with so many agricultural organizations—voluntary, semi-official and official—and these would appear to be overlapping in certain cases, with an overworking of the "willing horse".

Landlord and Tenants System

219. The possibility of the purchase of estates and creation of the landlord and tenant system which is referred to in paragraph 193 will necessitate the equivalent of the Agricultural Holdings Act in the United Kingdom. Indeed the flow of capital might well be encouraged by the creation of such legislation, and I would suggest that the question merits early consideration.

FARM STATISTICS

220. In carrying out this inquiry I have found the greatest difficulty in obtaining reasonably accurate statistics—even with the wholehearted co-operation of the various staffs concerned. A long experience of the United Kingdom has taught me some of the difficulties and problems to be encountered in obtaining accurate information about farming. I believe that it would be found profitable to concentrate on one comprehensive annual return from every farmer, with adequate penalties to ensure completion.

221. Discussion would be necessary between the various organizations now calling for sectional or piecemeal information, in order to keep the return within bounds and provide for as much of the required information as possible at the selected season of the year. In this way much correspondence and form-filling should be avoided. It would be understood that the information contained in the return would be circulated without delay to organizations entitled to receive it.

222. The East African Statistical Department should be equipped to handle such work, and it would be an added advantage for the Agricultural Economist and his staff to assist in the work. (In paragraph 51, sub-paragraph (b) of my earlier report of 3rd May, 1952, I have made a similar recommendation in connexion with Price Fixation arrangements.)

PRICE-FIXING POLICY

223. I do not feel able to add much of material value to the earlier interim report on the future basis for the calculation of prices which I presented on 3rd May, 1952. I should, however, wish to modify two suggestions put forward in that report in the light of more recent experience:—

(i) *Page 11, Paragraph 52, Sub-paragraph (c)*

It is generally agreed that it is better to avoid emergency awards in respect of unexpected and major changes in the cost of production, and to take such factors into account in the next succeeding annual review.

(ii) *Paragraph 52, Sub-paragraph (f)*

Although the principle of long-term minimum prices for livestock is not in dispute, in the United Kingdom it has not been found easy to fix realistic prices so far ahead at a time when prices are no longer rocketing, and as a result the long-term prices fixed offer little protection to the producer.

SUMMARY AND RECOMMENDATIONS

	<i>Paragraph</i>
224. From the information available, there would appear to be no cause for concern in the present indebtedness of the farming industry	79.
225. I am satisfied from the information at my disposal that the ever-increasing demands of Kenya for food, together with the needs of neighbouring territories and countries farther afield, will in general terms provide a sufficient market for Kenya products, and that Kenya should be in a position to compete in the export field. The only exceptions would appear to occur in those cases where the value of a particular commodity is in low ratio to its weight or volume, and therefore to the cost of transport	80, 81, 82 & 204.
226. The areas in Kenya (including part of the European Highlands) which enjoy a satisfactory rainfall are capable of intensive food production	83, 84.
227. Rapid progress has been made in recent years, and the speed of agricultural and livestock development should be accelerated	169-172.
228. I have outlined a production target capable of achievement in ten years which by the expenditure of approximately £55,000,000 additional capital will increase annual gross revenue from agricultural sources from the present estimated figure of £8,693,500 to £28,220,000, an increase of £19,526,000	173-175.
229. The development envisaged in the preceding paragraph is subject to the following conditions:—	
(i) A sense of security in the future of the European Highlands	178.
(ii) The determination of the European settler to increase production	179.
(iii) European immigration	180.
(iv) A distributed water supply on every farm	184.
(v) Proper soil conservation measures	185.
(vi) The development of drainage	186.
(vii) The increase of cattle, sheep, pigs and poultry	187.
(viii) A satisfactory supply of essential farming requirements	188.
(ix) Development of technical investigation and advice	189-191.
(x) The provision of finance	192-197.

230. I have made specific recommendations regarding:—

	<i>Paragraph</i>
Immigration	181-183.
Water supply	184.
Soil conservation	185.
Increased livestock	187.
Supplies of farm requirements	188.
Technical investigation and advice	189-191.
Finance	193-194.
Loans	195-197.
Income tax	194 & 198-202.
The Board of Agriculture	206-209.
The European Agricultural Settlement Board	210 & 211.
The Land Bank	212 & 213.
Commodity marketing organizations	214-216.
Landlord and tenant system	219.
Farm statistics	220-222.
Price fixation	223.

CONCLUSION

231. It is unfortunate that my return visit to Kenya has coincided with the Emergency period, during which normal life has been to some extent disrupted and concentration of effort and thought has perforce been required on more immediate problems. This has made the task of giving full consideration to long-term plans less easy.

232. I have received the greatest help from all those concerned in the farming industry, and my task has been made the more pleasant by the friendliness and hospitality which has been extended to me at all times and on all occasions.

233. Members and Heads of Government Departments and their staffs, the Board of Agriculture and Agricultural Organizations, have provided me with information and guidance. I should like to express my appreciation. I am also appreciative of the work of the two official reporters, Mrs. I. Dickinson and Mrs. Hemphill, who during the course of an arduous tour had to record and transcribe a mass of verbal evidence.

234. In the preparation of the report I am indebted to Dr. C. J. Martin, the Director of the East African Statistical Department, for the presentation of the section dealing with agricultural indebtedness, to Mr. S. Duckett of the Statistical Department for the extraction of a mass of financial statistics, and to Mr. R. E. T. Hobbs, Deputy Director of Agriculture, for the main information concerning the pattern of farming in the Colony.

235. The appendices which are an essential supplement to the report have been prepared by the persons whose names appear thereon, and permission has been kindly given to the publication of the map illustrating average rainfall prospects before its publication in an article on the subject in a scientific journal. I tender my thanks and gratitude to the Director, the East African Agricultural and Forestry Research Bureau and his staff. I am also grateful to the Director of Surveys and to his staff for the time and trouble expended on the preparation of the various maps for publication.

236. Mr. A. G. Dalgleish, as Secretary to the Commission, has once again been responsible for all the arrangements and for the collation of the report. I am more than grateful for the patience and imagination which he has brought to bear on this work.

237. Finally, I wish to record in almost identical words to those at the end of my first report my thanks and appreciation to Major F. Cavendish-Bentinck, the Member for Agriculture and Natural Resources, for his experienced guidance and hospitality.

I have the honour to be

Your Excellency's

most humble and obedient servant,

L. G. TROUP.

Nairobi,

24th January, 1953.

APPENDIX "A"

LIST OF WITNESSES

(Paragraph 9 of the Report)

I.—The following persons gave oral evidence:—

NAIROBI	
Sir F. O'B. Wilson	Chairman, Board of Agriculture.
Mr. R. G. Ridley	Standard Bank of South Africa.
Mr. S. C. A. Allen	Arrow Products, Ltd.
Mr. E. V. Whitcombe	Barclays Bank (D.C. & O.).
Mr. H. Bentley	Barclays Bank (D.C. & O.).
Mr. F. L. Megson	European Agricultural Settlement Board.
Mr. G. H. W. Annals	Lands Department.
Lt.-Col. R. C. Swain	Maize and Produce Controller.
Mr. N. Evans	Dalgety & Co. (Lands Department).
Mr. J. S. Bayne	National Bank of India, Ltd.
Mr. D. Fee-Smith	Gailey & Roberts, Ltd.
Mr. C. Bagehot	International Harvester Co.
Mr. E. G. Parke	B.E.A. Corporation.
Mr. J. F. Lipscomb	Chairman, European Agricultural Settlement Board.
Mr. F. T. Holden	Unga Ltd.
Mr. K. H. Pack	Kenya Meat Commission.
Mr. M. Gherrie	E.A. Production and Supply Council.
Mr. B. J. Flint	Hughes Ltd.
Mr. G. C. Reed	E.A. Association of Accountants and Auditors.
Mr. P. N. McMonnies	
Mr. J. H. Symons	
Mr. H. D. White	
Mr. D. H. M. Dempster	
Mr. W. D. Draffan	Kenya Co-operative Creameries.
Mr. J. Mackay	
Mr. G. M. Pain	Kenya Farmers' Association.
Mr. A. J. Millar	
Mr. R. H. Walker	
Mr. C. H. Bull	
Mr. J. H. Southall	
Mr. A. Ward	Pig Industry Board.
Mr. A. Storrar	
Mr. R. A. Hammond	
Mr. A. A. Haller	
Mr. C. J. Martin	
Mr. D. W. Dawson	Kenya National Farmers' Union. Agricultural Officer, Nakuru. Director of Veterinary Services. Chartered Accountant, Maize and Produce Control. Director, E.A. Statistical Department.
Mr. J. J. Hughes	
Mr. D. Fee-Smith	
Mr. G. S. Fotheringham	
Mr. C. Bagehot	
Mr. V. H. Mertens	Agricultural Section of Nairobi Chamber of Commerce.
Mr. K. A. Jeremy	
Mr. J. L. Downey	
Mr. H. E. Gill	
Major F. de V. Joyce	
Mr. R. Goodhart	Commissioner of Income Tax. Angus Lawrie, Jeremy & Co. Milk Producers' Co., Ltd.
Mr. J. C. Everard	
Mr. A. R. Shaw	
Mr. J. L. G. Brown	
Mr. L. R. Fisher	
Mr. L. M. Gibson	Machakos.
Major C. W. P. Harries	
Mr. G. M. Roddan	
The Hon. F. W. Carpenter	
Mr. R. E. T. Hobbs	
Mr. T. H. Jackson	Thika Production Committee.
Mr. E. G. P. Sherwood	
The Hon. J. L. Riddoch, M.L.C.	
	District Commissioner of Income Tax. Gibson & Co., Ltd. Thika. Director of Agriculture. Commissioner for Labour. Deputy Director of Agriculture. Horticultural Station, Molo. Imperial Chemical Industries.

TRANS NZOIA PRODUCTION COMMITTEE AREA

Cdr. F. B. Carslake	Trans Nzoia Production Committee.
Mr. C. Tilney	
Earl of Portsmouth	
Mr. J. V. Winter	
Mr. H. T. Lloyd	
	Agricultural Officer, Kitale.

TRANS NZOIA PRODUCTION COMMITTEE AREA—(Contd.)

Mr. W. H. Newton
 Mr. A. W. Symes
 Mr. G. E. L. Nicholson
 Mr. H. Crompton
 Mr. S. G. Nadin
 Mr. C. D. N. Statham
 Cdr. G. M. Temple
 Mr. G. G. Smallwood
 Mr. W. E. Strong
 Mr. J. Matthews
 Mr. S. H. Powles
 Mr. R. G. Greaves
 Mr. B. S. Mills
 Mr. W. R. Prophet
 Mr. J. Scarborough
 Mr. H. C. Kirk
 Mr. H. G. Ross
 Mr. H. Ballard
 Mr. N. W. Gerrard
 Mr. E. G. Black
 Mr. H. L. N. Sarre
 Mrs. B. Bowring
 Mr. R. Letcher
 Mr. G. Tomlinson
 Mr. G. R. Edge
 Mr. H. White
 Mr. K. H. Pickett
 Mrs. Brendon
 District Commissioner, Kitale
 Labour Officer, Kitale

European Agricultural Settlement Board.

Chairman, Municipal Board of Kitale.

Barclays Bank (D.C. & O.).
 Standard Bank of South Africa.

UASIN GISHU PRODUCTION COMMITTEE AREA

Mr. H. K. Upson
 Mr. A. E. Wright
 Mr. J. Gault
 Mr. C. Keese
 Mr. E. H. De Waal
 Mr. J. A. H. Wolff
 Mr. D. O. Russell
 Mr. R. J. Spooner
 The Hon. L. R. M. Welwood, M.L.C.
 Mr. D. A. Grafton
 Mr. L. J. Snyman
 Mr. B. H. Robson
 Mr. D. A. Grafton
 Mr. B. M. Ray
 Mr. G. F. McDonald
 Mr. H. G. Warrack
 Mr. L. S. Aniere
 Mr. M. E. L. Hobden
 Mr. W. J. M. Cooper
 Mr. J. W. Newton
 Mr. N. Gain
 Mr. M. F. Loveland
 Mr. H. D. Haggie
 Mr. G. H. Pembridge
 Mr. C. H. Walter
 Mr. J. I. Griver
 Mr. W. E. and Mrs. Croskill
 Mr. F. C. Dewell
 Mr. T. R. Ibbetson
 Mr. T. G. Williams
 Mr. J. C. Ecksteen
 Mr. G. Venning
 Mr. R. S. Kirk
 Mr. L. J. Nel
 Mr. D. Hay
 Mr. D. R. Millbourn

Uasin Gishu Production Committee.

Agricultural Officer, Eldoret.

European Agricultural Settlement Board.

Turbo/Kipkarren Farmers' Association.

Standard Bank of South Africa.

Chamber of Commerce, Eldoret.

Barclays Bank (D.C. & O.).

SOTIK AND LUMBWA/SONGHOR PRODUCTION COMMITTEE AREAS

Mr. R. E. Livingstone-Bussell	}	Sotik Production Committee.
Mr. E. B. Hay		
Mr. S. H. Young		
Mr. A. T. Cottell		
Mr. P. Ward	}	Agricultural Officer.
Mr. C. R. Coulson		
Mr. D. A. B. Ross		
Mr. D. E. Robathan		
Mr. W. E. Parry		
Mr. C. H. Terry		
Mr. S. N. Timmis		
Mr. R. H. Heath		
Dr. Strangways Dixon		
Mr. R. H. Walker		
The Hon. Mrs. B. Shaw, M.L.C.	}	Lumbwa/Songhor Production Committee.
Mr. W. J. H. George		

NAKURU PRODUCTION COMMITTEE AREA

Mr. W. H. Gunson	}	Nakuru Production Committee.
Mr. H. H. Peet		
Cdr. T. C. Pearson		
Mr. J. Chrystall	}	Chairman, Production Sub-Committee. Vice-Chairman, Production Sub-Committee.
Col. H. R. Jackman		
Mr. J. W. Best		
Mr. J. P. Ryan		
Mr. J. A. Liddell.		
Mr. E. G. Whittall		
Mr. J. F. Keppie		
Major J. R. Pickford		
Mr. W. Trench		
Mr. A. W. Hemphill		
Mr. E. N. Millington	}	President, Royal Agricultural Society of Kenya Vice-President, Kenya National Farmers' Union
Mr. H. E. Wedgewood		
Mr. D. E. Fielden		
The Hon. M. Blundell, M.L.C.		
Major P. Steyn		
Major A. F. Dudgeon		
Col. B. R. Mackenzie		
Mr. J. E. A. Wolryche Whitmore		
Cdr. C. A. Long		
Mr. J. Byng-Hall		
Mr. C. D. Hill	}	Agricultural Officer, Nakuru. European Agricultural Settlement Board.
Lord Delamere		
Mr. M. W. Wickham-Boynton		
Mr. H. E. Gill		
Dr. R. V. Bowles		
Lord Francis Scott		
Miss Pamela Scott		
Cdr. E. C. Ward		
Mr. W. Prentice		
Mr. H. C. Colthart		
Mr. A. Storrar	}	The Kenya Poultry Produce Co-operative Society, Ltd.
Mr. D. Broatch		
Mr. C. H. Upton		
Brig. V. K. H. Channer		
Mr. G. A. W. Saunders		
Capt. H. M. Harries		
Mr. A. K. Blackler		
Mr. F. A. Levy		
Mr. P. G. Thorne		
Mr. S. Haug	}	
Mrs. Y. Darville		
Mr. H. Stjernsward		
Col. L. Judkins		
Mr. G. M. Pain	}	

NAIVASHA PRODUCTION COMMITTEE AREA

Major E. W. Pardoe	}	Naivasha Production Committee.	
Mr. T. E. Evans			
Mr. B. A. Clarke			
Mr. J. M. Nightingale			
Mr. C. W. Hillyar			
Lt. Col. J. N. Nimmo			
Major C. E. Reynard			
Mr. J. Schouten			Agricultural Officer.
Mr. I. Hawkins			Manager for Sir John Ramsden.
Mrs. Stevens			
Mr. A. F. Reynard			
Mr. E. R. Newbiggin			

LAIKIPIA PRODUCTION COMMITTEE AREA

Mr. A. Dykes	}	Laikipia Production Committee.	
Mr. J. H. Van der Westhuizen			
Mr. W. A. North			
Mr. F. R. H. Shaw			
Mr. D. A. Smith			
Mr. H. D. White			
Mr. J. Schouten			Agricultural Officer.
Mr. L. W. Sykes			
Mr. B. H. Curry			
Mr. E. H. G. Augeraud			
Major G. J. K. Stapleton			
Mr. C. L. Wace			

NYERI PRODUCTION COMMITTEE AREA

Mr. G. Hopkins	}	Nyeri Production Committee.
Mr. F. E. Payne		
Lt.-Col. C. Oulton		
Mr. A. N. Bailward		
Mr. J. S. Davis		
Mr. P. B. Sandford		
Mr. P. Walker-Munro		
Mr. J. H. Thacker		
Mr. A. G. O. Hodgson		
Mr. E. T. R. Cook		
Mr. D. Cole		
Dr. A. H. Becker		
Mr. H. G. Prettejohn		
Mr. W. K. Bastard		
Mr. W. E. Powys		
Mr. W. H. Chadwick		
Lt.-Col. J. G. Kirkwood		
Mr. G. J. L. Burton		

Note.—Many of the above-named persons submitted written memoranda in support of their oral evidence.

II.—Memoranda were also received from the following persons:—

Mr. H. C. Kirsopp	Kitale.
Mr. O. H. Knight	Kitale
Mr. G. A. Swinton Home	Soy
Mr. J. H. Auret	Kitale.
Mr. R. N. Edmondson	Nakuru
Mr. H. C. Bevan	Subukia
Mr. H. S. Hex	Nairobi
Mr. W. H. P. de la Hey	Timau
Mr. G. Crawford	Songhor
Lt.-Col. D. C. Macleod	Ainabkoi
Mr. E. R. Cook	Mweiga
Mr. F. S. Howden	Konza
Mr. E. M. Kidner	S. Kinangop
Mr. H. G. Dempster	Kitale
Mr. W. P. M. Brettell	Kitale

III.—List of Farms Visited by the Commissioner:—

MACHAKOS PRODUCTION COMMITTEE AREA

Mr. N. C. Hill
 Mr. G. C. Javens
 Mr. F. S. Howden
 Mr. P. Webster
 Major F. de V. Joyce
 Sir F. O'B. Wilson
 Messrs. Stanley & Mackenzie
 Mr. G. B. Mousley

NYERI PRODUCTION COMMITTEE AREA

Mr. G. Hopkins
 Mr. J. Gould
 Mr. G. C. Wiley
 Mrs. J. C. Clarke
 Messrs. Cook & Sedgwick
 Mr. J. W. K. Pease
 Group Capt. The Hon. L. R. Briggs, M.L.C.
 Messrs. Mckillop & Prettejohn
 Mr. D. H. Street
 Col. C. C. Oulton
 Mr. W. D. Randall
 Mr. A. W. Sutcliffe
 Mr. D. Hinds
 Mr. F. E. Payne
 Mr. D. Cole
 Mr. P. C. Minns

Pura Milk Dairy.

UASIN GISHU PRODUCTION COMMITTEE AREA

Mr. V. Cloete
 Mr. P. S. van Deventer
 Mr. S. D. Whetham
 Mr. H. V. H. Gadsdon
 Mr. P. G. A. Smith
 Mr. J. C. Eksteen
 Mr. W. R. A. Knocher
 Mr. G. S. Roets
 Mr. M. F. Loveland
 Mr. J. N. G. Gain
 Mr. J. P. Barnard
 Mr. A. Douglas
 The Hon. L. R. M. Welwood, M.L.C. Ramsden Estate.
 Eldoret Agricultural Experimental Farm

TRANS NZOIA PRODUCTION COMMITTEE AREA

The Earl of Portsmouth
 Mr. G. E. L. Nicholson
 Mr. J. G. Evans
 Mr. C. Tilney
 Messrs. Shaw and Neal
 Mr. K. E. Chambers
 Cdr. F. B. Carslake
 Messrs. Forbes and Son
 Mr. R. Fulton
 Mr. E. G. Black
 Mr. G. B. Long
 Mr. P. K. Horsey
 Mr. W. Symes
 Mr. G. Bulstrode
 Mrs. Brendon
 Mr. R. Hartley
 Kitale Experimental Farm and Pasture Research Station.

NAKURU PRODUCTION COMMITTEE AREA

Mr. A. W. Hemphill
 Mr. T. L. Martin
 Lt.-Col. G. E. V. Keighley
 Mr. D. Pell-Smith
 Mr. E. N. Millington
 Major A. F. Dudgeon
 Mr. J. E. A. Wolryche Whitmore
 Mr. C. D. Hill
 Sir Philip Mitchell
 Mr. D. H. M. Dempster
 Mr. F. Ward
 Lord Delamere
 Messrs. Gunson and Pearson
 Messrs. Goode and Power
 Egerton Agricultural College
 The Hon. M. Blundell, M.L.C.

NAIVASHA PRODUCTION COMMITTEE AREA

Mr. J. F. Lipscomb
 Mr. E. W. Pardoe
 Mr. N. H. Lee
 Messrs. Scott and Sugden
 Mr. Mervyn Ray
 Mr. J. M. Nightingale
 Mr. E. M. Kidner
 Mr. T. Eaton-Evans
 Mr. C. W. Armstrong
 Mr. J. de P. Colvile
 Ol Joro Orok Agricultural Experimental Station

LAIKIPIA PRODUCTION COMMITTEE AREA

Mr. H. M. Collinson
 Mr. W. J. Edwards
 Mr. B. H. Curry

APPENDIX "B"
(Paragraph 8 of the Report)
COMMISSION OF INQUIRY

PRELIMINARY HEADINGS ON WHICH INFORMATION IS REQUIRED

- 1.—**Number of Farms** above 50 acres.
- 2.—**Total Acreage in Use** and further acreage capable of development.
- 3.—**Types of Farms—Numbers** and acreages in each case:—
 - (a) Mixed farms predominantly wheat.
 - (b) Mixed farms predominantly maize.
 - (c) Dairy ranching.
 - (d) Beef ranching.

Some indication of the numbers under (a) and (b) which practise monoculture and conversely are truly rotational.
- 4.—**Capital Involved** (at to-day's market figures) in respect of types of farms defined under 3, in:—
 - (a) Freehold and fixed equipment.
 - (b) Farmers' working capital.
- 5.—**Gross Annual Output and Annual Profit** in respect of above types.
- 6.—**Sources of Credit and Amounts** involved in the forms of:—
 - (a) Long-term loans.
 - (b) Mortgages.
 - (c) Short-term advances.
- 7.—**Government Assistance other than** under 6.
- 8.—**Changes in Values or Cost** as indicated by, say, 1930, 1939 and to-day:—
 - (a) Land.
 - (b) Fixed equipment.
- 9.—**Changes in Type of Value of Working Capital** in, say, 1930, 1939 and to-day:—
Information such as numbers of tractors.
- 10.—**Indebtedness as Percentage of:**—
 - (a) Value of fixed equipment and freehold.
 - (b) Working capital and turnover.
- 11.—**Numbers of Farms Changing Hands** in 1930/39 and post-war.
- 12.—**Is Indebtedness Concentrated Amongst Recent Settlers.**
- 13.—**Number of Farms Run Seriously to Produce Adequate Output.**

Number of hobby farms.

All the above to be aggregated from individual farms or districts.
- 14.—**Commodities:**—

Output	—	Wheat
Destination	—	Maize
Potential	—	Beef and Mutton
	—	Bacon
	—	Milk and By-products
	—	Poultry.

12th February, 1952.

APPENDIX "D"

OPERATIONS OF GOVERNMENT CEREALS FINANCE DURING PERIOD 1949/50
TO 1952/53

(See paragraph 45 of Report)

Pool Year	Crop	Total Amount Advanced in Pool Year	Total Amount Repaid in Pool Year	Maximum Balance Outstanding in Pool Year
1949-50	Wheat	£ 1,526,752	£ 1,204,429	1,392,515
	Maize	338,222	318,496	300,623
1950-51	Wheat	2,093,519	1,478,576	1,951,923
	Maize	493,366	451,829	378,693
1951-52	Wheat	1,992,280	1,391,973	1,752,455
	Maize	688,923	587,599	595,516
1952-53 (Season still run- ning)	Wheat	1,218,939	290,986	1,189,840
	Maize	444,542	327	444,215

APPENDIX "E"

THE MAIN SOIL GROUPS OF THE EUROPEAN AREAS OF THE KENYA HIGHLANDS AND THEIR UTILIZATION

By

E. Bellis, Esq., Soil Chemist

(Paragraph 86 of the Report)

Group 1

- Major: Beef ranching.
 Secondary: Dairy ranching; sisal.
 Minor: Fodder production; fruit and vegetables.

The soils of Group 1 characteristically comprise 2 to 3 ft. brownish-grey to black moderately acid to neutral (pH 5.6 to 7.4) sometimes shallow loam to clay loam, generally over phonolite and basalt though they also occur over gneiss and schist, the lighter colours being generally associated with greater loaminess. The surface soils have moderate organic reserves and are well supplied with mineral nutrients. The subsoils are variable; in some instances (particularly when the top-soil is heavy) the soil is uniform right down to a narrow band of weathered material directly over disintegrating rock; in others the soil becomes markedly lighter in colour, loamier in texture and calcareous with depth. The uniform variant is imperfectly drained but drainage and growth conditions in the variant with a marked calcareous subsoil are usually good.

Typically these soils are found on extensive flat, gently sloping or gently undulating plains though when they occur over basement Complex rocks they can also occur on less steep foot slopes of hilly country. The areas of occurrence of these soils are areas where rainfall (20 to 25 in.) exerts a severe limitation on choice of crops.

Within this main soil type steeper localities and broken topography are associated generally with bush-covered reddish-brown or orange-brown acid loams with murrum grit. In most of such localities the soil is very shallow and production potential is low; on the other hand, in favoured sites good depth of soils may be found and where water for irrigation is available and where liberal quantities of dung can be applied this soil has demonstrated a high crop potential for fodder crops, maize, fruit and vegetables. There are also restricted areas of ancient swamp.

Group 1A

- Major: Dairy ranching.
 Secondary: Beef and sheep ranching.
 Minor: Fodder (particularly lucerne) production.

The soils of Group 1A are the deep, slightly acid to alkaline (pH 6.4 to 8.5 with localized areas up to 10.5) clay loams which form lacustrine plains round the Lakes in the floor of the Rift Valley. Rainfall (20 to 30 in.) again limits crop potential except in favoured areas where irrigation is possible. In some localities the alkalinity of the soil is so great as to render it infertile. The plains in which these lacustrine soils are found are broken in parts by boulder-strewn lava flows and volcanic outcrops carrying shallow stony bush-covered soils.

Group 2

- Major: Fine-grained cereals.
 Secondary: Sheep; extensive dairy farming.

The soils of Group 2 typically comprise 9 to 15 in. seasonally waterlogged acid (pH 5.2 to 5.5) siliceous brownish-grey silt loam with fine orange and black mottling in the lower portion and frequently hard murrum pellets (sometimes cemented into sheets) at the base lying directly over very dark-coloured less acid (pH 6.2 to 6.4) impervious clay. In slightly elevated situations the surface soil becomes browner, the murrum more dispersed and the change to clay subsoil less abrupt. These soils occur on extensive plateaux with gently undulating, gently sloping, flat or depressed topography: sometimes with numerous large bush-covered ant-hills. Production potential on these soils depends largely on the ease with which they can be drained.

The top-soil of this soil even in its natural state characteristically has little structure: the soil is able to take up water only through the sponginess in its organic content and, with the rapid run-down of organic content of this soil with cultivation, there is correspondingly rapid development of susceptibility to wind and water erosion.

The range of plants which are suitably adapted for growing on this soil is limited. The surface soil is extremely deficient in phosphates and dressings of this nutrient are essential for satisfactory growth: potash and lime have also been found to be beneficial. The residual effect of the phosphates on this soil is considerable. Within this soil there may be patches of "Manyatta" soil, a friable clay loam of high chemical fertility.

Group 2A

Major: Maize; extensive dairy farming.

Secondary: Sisal.

The soils of this group comprise slightly greyish-black to black clay loams over at least 3 ft. of black clay on gently sloping or level land under conditions of seasonally impeded drainage. With deteriorating natural drainage this soil can be dark grey with mottling in the third foot or a brownish-grey silty clay loam over a grey silt clay with rust mottling, such land being characterized by a grassy rather than a bush vegetation and by the presence of numerous termite mounds. These soils are found under a rainfall of 55 to 70 in. at altitudes between 4,500 ft. and 5,500 ft. The darker-coloured soils may be cropped successfully but no satisfactory system of drainage of the wetter variants of this soil has yet been devised.

Group 3

Major: Fine-grained cereals.

Secondary: Wattle and maize.

The soils of Group 3 characteristically comprise somewhat orange-brown acid (pH 5.3 to 5.8) phosphate-deficient loams over gritty red loam subsoils with increasing amounts of murrum pellets in the first foot, giving way within the third foot to mottled murrum over weathering phonolite. This soil occurs in an extensive gently undulating plateau whose altitude ranges from 7,000 ft. to 8,000 ft. and whose rainfall is from 35 to 40 in. Cultivation is restricted (mainly by impeded drainage) to areas where there is at least two feet of soil over the earthy murrum and where there is no cementing of the murrum into sheets.

Group 3A

Major: Cereals; extensive dairy farming.

Secondary: Sisal; coffee; pineapple; pyrethrum.

In Group 3A there are two distinct but intermingled groups of soil. These soils are of frequent occurrence where there are gentle slopes rising from areas of soils of Groups 1 and 2. Firstly, there are seasonally wet, generally shallow, orange-brown, reddish-brown or orange soils with pellet or sheet murrum over weathering phonolite or sometimes erodible clay. These soils are characterized by the presence of numerous large termite mounds and by a natural grass and bush rather than deep-rooted tree vegetation.

Secondly, wherever local topography favours better drainage and greater soil depth there are soils with 3 ft. or more of friable red loam carrying a natural forest vegetation which on clearing supports a Star grass sward rather than the hay-type grass grazing of the shallower soils. These soils are fertile and have a high crop potential.

Group 4

Major: Coffee; sisal; dairy farming; cereals.

Secondary: Pyrethrum.

Minor: Fruit; flowers; vegetables.

The soils of Group 4 comprise very deep dark-red to red, well structured, acid (pH 5.6 to 6.4) loams with dark-red or chocolate top-soils derived from deeply weathered rocks and are found generally on ancient forest-clad hill-sides under rainfalls between 35 to 45 in. These soils have very large nutrient reserves and provided care is taken of their water-absorption powers and they are protected from water erosion, they have a high fertility and are able to withstand prolonged intensive cropping; they respond well to organic dressings as mulch or manure, but have high phosphate-fixation powers.

Crop production, wheat production particularly (but plantation crop-growing to a lesser extent) on this soil is limited by topography, a feature particularly of the higher altitudes being the relative scarcity of flat land and the steepness of the slopes on which the soil occurs,

Group 4A

- Major: Tea.
 Secondary: Maize and dairy farming.
 Minor: Passion fruit.

Closely resembling but markedly more acid (pH 5.2 to 5.7) than the red loams of Group 4 are a group of soils found at an altitude of 7,000 ft. under a rainfall of 70 in. in the vicinity of Kericho and again in North Sotik. These soils are the main soils of the Kericho and Sotik Tea Plantations. They also occur on the tea soil within Soil Group 5B at Limuru.

Group 4B

- Major: Tea.
 Secondary: Coffee.
 Minor: Fruit; hibiscus; ramie.

Other variants of the red loams of Group 4 are the deep-red to brownish-red to chocolate to yellowish-brown acid (pH 5.2 to 5.7) clay loams found on the western and southern slopes of Mt. Tinderet. These soils differ from the Kericho soils particularly in occurring in broken country with steep shallow soils appearing to separate the more fertile areas. Their main occurrences are in Nandi (where they are used for tea), Upper Songhor, Fort Ternan and North Lumbwa (where they are used for coffee).

Group 4C

- Major: Wheat; dairy farming.
 Secondary: New Zealand flax; ramie.

Along the southern and eastern fringes of the shallow plateau soil of Group 3 is moderately undulating country with a deep orange-brown to reddish-brown friable clay loam carrying a natural thorn forest vegetation and supporting a Kikuyu grass sward after clearing. Within this area, particularly to the south, are large areas of friable black clay loam. These soils appear capable indefinitely of bearing arable crops at a high yield level with application of little or no fertilizer. The southern area at the same time is also broken with numerous steep forest-covered rocky hill-sides and spurs.

Group 5

- Major: Fine-grained cereals; pyrethrum.
 Secondary: Extensive dairy farming; sheep.
 Minor: Essential oils.

Above about 8,000 ft. under a rainfall of 40 to 45 in. there are extensive upland areas of smooth relief with deep-yellow orange-brown, yellowish-brown and brown phosphate-deficient loams over orange-red and black mottling (but no hard pellets) below 2 ft. 6 in. These soils are derived *in situ* from grey-white tuff and conglomerate on hill crests and gentle slopes and from creep material in the lower slopes towards the river channels. On steeper upper slopes there is a reddish-brown top-soil over a shallow orange-red subsoil with less mottling and on the summits of the hills the soil is markedly red. The lowermost slopes often have slightly impeded drainage with seepage water in the subsoil and a high run-off on the surface; such areas need cut-off drains if they are to be cultivated.

The soil has high phosphate-fixation powers and residual effects from phosphate applications are small. Once the natural ground cover is broken the soil, particularly on steeper slopes, is susceptible to severe gully erosion.

Group 5A

- Major: Fine-grained cereals; dairy farming; pyrethrum.
 Secondary: Wattle.
 Minor: Peas; maize.

Soils resembling the soils of Group 5 but with a more acid reaction are found in high country (above 8,500 ft. under 45-in. rainfall) west of Rift in the Timboroa/Ainabkoi/Kipkabus area and again in the broken country on the eastern fringes of the Kinangop Plateau. In the West of Rift area this group of soils is characterized by a very high population of small hemispherical termite mounds.

These soils when treated with phosphate (sodaphosphate being particularly valuable in the Kipkabus area) lime and potash are capable of considerable arable cropping.

Group 5B

- Major: Dairy; wattle.
 Secondary: Residential.
 Minor: Fruit; flowers; vegetables.

In the Limuru area above an altitude of 7,500 ft. under a rainfall of 45 to 50 in. there is a very acid (pH 4.4 to 5.2) deep-orange loam with very large reserves of organic matter. The soil in its natural state supports high forest which after clearing and cultivation gives place to bracken.

Group 6

- Major: Cereal; mixed farming; sisal.
 Secondary: Coffee; pyrethrum.
 Minor: Citrus.

Group 6 comprises a group of natural, well-drained reddish-brown, brown and grey-brown sandy loams to loams slightly phosphate deficient over a slightly reddish-brown and brown subsoil often with a range of textural differences in the profile. Though the parent material is mainly fine ash and pumice the soils have been reassorted and contain considerable admixtures of water-borne deposits. These soils occur in undulating country.

Group 6A

- Major: Maize; dairy farming.
 Secondary: Fodder crops.

Group 6A comprises a group of brown to dark-brown loams, whose surface soil becomes more orange under prolonged cultivation. The soils are mainly sedentary derived from dark tuff, pumice and ash. This group is of very recent origin and the profiles of its soils are built up of layers of volcanic ejectate which have largely retained their original textures. The occurrence of this soil group is believed to coincide with the occurrence of a wasting disease in stock known as *Nakuruitis*, for control of which inclusion of cobalt in the stock-lick is essential. The soil carries good crops of maize (30 cwt. per acre being obtainable) optimum yields being secured when phosphates are given; fine-grain cereals, on the other hand, do poorly and react adversely to dressings of phosphate. The reason for this peculiar behaviour of fine-grained cereal is suspected to be due to a trace element imbalance in which copper deficiency is implicated.

Group 7

- Major: Beef; dairy and sheep ranching.
 Secondary: Sisal.

Under a rainfall of 20 to 25 in. in the bed of the Rift between 6,000 ft. and 7,000 ft. around Mt. Longonot there are gently sloping plains on recently deposited deep coarse-textured ash soils rising to high rock outcrops around the mountain crater.

Group 8

- Major: Extensive dairy farming.
 Secondary: Wheat; essential oils; pyrethrum.

At altitudes of 6,000 ft. to 7,000 ft. under a rainfall of 50 in. on fairly steep to steep slopes in the Lumbwa and Sitoten areas there is a reddish-brown to dark-brown to chocolate-brown crumbly loam which is usually shallow over greyish phonolite but which on shelves, hill-tops and valley bottoms may develop a good depth of only moderately acid (pH 5.8 to 6.5) loam with adequate phosphate reserves.

Group 9

- Major: Dairy and sheep farming.
 Secondary: Maize; pyrethrum.

At an altitude of 8,000 ft. under a rainfall of 35 in. in the Wanjohi Valley (between the Aberdares and Kipipiri Mountains) there is a small area of deep humic loam of high-production potential whose development is limited by relative inaccessibility.

Group 10

Major: Extensive grazing.

Secondary: Cereals; pyrethrum.

Group 10 is a group of soils on the eastern and parts of the western wall of the Rift Valley and of the shelves and pockets of cultivable soils formed on them. The soils of these pockets vary from place to place; below the Kinangop Plateau they resemble the soils of Group 2; in the much-dissected country north of Gilgil they are dark-brown, nearly neutral, chemically rich clay loams over lighter-coloured zones of calcareous accumulation, such soils being used within the limits permitted by local rainfall (about 30 in.) for wheat-growing; east of Bahati and west of Ol Kalou they resemble the red variant of Group 3A. Escarpment side soils of agricultural value are found only in these pockets and shelves.

Group 10A

Major: Rough grazing.

Secondary: Residential.

Broken country similar to the country north of Gilgil but which has been formed by the cutting back of tributaries of the Sagana River into the Cole Plains is found between 6,000 ft. and 7,000 ft. to the north of Nyeri. In this area rainfall (25 in.) limits utilization of the few sites in which topography and soil depth make farm operations possible.

Group 11

Major: Maize; mixed farming.

Secondary: Sisal.

The gneiss of the Basement Complex of the Trans Nzoia peneplain has given rise on the ridges of gently rolling country at altitudes ranging from 6,000 ft. to 7,500 ft. under a rainfall of 40 to 55 in. to a range of natural well-drained reddish sandy loams overlying somewhat heavier subsoils. These soils, which set hard when dry, require phosphate and nitrogen to obtain optimum crop yields. While these soils lose their structure relatively quicker under cultivation they have proved particularly amenable to restoration under grass and under green manures.

In the vicinity of the Nzoia River and more particularly on its left bank there is a kindred group of soils having in cultivable areas a similar usage and similar yield potential, but whose parent material is transported and creep material derived from gneiss, with admixtures of lava-derived particles. These soils are reddish-brown, brown and greyish-brown sandy loams over redder subsoils: they are much less compact than the peneplain soils and occur in markedly broken country below the lava flow which forms the Uasin Gishu Plateau. The broken nature of the country in which this soil is found reduces somewhat their agricultural value.

The depressions, and particularly the broad valley bottoms of the peneplain, are swampy with acid (pH 5.4 to 6.1) humic top-soils over heavy subsoils.

Group 11A

Major: Maize; beef and dairy ranching.

Secondary: Coffee; fruit.

Minor: Tobacco.

Along the eastern fringes of the Kenya Highlands, between 4,500 ft. and 5,500 ft. in the Machakos and Ithanga Hills there is much broken country derived from schist, gneiss and granite of the Basement Complex. Most of the soils are shallow and stony with numerous rock outcrops. Skirting the hills, however, may be found acid (pH 5.3 to 5.8) loamy mantle soils derived from soil creep material from higher ground. Though relatively easy to cultivate, however, their nutrient reserves and moisture-retaining powers under the relatively dry (rainfall 25 in.) conditions which are typical of most of the area are low and their crop potential is correspondingly low. The greatest use to which the soil-type is put is beef and dairy ranching.

APPENDIX "F"

NOTES ON TEMPORARY LEYS IN THE EUROPEAN FARMING AREAS OF KENYA—JANUARY, 1953

By

L. R. N. Strange, Esq., Department of Agriculture

(Paragraph 101 of the Report)

I—SPECIES IN USE

The following are the principal species at present used to some extent:—

Altitudes Below 8,000 ft.

(a) *Rhodes Grass (Chloris Gayana)*.—A valuable "General purpose" ley species, used for grazing or hay.

It is inclined to fall off rapidly in production after the first season.

Tends to run quickly to stem.

It is the principal ley grass of such areas as Rongai, Nakuru, Moiben Valley, etc., where it flourishes naturally and has become the dominant species over wide areas.

(b) *Molasses Grass (Melinis Minutiflora)*.—Essentially a "grazing" species; does not make a good quality hay.

Probably the more useful of the two grasses, except in areas where Rhodes is naturally very prolific.

There are no legumes in general use for grazing leys at these altitudes, although Kenya white clover (*Trifolium semipilosum*) comes in commonly as a volunteer in some localities such as Rongai-Nakuru, and is a valuable constituent of the sward.

Altitudes Over 8,000 ft.

(a) Brome grass. (*Bromus marginatus*).

(b) Cocksfoot.

(c) Italian ryegrass.

(d) Tall Fescue (especially Kentucky 31 Fescue).

With the exception of Brome grass, little use has been made of these species until recently.

Brome grass has the disadvantage of being short lived, its performance being little better than that of oats.

At these altitudes some use is being made of crimson clover, red clover and serradella (*Ornithopus sativus*) as short-term grazing or fodder legumes, in mixture with the grasses.

Kenya white clover (*Trifolium semipilosum*) occurs commonly.

II—METHODS OF ESTABLISHMENT

At the lower altitudes, leys are usually established by sowing under the last crop in the arable break.

In the maize producing areas grass seed is broadcast by hand after the last hand weeding, when the crop is three feet to four feet high. A light covering of the seed is advisable, but not essential.

Seed rates commonly used are:—

Ten lb. per acre for molasses grass.

Fifteen lb. per acre for Rhodes grass.

Undersowing will result in a satisfactory ley providing:—

(a) the broadcasting is carried out evenly; the seed has a fair percentage germination;

(b) soil moisture and fertility are sufficient for both crop and grass;

(c) the land is clean.

Experience has shown that such undersowing does not appreciably reduce the yield of maize.

Under certain conditions, direct seeding may be preferable to undersowing, although seldom practised. Where direct seeding is used, it is advantageous to sow with a quick growing annual which will give ground cover and an early grazing during establishment of the perennial grasses. This method would appear desirable on soils such as those of the Uasin Gishu Plateau, which tend to remain powdery, and dry out rapidly at the end of the rainy season. There is evidence to show that consolidation of the ground soon after establishment is an important factor on such soils.

It is doubtful whether rolling the seed bed is as effective as treading by cattle, due to the risk of packing the surface, and consequent sheet erosion.

Direct seeding is, perhaps, the ideal for any land where fertility has dropped low as a result of cultivation, although for economic considerations it may not be used by the farmer.

In the wheat growing areas, given adequate soil fertility and moisture, satisfactory leys are obtained by sowing at the same time as, or soon after, the drilling of corn. In the Rongai-Nakuru district, where Rhodes grass is particularly vigorous sowing is often deferred until the corn is well established, in order to avoid too much competition.

Undersowing a cash crop is attractive for the following reasons, and is the method generally advised by the Agriculture Department:—

- (a) The farmer saves the cost of a complete cultivation.
- (b) The avoidance of an extra cultivation is desirable, particularly from the aspect of soil structure.
- (c) Some extra grazing is available during the dry season immediately after harvest.

The indication is that where soil conditions are right, a direct-seeded ley will gain little, if anything, over one sown under maize the previous season.

The following are some important difficulties commonly encountered in ley establishment:—

(a) How to Obtain an Even Stand

Hand broadcasting, in itself a skilled task, must be replaced by some more reliable method.

Possibilities are:—

- (1) The ordinary grass seed barrow. Excellent results have been obtained so far with seed barrows, and there is much to be said in their favour.
- (2) Herbage seed attachments for grain drills.
- (3) Special grass seeders set between rib rollers. An example of this is the "Brillion Seeder", a popular machine in America.
- (4) Sowing in mixture with fertilizer through the fertilizer attachment of an ordinary grain drill. This method has been used successfully in preliminary trials. A small attachment to the drill is necessary.
- (5) The construction, locally, of an attachment to an ordinary maize planter, which will enable herbage seeds to be drilled in three- to four-foot lines. Good results have been obtained at the G.R.S. Kitale by means of attaching two "Planet Junior" planting boxes on to an I.H.C. maize drill. A machine of this type will be of particular value where row planting is desired, as for seed production or special fodder leys.

(b) The Availability of Reliable Certified Seed

Many leys have failed because the farmer has used seed of an unknown quality.

Costs of establishment will remain higher than necessary so long as heavy seed rates must be used as an insurance against failure.

A colony-wide certification scheme would not only ensure a standard minimum germination, but would ensure that strains coming on to the market are authentic.

Pending the introduction of such a scheme, farmers could make considerably more use of the Scott Laboratories Seed Testing Station.

(c) Adequate Fertilizing in the Seed Bed

Experiments show that on some soils, especially where fertility has dropped due to overcropping, fertilizers are beneficial to, if not essential for, satisfactory establishment and growth. The cost of these fertilizers is, in many instances, greater than the return which can be expected, and farmers are therefore naturally unwilling to use them.

A possible remedy may be the re-introduction of some form of financial aid to farmers, such as the old "grass ley" bonus of the Production Board.

III—COSTS OF LEY ESTABLISHMENT

Owing to the large variations in technique, soils, species, etc., only approximate costs of establishment can be given. The following estimates for a Rhodes or molasses ley will, however, serve as a guide. Cultivation costs are worked out in accordance with the figures given by Mr. L. G. Troup on page 17 of his report on 1951 maize prices. The costs are for a farm having 300 acres of leys.

(a) (i) The most common method of establishment is broadcasting under maize without the use of additional fertilizer. The cost of cultivation is carried by the maize.

	<i>Sh. per acre.</i>
Cost of seed (@ Sh. 2 per lb. for Rhodes and Sh. 3 per lb. for molasses)	30.00
Cost of sowing by grass seed barrow (depreciation) ...	.50
Labour for sowing	1.00
Cost of supervision	1.00
Cost of covering seed	1.00
	<hr/>
Total working cost per acre ...	33.50
	<hr/>

(ii) Cost of ley establishment when undersowing in wheat or barley:—

In the higher areas the normal practice is to undersow wheat or barley. The cost of the latter is estimated at Sh. 100 per acre, exclusive of interest on working capital and on capital invested in machinery and exclusive of the cost of seed.

The cost of seed per acre would be as follows, according to the species used:—

	<i>Sh.</i>
K. 31 fescue	28
Cocksfoot	30
Bromus	20
Rhodes (Nzoia)	37
Rhodes (Rongai)	15

(b) Direct seeding, plus an annual cover crop for quick grazing and ground clover, but without the use of fertilizers:—

	<i>Sh. per acre.</i>
All working costs as in (a) above	33.50
Plus the following:—	
Seed of an annual cover crop for early grazing	15.00
One combined tractor stalk cutting and disc harrowing at the rate of 15 acres per day	3.27
One and a half tractor ploughings at the rate of eight acres per day	9.22
One tractor disc harrowing at the rate of 20 acres per day ...	2.45
Transport of fuel and oil to farm ... ..	.40
European supervision for cultivations, say one-sixth of that required for maize production	6.00
	<hr/>
Total working cost per acre ...	69.84
	<hr/>

(c) Direct seeding, plus an annual cover crop to give quick grazing and ground cover, plus the use of fertilizer:—

	<i>Sh. per acre.</i>
All working costs as in (b) above	69.84
Plus the following:—	
One cwt. double supers per acre @ Sh. 859/61 per ton ...	42.98
One cwt. ammonium sulphate per acre @ Sh. 815 per ton ...	40.75
Transport of fertilizers to farm and field (estimating a five-mile trip in and out)	1.00
	<hr/>
Total working cost per acre ...	154.57
	<hr/>

IV—THE WEED PROBLEM IN CERTAIN AREAS

In certain areas, notably in the Thomson's Falls and Molo districts, land which has been under cereals for a number of years is so infested with weeds that the competition is too great for many grasses. It cannot be said that a satisfactory, economic solution to this problem has yet been found. The difficulty can be overcome by using the grass *Bromus marginatus* which grows rapidly enough in the early stages to compete with the weeds or by planting a competitive grass of creeping habit, such as Star grass. The former grass is unpopular as it quickly becomes stemmy and will not stand up to hard grazing while the latter has the disadvantages that it must be planted from splits. The costs of establishing grass by planting splits are not available. Other obvious partial remedies are: (i) re-seeding land to grass before it becomes weed infested, say, after not more than four years' cereals; (ii) row planting of seeded grasses to permit of subsequent intercultivation; (iii) the use of herbicides—but suitable types and techniques have not yet been found.

V—OTHER POINTS OF INTEREST ON THE ECONOMICS OF LEY ESTABLISHMENT AND UTILIZATION

One of the problems which requires urgent attention is the study of techniques for the mechanical harvesting of herbage seeds. If tackled vigorously, with sufficient capital, the solution of this is likely to have an appreciable effect on reducing costs. At present much of the Rhodes and molasses grass seed, especially molasses grass, is harvested by hand.

Except for Brome grass, there is little or no seed production locally of the other species mentioned.

APPENDIX "G"

PIG PRODUCTION, OL JORO OROK EXPERIMENTAL FARM

By

J. Schouten, Esq., Agricultural Officer, Ol Joro Orok

(Paragraph 127 of the Report)

BREEDING STOCK AND BUILDINGS

The breeding stock consists of eight Wessex saddleback sows and one large white boar. The cross-bred pigs are sold to the Bacon Factory as baconers with a liveweight of between 200 and 210 lb.

The buildings are designed after the Danish-type pig house. They were built in 1949 and cost approximately £560.

HISTORIES OF BACONERS IN PRODUCTION

A survey of figures concerning production of baconers is made from 1st October, 1951, to 30th September, 1952. During this period 125 pigs have been born and weaned, an average of 15.6 weaners per sow per year. The number of baconers supplied to the factory at the time of the survey is 100 pigs. The progress of the baconers may be summarized as follows:—

- Number sent to the factory—100.
- Number sold for breeding purposes at bacon weight—6.
- Number of deaths after weaning—2.
- Number of litters—16.
- Average number of pigs per litter—7.8.
- Average weight of litter at weaning—326.25.
- Average weight of weaner at 56 days' age—41.76 lb.
- Percentage of A Grade payments (100 pigs)—73 per cent.
- Percentage of "Firm" or "Very Firm" setting quality (100 pigs)—99 per cent.
- Average killing-out percentage—75 per cent.
- Average age to bacon weight—25.5 weeks.
- Average amount of food fed per baconer (110 pigs)—473 lb.

PIG COSTINGS AND REVENUE

The costs of production are divided into two categories:—

- (1) Depreciation of pigsties, labour wages, maintenance of breeding stock and transport charges.
- (2) The cost of food fed to the baconer in production.

In respect of category (1) costs are spread over the production of 125 baconers per year thus showing the expenditure for each baconer on these items.

(a) Buildings and breeding stock £600 depreciation at 10 per cent—This cost spread over 125 baconers	9.60
(b) Maintenance of breeding stock	33.64
(c) Cost of African wages	4.17
(d) Transport to railway station ... ..	.90
Total cost per baconer ...	48.31

The cost of European supervision is not taken into account.

In respect of category (2) above a ration with a digestible protein value of between 13 per cent and 14 per cent was used. Home-grown cereals are costed in at the Kenya Farmers' Association prices for the period under review. The cost of the ration thus obtained was 16½ cents per lb. The average cost of feeding, therefore, to produce a baconer is Sh. 78/04. The average total cost of production on this basis, therefore, has been Sh. 126/35.

Revenue

The revenue received from these litters from the Bacon Factory on 100 pigs already supplied amounted to Sh. 22,967/93 or 229/67 per pig.

APPENDIX "H"

SOME NOTES ON THE EDIBLE CANNA AND ITS USE IN FEEDING TO PIGS ON THE LEHMANN SYSTEM

By

R. H. Walker, Esq., Muhoroni

(Paragraph 127 of the Report)

Extracts from Davidson's "The Production and Marketing of Pigs", pages 254, 255, 444 and 445:—

"The system of feeding developed by Lehmann of Gottingen and first described in Great Britain in 1930 is one that is particularly well suited for adoption when large quantities of waste and by-products are available, *or when concentrates are in short supply.*

As originally worked out it consisted in feeding a fixed daily amount of mixed concentrates containing a high proportion of protein, minerals and vitamins from shortly after weaning to slaughter. Cooked potatoes were gradually added, according to appetite, until slaughter.

The original basic meal allowance was 1 kg. consisting of 7 parts barley meal, 3 parts fish meal. As the amount of potatoes increased, so the nutritive ration of the total ration widened, and automatically adapted itself to the live weight of the pig.

The advantages of the system are obvious: (1) It obviates both the calculations involved in altering the protein and mineral balance of the ration according to weight, and the preparation of different meal mixtures. (2) It makes the fullest use of surplus foods and the least demand on purchased feeding stuffs. With potatoes it works particularly well, with other foods it is seldom quite as effective and it may be advisable to increase the basic meal ration.

But the basic principle remains essentially a sound one and, if *intelligently applied*, will probably give as satisfactory results with waste and by-product feeds as rations carefully calculated out from week to week according to digestible percentage composition.

In a typical experiment carried out with this method of feeding the foods consumed per pig for a live-weight gain of 196 lb. were 231 lb. barley, 31 lb. fish meal, 59 lb. meat meal. There was thus a gain of 196 lb. live weight for 321 lb. of meal plus potatoes.

The conception of pig rations being based on nothing but mixtures of cereal meals is not in keeping with the conditions found in most parts of the world."

The edible canna grows best on a medium-heavy loam, well drained but of good moisture-retaining capacity. It requires a good rainfall and warm temperatures for optimum growth, and when grown under these conditions gives a complete ground cover and is an excellent cleaning crop.

Yields of 20 tons of tubers per acre can be obtained 15 to 18 months after planting and a very large quantity of high-quality green matter rich in protein in which pigs will eat with avidity.

It also removes large quantities of plant food per acre and should not be grown more than twice in succession even on most fertile soils.

Very large quantities of manure are produced by this system of feeding and it pays handsomely to return this manure to the land on which the cannas are to be grown.

There are large areas in Nyanza Province, especially the warmer parts, where soil and climatic conditions are ideal and yields in excess of those mentioned are obtained.

It is composed of almost pure starch, therefore adequate protein must be fed with it. It can either be fed raw or steamed, it appears to be more palatable if well-cleaned and cooked.

On this farm it has been tried out on the Lehmann System, i.e. the pigs from weaning get a standard ration of 3 lb. each D.P. ratio of about 4.6. This ration remains constant and is not increased. As the pig becomes older so it eats more canna which automatically widens the ratio.

Pigs fed on this system have averaged a daily gain of 1.18 lb. throughout 1951 and have been graded above average at the factory.

The fundamental point is to balance the large intake of starch in the canna by a balancer meal of the right D.P. ratio (about 1 to 4.6 or 17½ per cent protein) and adequate vitamins and minerals. Every endeavour should be made not to change the ingredients too frequently as this usually puts the pig off feed for a day or two.

Approximate Cost of Growing Canna per Acre

(All bags calculated 120 lb.)

	Sh. cts.
Ploughing, harrowing and ridging (canna planted in the furrows) ...	60 00
Planting—	
Two boys planting; two boys covering; eight boys selecting and digging planting material, at Sh. 1/50 per boy-day (12 boys) ...	18 00
Cultivation—	
By hand twice	25 00
By tractor twice	20 00
Transport of material and contingencies	15 00
Harvesting—One boy digs, cleans and roughly peels five bags of 120 lb.	
At the rate of 750/120 lb. bags per acre = 70 boys	105 00
Transport, sundries, and wear and tear on bags	50 00
	Sh. 293 00

(Say, Sh. 300 for 350 bags = 86 cents per bag of 120 lb.)

Six and a half bags costing Sh. 5.60 is equivalent in feeding value of one bag maize costing Sh. 40. Even if you only get one-third of this yield it is still far and away the cheapest supply of carbohydrates.

Further advantages are it is not stolen, is a complete cover crop to stop wash on the land and remains in the ground till required, and in addition provides quantities of green-stuff relished by the pigs.

The keeping of a sow by this method should not exceed £22 per annum and assuming she produces 14 weaners their cost should not exceed Sh. 31/50 each. From weaner to bacon weights the cost should not be more than Sh. 133. That will include 450 lb. concentrates at 20 cents per lb. and approximately 40 gallons skim milk at 40 cents per gallon.

One African can easily tend an output of 200/300 pigs per annum *providing* he has convenient buildings, water laid on and the manure carted away for him.

The ever-increasing pressure on food supplies by the rapidly increasing population will make it more than ever necessary to conserve those cereals that *are* suitable for human consumption *for* human consumption, and the pig must come to depend on less concentrated food.

APPENDIX "J"

THE PRINCIPLES OF FARM PLANNING

By

A. Storrar, Esq., Department of Agriculture

(Paragraph 149 of the Report)

The organization of a farm in a country such as Kenya can, in principle, follow methods similar to those used in the United Kingdom but where soil conservation works are necessary a completely different layout is required. If a farm were to be laid out on the square as in the United Kingdom it would be found that any soil conservation measures would be completely incompatible with this layout; the rectangular field shown on the accompanying map, covered by fields 2 and 6, and parts of 7, 3, 9 and 1, is a good example of such incompatibility.

It is considered essential, therefore, to commence planning with some sort of survey. For this purpose either an aerial survey, plane-table or grid survey is considered suitable but the least required would have to be fairly accurate form lines run out by lineal measurement and compass. As a general rule land under 4 per cent requires contours at a 5-ft. vertical interval; between 4 per cent and 8 per cent, 10-ft. intervals; and over 8 per cent, 20-ft. intervals, except on very steep land over 30 per cent where 50-ft. or even 100-ft. contours suffice.

After a survey has been completed the first important point with which to deal is drainage ways entering and leaving the farm, as these ensure that water is properly controlled on a district basis and that water discharging from a higher farm does not endanger the conservation works below. Such drainage ways are those marked (A) and (B) on the accompanying map. Where the district drainage ways are insufficient to meet the requirements of the farm for internal drainage, then further drainage ways may have to be found. The maximum distance for discharge of conservation works in any one direction is 500 yards, therefore drainage ways at a distance apart of not more than 1,000 yards are required. Wherever possible a natural depression should be used for this purpose and drainage way (C), commencing from field 13, is a good example. Instances arise where the use of a natural drainage way is not possible and then construction may have to be carried out such as in the continuation of drainage way (C), up to field 14. With this completed, one has the skeleton layout on which to build a farm plan.

Practical experience in this area has shown that land under 4 per cent, between 4 per cent and 8 per cent, between 8 per cent and 12 per cent and over 12 per cent, require different methods of protection, therefore the next step is to study the varying slopes which affect the conservation measures required. For example, field 3 has a slope under 4 per cent and conservation measures would be represented by a diversion ditch on the field boundary and contour cultivation within. Field 8 has a slope between 4 per cent and 8 per cent and this would require broad-base terraces for protection. On steeper farms it may be necessary to narrow-base terrace land between 8 per cent and 12 per cent for pyrethrum and fodder farming, particularly where the normal arable is scarce, but land over 12 per cent is considered unsuitable for any permanent type of cultivation. Any violent change in soil-type must also be indicated on the preliminary map; this is particularly important where porous and vlei soils are contiguous as they demand entirely different conservation measures and cropping. At this stage all land unsuitable for cultivation for reasons other than slope and soil should also be demarcated.

The farmer can then be presented with a map showing the total amount of arable and non-arable land on the farm, and the policy to be adopted is then discussed with him. A suitable type of rotation is worked out, and it is important to stress the fact that the number of fields should be a multiple of the number of years in the rotation so that annual crop acreages can be standardized and suitable machinery units can be chosen. For instance, on this farm the rotation is seven years and therefore there are 14 fields. At this point subdivision into fields can commence, and the field size should be a compromise between suitability for working the types of machine envisaged, suitability for grazing and that which the conformation of the land will allow. The tendency should be towards long narrow fields to allow ease of cultivation, but at the same time care must be taken not to increase unduly the cost of fencing. After the fields have been established, roads (green lines) and pipelines (yellow lines) should be indicated. Wherever possible water should be carried to every field but the general main lines should come first. For instance, on such a plan as this, an extension of the pipeline as far as field (1) would only be looked upon as a development

for the future. The availability of water should be considered when working out a re-seeding policy so that the fields lying near to the main line can be dealt with first wherever possible. Farm building should be sited at a central point unless it proves completely impractical to move any existing buildings, and the suggested site on this farm is at the join of fields 5, 6 and 7. Where permanent silos are envisaged it is important that they should be sited at various points throughout the farm in order to save cartage and facilitate feeding. Suitable sites on this farm would be at the junction of fields 10 and 11 and fields 2 and 3, as near to the road as possible.

When these matters have been decided then comes the problem of the manipulation of crops and grass within the fields. A general policy of re-seeding the oldest crop land and breaking up existing grassland is sound but not always practical. It is considered necessary to avoid a situation where all the crop will be at one end of the farm and the grassland at the other and so, when working out individual field rotation, this must be kept in mind. The amount of breaking and re-seeding must also be kept within the bounds of practice and it is imperative to relate it to the stock available. Also the suitability of certain crops to certain fields must be studied and it is often the case in this country that where land is becoming unsuitable for the growing of wheat or maize, due to over-cropping, good crops of oats can still be grown. At this stage portions of old fields which become part of grass fields in the new layout should be re-seeded right away under the next crop and conversely existing grassland broken into an arable field. It should be stated here, however, that where limited funds are available for fencing and piping, it may be necessary to run fields of grass together in the beginning to economize in this direction, but at no time should one lose sight of the eventual distribution of the crops within the fields. It should also be understood that it is most important that the previous economy of the farm should gradually be fused with the new, otherwise, where this is too rapid, financial hardships will be experienced.

When working out the rotation, careful attention should be paid to machinery requirements so that the farm does not become over-capitalized with a wide variety of machinery: for instance, maize and wheat have different machinery requirements and although it may be considered sound to alternate these two crops in a rotation, this principle would have to give way if the acreage of either was insufficient to justify the use of expensive machinery. In such a case one crop should be grown and this would offer an economic unit from the machinery angle.

It will be seen, therefore, that there are many considerations which influence the commencement and carrying out of a new rotation and due attention must be paid to each point when drawing up the final plan.

The next step is that of stocking the farm and it is normal in this country to find a farmer with a modest herd of cattle. For financial and veterinary reasons, it is often found necessary to build up the herd on a "natural increase" policy and the anticipated rate of increase of female stock is 40 per cent of the number of cows, less any culling which may be required, and at this stage only very old cows or bad breeders should be culled. The number of cattle on the farm has to be related to the grassland available, but also they will influence the re-seeding policy. As a generalization, a carrying capacity of about one and a half acres per beast is anticipated where grass leys are sown. The number of cattle also has to be associated with the production of fodder for the dry season and an average cow, producing in the region of two gallons of milk daily, will require in the dry weather in addition to rough grazing, 40 lb. of silage for 180 days, 10 lb. of hay for 120 days, or roughly, 3½ tons of silage and ½ ton of hay per annum. This can be allowed out of the grassland, from a silage and hay crop such as oats, or from both. The aim should be the production of fodder having a nutritive ratio on Henry & Morrison standards of 7 or 8 to 1. Where the number of breeding cows is extremely short it may pay to keep steers but the peculiarities of each farm must be studied, remembering that four years should be allowed for the fattening of any steers retained. It may be possible to provide concentrates on the farm for higher-producing cows and this should be calculated at 3½ lb. per gallon of an even mixture of, say, oats and beans. This in turn obviously affects the rotation on the farm but, once again, crops should be chosen that can be managed with existing machinery.

On a dairy farm, where there is no fresh milk trade, then skim milk appears as a by-product and consideration should be given to the establishment of a herd of pigs. A 500-gallon cow should provide sufficient skim milk, after allowing for the removal of cream and the feeding of a calf, for two fat pigs per annum and this allows 150 gallons of skim milk per pig. In turn each fat pig would require three and a half bags of grain (this includes an allowance for the sow) and provision should be made within the rotation for the production

of this grain wherever possible. Particular conditions may dictate the growing of, say, wheat as opposed to barley or maize, and provision should be made well in advance for buying in the necessary grain for pig feed.

Similar calculations would be required if the farmer decided to go into poultry economy, but whatever the case, every attempt should be made to make full use of the by-products of the farm.

It should be stated here that although the eventual aim of the farm is most important, even more important is the means of arriving at it. Each step for each year should be carefully considered, remembering in particular that grassland re-seeding and fodder production have to be one year ahead of stocking.

At this stage, expenditure of capital has to be carefully allocated so that one section of the farm does not suffer at the hands of the other and that there is no wastage. The total amount of piping, fencing, conservation work and buildings is known and, having worked out a rotation with a view to saving wherever possible, only the minimum development required each year should be dealt with annually.

Conservation works should take priority over all others, but here also economy should be kept in view, and any fields going back to grass immediately and those under grass, can be left until such time as they are broken up again. Piping should only be taken to the main parts of the farm and fencing erected as each field goes back to grass and where there are two grass fields together, it would be unnecessary to put in a dividing fence until such time as one of them comes up. Wherever possible, a farmer should start with movable pig houses and milking bales and, if necessary, such things as temporary troughs, so that maximum savings can be made with a view to directing capital available towards revenue-earning purposes such as the purchase of cows, sows, etc.

It has been suggested to several farmers that out of profits earned in one year, one-third should be used for capital development, one-third set aside against depreciation of machinery, etc., and the remainder held as a money reserve. Such a procedure is recommended so that if any unheralded slump occurs the farmer will be in a position to carry on.

Farming is both an art and a science but it is also a business and it should be fully understood that if farming is to be a success then it must be as carefully planned and calculated as any other commercial organization. Good planning and good farming make good business and within this memorandum the author has attempted to explain the principles which should be followed and are being executed with success to-day.

Nakuru.

21st November, 1952.

APPENDIX "K"

SUMMARY OF DEVELOPMENT AND RETURNS ON AN ACTUAL PLANNED FARM

By

A. Storrar, Esq., Department of Agriculture

(Paragraph 149 of the Report)

The physical planning of this farm was carried out on the basis of the principles described in Appendix "J".

This farm lies about 6,800 ft. above sea level, on a light volcanic soil and was very heavily cropped over the last 20 or 30 years. When the farm was taken over by the present owner all fields on the left of fence (a) were under crop, while the fields on the right of this line were resting under natural reversion. These fields which were resting were terraced in 1944 as the land was severely eroding under continuous cereal farming. It might be said that the fields on the left of fence (a) were very close to complete exhaustion while those on the right were recovering from over-cropping under a forest of Mexican Marigold.

In the past the farm was divided into five more or less equal sections and the only development was represented by about two miles of very poor fencing. There were no buildings, no piping, and the farm could only be described as derelict.

The present owner purchased the farm in 1947 and started off by buying a tractor, plough and harrow, building a house, a maize crib, a grain store and a dip, and the situation remained the same in 1948. In 1949, planning commenced and as it was late on in the year no improvement was possible except in the breaking up of field (1).

In 1950, the development commenced in earnest and the machinery unit was built up to two tractors with the necessary ancillary equipment, excepting a combine. Implement sheds and workshops were completed and one mile of pipe was laid through fields (12) and (10) and carried on to the house in anticipation of grass leys being undersown on that part of the farm. The drainage line next to the house was fenced and boundary fences were completed. Field (14) and also field (8) were fenced, as was the road proceeding from field (14) towards the house. During this year pit silos were also prepared.

In anticipation of increased yields from leys and attention to stock farming, a central dairy was built in 1951 to the specifications required for whole-milk. The machinery unit was completed during the year by buying a 6-ft. combine. Also, during 1951, fields (9) and (1) were fenced in anticipation of reseeding and the roadway from the farmstead out to field (1) was double fenced. Troughs were built where required.

During 1952, fields (11) and (13) were fenced in anticipation of reseeding and 20 good grade heifers were bought to fill up the cattle herd. It could be said at this point that the farm had reached a stage of good running order and that the majority of the development had been completed.

In the year 1953, fields (4) and (5) will be reseeded and these will be fenced off before the end of the year. The remainder of the fencing required on the farm, which amounts to very little, will be completed over the following two years when the contour fences on fields (2) and (7) are erected. During 1953 a further half mile of piping will be required and the balance of approximately half a mile will be laid by 1955 when development will be complete.

Production on the farm is shown on the attached sheet and the following remarks apply:—

1947.—In addition to much of the land being in an exhausted condition, the rainfall was heavy and hence the very low wheat yields.

1948.—This was the best wheat year ever on record in the area and the district average was over seven bags per acre, whereas maize was severely hit by drought in the early stages.

1949.—It is of interest here to note that field (1) (32 acres) was newly broken out of reverted grassland and yielded 420 bags out of a total of 1,598 bags from 268 acres. The maize crop was grown on worn-out land and yielded under four bags per acre.

1950.—This was another dry year and although the average yield of wheat was not high, the fact that the land on the left-hand side of the house yielded on the average under four bags per acre should be considered as assessing the value of the improvement.

Although the number of cows had risen from 23 in 1947 to 38 in 1950, the production of butterfat was still low and yielded only a little over 68 lb. per head for sale.

1951.—Maize was grown on second-year land after grass, field (4), and showed a good yield and field (1), which was in third-year wheat and undersown to grass, also yielded well. Of the 192 acres under wheat, field (13) proved incapable of yielding any crop at all and was

APPENDIX "L"

PROPOSALS FOR A FARM PLAN

By

R. J. Spooner, Esq., Department of Agriculture

(Paragraph 150 of the Report)

The following is a summary of the proposals for the development policy of your farm as determined by conversations between yourself, your manager and myself.

In an enclosing two plans; the first indicating the contour survey, and the second the layout of all development features.

General

The rainfall, soil condition, availability of water and topography indicate that the farm is suited to the development of a mixed farming system.

Your own natural inclinations are to concentrate mainly on cattle, eventually deriving from that source the greater part of the income of the farm. It is not your wish to introduce pigs on the farm to a large degree. As it is likely, however, that the outlet for skim milk possibly sold to neighbours and used for your horses on the home farm will not consume the full amount available, I think a small herd of pigs should be considered in order to develop the economic returns of the farm to their fullest extent.

The quality of the natural grass cover and the availability of suitable ley grasses supports the view that a preponderance of grass should play its part in the rotation. The sandiness of the soil and its tendency to erode under prolonged cultivation stipulates a limited arable phase in the rotation.

Soil Conservation

The general slope of the land is favourable to cultivation within the rotation and the type of protection required will conform to an easy system of working the land. The long grass ley will tend to stabilize the soil and will require no more, in my opinion, than diversion ditches at the top of each field.

There is no land which requires maintenance permanently under grass, on account of the steepness of the slope, but adjacent to the river is some 112 acres potentially highly productive which should be maintained, as it is low-lying, as pasture.

Certain features such as wind breaks and fence lines should conform to the diversion ditch layout and all cultivation should be in accordance with the soil conservation scheme.

The two main natural drainage ways lie between fields (16) to (20) and (12) to (14) and between fields (12) to (14) and (8) to (11). Further drainage ways will be constructed between fields (8) to (9) and (5) to (7) and between (5) to (6) and field (4).

Beyond the main depression demarcated on the map, one further drainage way between fields (28) to (30) and (25) to (27) will also need to be constructed. The total length of diversion ditches will be approximately $12\frac{1}{2}$ miles. Your own D4 tractor and No. 1 terracer will be able to undertake this at less cost to you than the Soil Conservation Service unit as the scheme progresses.

Road Layout

In considering the above it is important, so far as possible, to give access to every field with maximum ease and minimum cost. From the layout on the plan you can see that accessibility has been achieved at the expense of six miles of road. Here, again, your own tractor and terracer will effect considerable savings.

Fencing Layout

The total length of fencing to be undertaken is $25\frac{1}{4}$ miles for boundaries and paddocks, assuming that you single fence your internal roads. If you double fence them, there is an additional $5\frac{1}{2}$ miles to be constructed. You already have 2,000 fence posts on hand which should be sufficient for just under 20 miles, and some four miles of boundary fencing has already been put up. I would suggest, in buying your wire, that you make a bulk purchase, obtaining the best possible discount. You will notice that the fencing conforms again with the soil conservation plan.

Wind Breaks

These will play an important part in the efficient economy of the farm. As such, they will protect your grazing from the high winds during the dry weather months, thereby conserving the value of the grass. At the same time, they will provide shelter for your cattle in the heat of the day when much potential milk yield can be lost through high temperature effect.

In addition, up to ten per cent of your maintenance feed is wastefully expended when cattle are standing out in the open.

The wind breaks are indicated on the plan and fences should run down one side of them for half the full length through the belt and then down the other side for the remaining length of the field. This obtains maximum depth and therefore minimum temperature for the cattle.

The total requirement is 36,000 ft. of tree belt and should be a minimum of 11 to 12 trees wide on a 10 ft. \times 8 ft. planting distance. You should reckon, therefore, on providing up to 35,000 trees in due course, and it would be as well to start on your own nurseries to effect a saving in this respect. The belts should be graduated with, say, cypress, to windward and gum to leeward, thereby directing upward the flow of the wind as it strikes. You can reckon that a tree gives up to ten times its own height in protection.

Field Layout

Wherever possible the size of each field in the rotational area should be approximately 50 acres.

The total stock population will provide mobs of sufficient size efficiently to graze such fields initially, although it should be borne in mind that if more intensive grazing is required for maximum productivity, subdivision by electric fences may be necessary at a later stage.

The field unit of 50 acres provides an economic size for machinery and the layout gives you optimum width of field to conform with contour ploughing while preventing erosion.

Water Reticulation

Maximum accessibility of water from each field has been aimed at. It is important at your altitude and temperatures that stock should move as little as possible to water.

Troughs have been sited to provide water to as many fields as possible from one point and a total of 20 is involved.

The 2-in. pipe at the house site is delivering 800 gallons an hour to the 10,000-gallon reserve tank. This will be sufficient for all those fields north-east of the proposed access road.

As there is water within 100 ft. of the main road at your farm entrance, it will be cheapest to continue this over the road and feed to troughs in the 31-acre field No. (1).

In respect of water supplies for the 500 acres west of the main depression, I propose that a dam should be constructed on a site which was inspected recently. A 3-h.p. engine and pump will deliver a further 800 gallons an hour for the land in this area and for the house site proposed in the area of field (26). I would suggest that this house be sited below the highest contour in order to get sufficient head to feed the domestic supply. It could, therefore, be built on the road proposed between fields (25) and (26) and mid-way up it.

A reserve storage tank with a two-way tap will allow passage of water to the highest point above the dam. I have suggested duplicating the engine because you already have a similar model on Nzoia River, and although the initial expense may be a little higher, the saving eventually in maintenance and spares will, I think, be considerable.

Policy

Of the total acreage of the holding, approximately 1,500 acres is cultivable and could therefore come within the rotation. In addition, you will have approximately 112 acres of water meadows and 52 further acres of permanent pasture. There will be some further grazing in the main drainage ways which will not be ploughed.

As the emphasis of the development will be mainly on stock, there should be a preponderance of ley in the rotation. In addition to grazing, these leys will in time produce silage and hay. It is important to emphasize the value of mowing surplus grazing in efficient grassland control.

The arable will be devoted first to provision of stockfeed and any surplus will produce cash crops. It is my recommendation that the stockfeed takes the form of bulk maize silage and a high protein cereal legume silage. By spacing out the plantings of these crops the work will be correspondingly spread over a period. As you are already fully equipped for the making of silage, barring the building of permanent silos, this will not require any further major capital expenditure. The growing of silage is a safer means of producing cattle food in years of uncertain rainfall. In addition you could obtain greater quantities of satisfactory stockfood from smaller acreages, thereby releasing more fields for the production of cash crops.

A six-year rotation of which four years are devoted to grass and two to arable will provide you eventually with 1,000 acres of ley approximately and 500 acres of arable, with which you should support a dairy herd of 450 with 540 followers, of which in due course 180 will be surplus each year.

Stock

I understand that two pedigree Ayrshire bulls are due for delivery shortly, and that 60 high-grade Ayrshires due to calve in 1953 are also available. A further 250 head of Ayrshire in-calf heifers should be at the farm in 1954. On the basis of 40 per cent of your total calves per annum being available finally as heifers for the herd, I have worked out the stocking of the farm until 1958 when it reaches a consistent level. You can reckon that you will require approximately four tons of silage per adult cow to feed the dairy herd and followers on the basis of:—

- (1) Feeding for the third gallon during the rains; and maintenance, and two gallons for the dry weather.
- (2) Feeding of followers during the dry weather only.

I have based this on a dry-weather period of 150 days.

I understand that in the past you have been able to dispose of up to 100 gallons a day of skim milk to neighbouring pig producers. In due course your skim milk production will be considerably in excess of this, and it may not be possible to dispose of it all. I would, therefore, recommend for your consideration the maintenance of a small herd of pigs, on a basis of 15 sows producing 180 baconers a year. This will require approximately 720 bags of cereal for bacon production.

Cropping

You are able to produce high yields of maize silage but as an average I have taken the figure of ten tons per acre only. I would suggest that in the fourth year of the ley you break in June and plant to a cereal legume silage. This will give you 250 acres at five tons per acre towards your silage requirements.

In the following year you should grow 250 acres of maize.

In the second arable year you should grow 100 acres of maize silage, 100 acres of maize for grain and 50 acres of barley, assuming that you subscribe to the policy of pigs which I have suggested.

I enclose a table giving the total crop acreages year by year for two cycles of the rotation, together with the stock and fencing requirements. Each unit of 250 acres in the rotation I have grouped together in five fields, and would recommend that fields (1) to (3) and (14) and (15) come into ley in 1953, as they have been in cultivation for several years.

The fencing required for that group is stated in the table.

The next group to come into ley will be fields (16) to (20); the third group, fields (9) to (13); the fourth group, fields (4) to (8); the fifth group, fields (21) to (25), and the last group, fields (26) to (30).

The whole of your farm, therefore, by 1958, should be fenced and in the ley-arable rotation. Should you feel that you wish to speed up this development, I would suggest that you could do so, but would not recommend the ploughing of any large areas of veldt and maintenance of them under cropping for more than three years prior to their coming into their ley phase. As it is, the cropping table indicates the ploughing of your veldt acreages one year earlier than normal in order to obtain your high protein silage requirements in accordance with the increases of your stock. You will notice that the policy of ploughing up and returning to ley corresponds with the increases in your herd which are forecast. It is anticipated that the small differences in acreage from year to year will enable you to build up a reserve of silage against possible locust attack or severe failure of the rains. The cropping of each field year to year is shown in the attached table.

Buildings

With a central cow-house with an auto-recorder at your farmyard site, there should not be any difficulty in moving stock from your leys at any stage in the rotation to the buildings. I foresee that eventually you will require a cow-house with some 50 standings to cope with the maximum number of in-milk cows.

Should you pursue the pig policy, it is important that your pig buildings should be easily accessible from the dairy to economize in transport of your skim milk.

I would like to discuss the actual building layout with you later.

I would strongly recommend that you consider the eventual installation of power in the farmyard, thereby economizing in maintenance of engines, etc., for your farmyard machinery.

I would recommend that ten silos of approximately 200 tons each be dispersed through the farm at strategic points to enable stockfeed to be rationed to the herd followers without big demands on your transport, and to ensure minimum use of transport when the silage is made. The 200-ton silo of 20 ft. in height is the maximum convenient to which your Papec blower will elevate. I have sited the silos as follows: four at your yard, two at junction of fields (12), (13) and (18), two at fields (25), (26) and (28), and two at fields (5), (7) and (9).

Costs	£
Fencing—Taking into account material already on the farm	2,000
	£
Water Supply—4,500 ft. $\frac{3}{4}$ in. piping and 11,500 ft. $\frac{1}{2}$ in. piping	765
Pump and engine	200
Dam	800
Troughs (20)	300
	2,065
Wind Breaks—If all trees bought (35,000)	105
Silos—Ten at £100 each	1,000
Roads—Six miles at £8	50
Soil Conservation—12 $\frac{1}{2}$ miles at £6	75
	2,295
Total	£5,295

The costs of the roads and soil conservation are based on known S.C.S. charges for a D6 and No. 2 terracer. I have scaled these down and allowed for lower overheads.

It is important to bear in mind that the capital expenditure apart from buildings is to be spread over five years. Your 1953 expenditure will amount to approximately:—

	£
Fencing	600
Dam	800
Roads	30
Silos	600
Troughs	100
Fodder loader	120
Total	£2,250

Footnote.—While it is seldom good policy to determine one's future income, I would suggest that at present prices the following is obtainable:—

	£
Maize, 350 acres at eight bags per acre (2,300 bags approx.)	4,140
Barley, 300 bags surplus to requirement at malting prices	525
Pigs, 180 baconers at £12 each	2,160
Cream, at 450 gallons average of milk and 4 per cent butterfat	11,700
Surplus stock, 180 heifers at £25 each	4,500
Total	£23,025

or approximately £15 per acre per annum.

Eldoret,

16th December, 1952.

APPENDIX "M"

PROSPECTS OF INCREASE OF LIVESTOCK IN THE EUROPEAN AREAS

By

R. A. Hammond, Esq., O.B.E., Director of Veterinary Services

(Paragraph 187 of the Report)

The following memorandum sets out to express my views on the manner in which an increase of up to 250 per cent in the numbers of livestock on the European farms of the Colony might be achieved during the next ten years.

Cattle

Assuming that the A.3 Returns submitted by farmers to the Board of Agriculture are reasonably accurate—and no other statistics are available—we find there has been an increase of approximately 20 per cent in the number of cattle during the six-year period 1945–1951. This figure is, however, influenced by the fact that the numbers of work oxen declined from 102,000 in 1945 to 60,000 in 1951.

2. Disregarding, therefore, the existence of work oxen we find an increase in other cattle of 33 per cent during the six-year period—that is, from 429,000 to 570,000. If this rate of increase is maintained we can expect to achieve a cattle population of approximately 875,000 head by 1962, as compared with our target of, say, 1,250,000.

3. The rate of increase in breeding cows and down-calving heifers during the above period has been lower than among "total cattle", having attained only a total increase of 28 per cent. Any significant increase in the total number of home-bred cattle can therefore only be achieved by accelerating the expansion of the breeding herds of the Colony.

4. My calculations suggest that an annual introduction of not less than 15,000 heifers for five years, over and above the annual increase of the stock already on the farms, will be necessary if the target of one and a quarter million head is to be achieved by 1962. Despite the existence in the African areas of over 5,000,000 cattle, it is doubtful whether as many as 15,000 heifers a year could in fact be purchased in the African areas at prices which would permit of their resale to European farmers at an acceptable figure. My own assessment of the situation is that the annual importation of 5,000 heifers from the African areas might be capable of achievement, but it remains to be seen whether or not farmers would be prepared to accept, at what they would consider high prices, heifers drawn from areas other than the Northern Frontier where the much-favoured Boran stock can be obtained in limited numbers.

5. Despite the limitations on the numbers of female breeding stock which I consider could be secured, I suggest that the total number of cattle on the European farms could be rapidly increased by the purchase in the African areas of store bullocks which, after grazing for three years or so, could then be resold at a useful profit. I think it probable that at least 15,000 such stock could be bought annually at an average price of about £7 per head, and with a reasonable prospect of their value being roughly trebled within three years. The importation of 15,000 steers each year would serve to increase the total number of cattle on the farms by about 45,000, or roughly 8 per cent of the present figure, and this could be achieved within three or four years. No further increase in total numbers would attend the introduction of store bullocks after the fourth year, when sales would offset purchases.

6. The financing of any scheme for the importation of steers might well require Government assistance and I recommend a study of the procedure in Southern Rhodesia, under which stock bought in the African areas by the Cold Storage Commission are issued to farmers under terms which require no more than the payment of interest until such time as the stock are returned for slaughter by the Commission, when the farmer receives the current value of the cattle less their original valuation. I suggest that £100,000 worth of the 1953 Rehabilitation Loans might be made available for this purpose.

7. I suggest that the importation of heifers from the African areas should not be financed by Government except in so far as working capital for the initial purchase of the animals would be required. They would then be resold direct to farmers, many of whom would use their rehabilitation loans for the purpose.

8. Coming now to other directions in which capital would be required, it is necessary to mention that the increase in the number of cattle which is envisaged could not be achieved unless a substantial capital investment in fencing, dips and water supplies were to be undertaken. Assuming that farms already carrying cattle are understocked to the extent of 30 per cent, or alternatively that their carrying capacity could be increased by 30 per cent with the provision of additional fencing and water supplies, we must envisage additional capital expenditure on the existing cattle farms over and above that required for the development of farms at present unstocked.

9. I have given further thought to our discussion on the matter of subsidies for calves reared by dairy farmers, but except for the possibility of avoiding the slaughter of perhaps 700 to 1,000 *heifer* calves each year I hesitate to advocate any system of bonuses or subsidies for the rearing of bull calves on farms where they are at present slaughtered. The increasing use of calf starter meals and gruels will, I believe, lead to the retention on the farms of a number of bull calves at present being slaughtered, and the increasing use of beef bulls, and in particular Boran bulls, in herds where inferior cows are now being retained in dairy herds on understocked farms would of itself lead to the rearing of greater numbers of bull calves. In this connexion I should mention that four imported Hereford bulls are standing at the Artificial Insemination Station, and that subsidies to encourage the wider use of these bulls on culled dairy cows might prove very effective.

10. I suggest that sustained propaganda advocating the wider use of beef bulls on inferior dairy cows would be necessary.

Sheep

Sheep in the Colony have increased from 232,000 in 1945 to 294,000 in 1951, having reached a low point of 210,000 in 1947. I do not foresee any rapid expansion in the numbers of sheep nor am I able to suggest any means whereby the maintenance of sheep could be made more popular. The African areas of the Colony are able to supply the needs of the main consuming public and a subsidy on European-produced mutton and lamb would therefore hardly be justifiable. In any event, the current internal prices for mutton are so high that exportation of mutton or lamb could not be envisaged without a subsidy.

2. The wool market probably will, if it remains high, serve to attract more farmers to keeping small flocks of sheep. The larger established sheep runs appear to have reached the limit of their expansion and any increase in sheep numbers is to be looked for on the smaller farms.

3. It is only too apparent that one of the major limiting factors to the increase of sheep is their susceptibility to disease, and there is a wide field of investigation requiring to be followed up. Under present staffing conditions it is impossible to make available the services of a whole-time veterinary research officer for investigation of sheep diseases, and I believe that if a suitably qualified officer were to concentrate on this work, and none other, he might bring about a significant change in the present attitude to sheep farming.

Pigs

It is probable that plans for the construction of a factory to handle up to 4,000 pigs a week will shortly be approved. This output would be approximately three times the present figure. I believe that the existence of such a factory would provide an atmosphere of confidence hitherto lacking in the pig industry, and that provided prices continue to be attractive, and provided also that adequate supplies of feeding stuffs are available, a target of 200,000 pigs a year is capable of achievement within ten years. It should not be overlooked, however, that during this period there are likely to be years during which supplies of cereals are barely adequate for feeding the human population of the Colony, in which event a setback in the pig industry must be expected. I nevertheless express the view that the required expansion of the pig industry will come about without special measures, *provided always that the expansion of the dairy industry is fostered.*

Poultry

Here, again, an expansion is likely to come about of itself provided that prices are attractive, and provided also that the disease-control aspect is adequately covered by the Veterinary Department. The development of a specialist poultry advisory section of the department would meet the expressed wishes of the poultry industry.

General

Most farmers with whom I have discussed the possibility of a 250 per cent increase agree with my view that the country could well carry this additional number of livestock, but that such an increase could not be achieved within a ten-year period. The additional capital investment in terms of stock, fencing, water and buildings would be of the order of £15,000,000 or so, apart from the practical difficulties of augmenting the breeding herds rapidly enough. Nevertheless, that is no reason why we should not set our sights high—my own view is that we would have done very well if we achieved a cattle population of a million, instead of a million and a quarter, within ten years.

2. I therefore suggest that our objective should be the introduction into the European areas of as many cattle, male and female, as we can obtain from the African areas, devoting to this project any subsidies which might be available. It might be possible to justify such subsidies on the grounds that they would alleviate the overstocking problem in the African areas while at the same time overcoming the understocking of the European farms. The resale of heifers at, say, Sh. 30 per head below cost, and steers at Sh. 10 below cost, would greatly facilitate the whole transaction, which could be operated by the existing organization which has already been set up to organize the marketing of slaughter stock from the African areas.

3. Opinions will vary on the value as foundation stock of native Zebu heifers drawn from areas other than the Northern Frontier. We must not ignore the fact that the grade herds of the Colony have been built up on stock from Nyanza and Machakos to at least as great an extent as upon Boran cattle, and though cash returns from such heifers will be negligible they should each produce at least seven or eight half-bred calves, and would ultimately fetch at least the equivalent of their purchase price when sold for slaughter. If farmers cannot be persuaded to accept native heifers other than Boran, I can see no prospect of attaining our target.

4. I do not propose here to discuss the inadequacies of the existing establishment of the Veterinary Department in relation to a greatly expanded livestock population on the farms. If a rapid expansion can be brought about, the greater concentration of stock and the increased investment of capital can be expected to attract to the Colony increasing numbers of private veterinary surgeons. The existing establishment of veterinary officers can handle the scheduled diseases easily enough, regardless of any increase in the numbers of livestock, but it is the breeding diseases, the problems of calf-rearing, and the sheep pneumonias which call for the closer veterinary cover which can best be provided by independent veterinary surgeons.

APPENDIX "N"

HANDLING AND STORAGE OF THE COLONY'S WHEAT

By

F. T. Holden, Esq., Messrs. Unga, Ltd.

(Paragraph 216 of the Report)

1. There can be little doubt that at long term Kenya's wheat crop will be handled in bulk from the field to the mill. Any present attempt to rationalize the movement and storage of wheat should, therefore, be planned on this assumption. To-day, and for some years to come, the problem must be governed by the need to avoid peak movements by rail in the early months of the year. It therefore follows that if farms are to be cleared quickly, wheat must be held at intermediate points for regulated despatch by rail later in the season.

2. If the basic assumption is correct, that wheat will in time be handled in bulk, it would seem that any attempt to conceive a solution to present problems should be based on the early provision of terminal storage in bulk at the principal milling centres. At present these are Nairobi and Eldoret but Nakuru should be included as a future milling centre of importance.

3. The capital cost of any scheme which achieves early farm clearance will be large and neither the industry nor the Government is in a position at the present time to face capital expenditure which can be avoided or postponed. In these circumstances the most acceptable plan will be that which keeps total cost to a minimum. Unfortunately such a plan would exclude bulk storage; therefore, since some bulk storage is basic to any sound solution, this element must be kept to a minimum.

4. Two factors influence the total capital cost of a comprehensive storage scheme; the first is the date to which it is planned to hold milling requirements covered with wheat; the earliest date which can be taken with any degree of safety is 31st December. The second is the date by which farms are to be cleared of the season's harvest. The incidence of farm storage allowances from 1st May suggest that farms should be cleared by 30th April; this in effect implies clearing the main area four months after the crop comes off, which is reasonable. In some areas wheat may be more than five or six months old by this date; in others, three months or less. If farm clearance begins as soon as the grain is dry enough for delivery, early wheat will be moved well within four months of harvest. In the case of late wheat, coming off in January/February, there is a case for delivery during May. Such areas, however, are in the highest altitudes which are most susceptible to road closure during May. This wheat could not be moved with certainty before June. Whether it should be so left might depend in any season on the amount of grain it had been possible to move from the season's harvest before 31st December, as the following paragraph will show.

5. On the assumption that each crop must cover mill requirements to the end of the calendar year, that farms must be cleared by 30th April and that the load on the Railway must not exceed one month's consumption in any of the months of peak load, i.e. January to May, the provision of bulk storage at mills and intermediate storage between farm and rail is automatically determined by the following table:—

(One unit = one month's consumption)

	OPENING STOCK		DELIVERIES FROM FARMS		Despatches from intermediate storage to Mills	Mill Usage	Total Closing Stocks
	At Mills	In intermediate storage	To Mills	To intermediate storage			
November	2	—	$\frac{1}{2}$	—	—	1	$1\frac{1}{2}$
December	$1\frac{1}{2}$	—	1	—	—	1	$1\frac{1}{2}$
January ..	$1\frac{1}{2}$	—	1	—	—	1	$1\frac{1}{2}$
February..	$1\frac{1}{2}$	—	1	2	—	1	$3\frac{1}{2}$
March ..	$1\frac{1}{2}$	2	1	2	—	1	$5\frac{1}{2}$
April ..	$1\frac{1}{2}$	4	1	2	—	1	$7\frac{1}{2}$
May ..	$1\frac{1}{2}$	6	—	—	1	1	$6\frac{1}{2}$
June ..	$1\frac{1}{2}$	5	$\frac{1}{2}$	—	1	1	6
July ..	2	4	—	—	1	1	5
August ..	2	3	—	—	1	1	4
September ..	2	2	—	—	1	1	3
October ..	2	1	—	—	1	1	2
TOTAL ..	$20\frac{1}{2}$	27					$47\frac{1}{2}$
Av. Months	1.7	2.25					3.95
Per cent							3.95
Usage ..	85.5%	37.5%					49.5%

The extent to which it might be possible to accelerate new crop movement before December would increase the "efficiency" factor for bulk storage utilization at mills and reduce the "peak" movement of wheat by rail in June. It would also govern the extent to which it might be necessary to hold the late wheat on farms until June. If two months' wheat (two units) could be moved to mills before 31st December, the bulk storage factor would rise to 100 per cent and the rail movement in June would fall to one month's wheat (one unit). (It should be explained here that since some wheat moves direct by road from farms to mill one unit in the table does not imply a rail movement equal to one-twelfth of the season's consumption.)

6. It will be seen that mill storage should provide for two months' consumption and intermediate storage for six; the balance of four months' wheat moves direct from farms to mills during the four months January to April. (The possible movement of half a month's wheat being delayed till June is purely incidental.) From the point of view of the Railway, the plan is as nearly ideal as can be devised; whether this is true of the farmer is another question. Can the farmer deliver nine months' wheat in three months? In some cases (the late areas) this would mean his whole crop. It is thought that (weather permitting) the job can be done.

7. The facts postulated at paragraph 5 have been shown to require the provision of intermediate storage for half the year's requirements. Most of this storage will have to be sited at Railway stations; some should be adjacent to mills, e.g. Eldoret; some might be justified at an intermediate point, e.g. the Kinangop, for subsequent transfer to Naivasha. For obvious reasons intermediate storage should be planned for a minimum number of centres; it is desirable, too, to restrict these centres to the high altitudes where infestation is least. These factors conflict with the need to maintain regularity in the composition of millers' blends. They also prevent the avoidance of short-haul movements by rail to intermediate storage, or to mills for use during the November/April period. These elements can only be regarded as a measure of the compromise that is likely to be inherent in the best of plans.

8. To translate the plan into terms related to the Colony's production it is necessary to assume a crop for sale reasonably related to the present trend. It is thought that for purposes of illustration a fair figure may be taken to be 1,350,000 sacks for sale (say approximately one and a half million sacks gross). The pattern of distribution is likely to be something like this:—

Nairobi "Supply" Areas (all areas except Uasin Gishu and Trans Nzoia)

	<i>Sacks p.a.</i>	<i>Sacks p.a.</i>
To Nairobi	464,500	
To Nakuru	260,000	
To other destinations	85,000	
	—	810,000

Eldoret "Supply" Areas (Uasin Gishu and Trans Nzoia)

To Eldoret	367,000	
To Nairobi	153,000	
To other destinations	20,000	
	—	540,000
Total		1,350,000

9. These figures result in the following quantities required to provide two months' storage at mills:—

<i>Nairobi</i>	102,917	of which 9,000 tons should be in bulk.
<i>Nakuru</i>	43,333	of which 3,850 tons should be in bulk.
<i>Eldoret</i>	61,167	of which 5,300 tons should be in bulk.
<i>Other destinations</i>	17,583	—
<i>Total Bulk Storage</i> ...	<u>18,150</u>	tons

10. The pattern stated at paragraph 8 calls for intermediate storage for six months' supplies, as follows:—

<i>For Nairobi</i>	308,750	of which 153,000	
		$\frac{153,000}{2} = 76,500$	from Eldoret areas.
<i>For Nakuru</i>	130,000		
<i>For Eldoret</i>	183,500		
<i>For other destinations</i> ...	44,834		

Note.—The figure for other destinations has been reduced to allow for the fact that wheat supplied to Arusha should be delivered during the period January/June.

11. The figures at paragraph 9 resolve themselves into the following requirements in the two main "supply" areas:—

<i>Nairobi "Supply" Areas</i>							<i>Sacks</i>
For delivery to Nairobi	...	...	...	...	...	...	232,250
For delivery to Nakuru	...	...	...	...	...	...	130,000
For delivery to other destinations	...	...	...	...	...	...	34,834
Total							397,084

<i>Eldoret "Supply" Areas</i>							<i>Sacks</i>
For delivery to Eldoret	...	...	...	...	...	...	183,500
For deliver to Nairobi	...	...	...	...	...	...	76,500
For delivery to other destinations	...	...	...	...	...	...	10,000
Total							270,000

The distribution of this intermediate storage should be planned to minimize the number of storage points; something on the following lines would be indicated:—

<i>Nairobi "Supply" Areas</i>							<i>Sacks</i>	<i>Sacks</i>
Molo	...	...	...	...	...	50,000	
Njoro	...	...	...	...	...	50,000	
Nakuru (for Nakuru)	...	...	...	...	...	100,000	
Ol Kalou	...	...	...	...	...	100,000	
Naivasha	...	...	...	...	...	100,000	
							400,000	
<i>Eldoret "Supply" Areas</i>							<i>Sacks</i>	<i>Sacks</i>
Kitale	...	...	...	...	...	50,000	
Eldoret (for Eldoret)	...	...	...	...	...	170,000	
Kipkabus (?)	...	...	...	...	...	50,000	
							270,000	

12. The wisdom of storing 50,000 sacks at Kitale is open to question because Kitale is 1,000 ft. lower than Eldoret and a difficult area for weevil. The only justification is to avoid moving this quantity by rail during January/April. It would be wiser to reduce the quantity to permit final clearance to Eldoret by 30th June (say, to 20,000 sacks). There is also a strong case for the storage of 30,000 sacks at some other station in the Burnt Forest area. This would give:—

							<i>Sacks</i>	<i>Sacks</i>
Kitale	...	...	...	...	...	20,000	
Eldoret	...	...	...	...	...	170,000	
Burnt Forest Area	...	...	...	...	...	80,000	
							270,000	

13. Such a plan involves "railhead" storage at six or seven stations (excluding Nakuru and Eldoret where the storage does not call for subsequent rail movement). It also entails clearing all other stations at which wheat comes to rail, direct to mills by 30th April. If movement is begun as soon as new crop comes to harvest the railway should have handled something more than 50 per cent of the total wheat movement for the year, without the load it is called upon to handle exceeding one month's consumption in any month. This discussion has omitted reference to possible export movements of wheat, for two reasons. Firstly, they are difficult to forecast and, secondly, it is considered that the right policy from the point of view of the sound development of the milling industry is to permit such surpluses to be milled and sold as flour. This policy would integrate the handling of surpluses into the general movement for the season and avoid the creation of peak demands for wheat movement by rail.

14. The problem of maintaining uniform blends of wheat cannot be neglected in arriving at a satisfactory solution of this problem of early farm clearance and the storage of wheat. This may require movements *by rail* to intermediate storage in difficult seasons. The pattern of wheat production is largely fortuitous (almost kaleidoscopic) and it is doubtful whether any attempts which may have to be made in the future to control this pattern in the general

interests of the industry can hope to avoid seasonal complications over blending needs. Nevertheless, the problem of the orderly handling of the crop must be solved in the most practical way that can be devised; perfection is not attainable.

15. Turning to economic aspects, the probable cost of some 18,000 tons of bulk storage is of the order of £540,000. To provide to store 670,000 sacks in intermediate storage will involve at least as many pounds sterling. This gives an indicative total of some £1,200,000 without ancillary expenditure for staff housing, handling equipment, etc., at intermediate stores.

16. No case can be seen for aiming directly at bulk handling methods for farm clearance and intermediate storage at the present stage of development of the industry. To do so is to put the whole problem beyond the Colony's present means. This is not to say that modest steps cannot be taken to begin to shape a trend that will contribute at long term to economy in labour, materials and cost.

Delivery from intermediate storage to rail can be put on to a bulk basis from the beginning since the main receiving mills will be equipped to receive in bulk. Facilities can be developed progressively at railway stations scheduled for seasonal clearance direct to mills, to encourage and assist farms to load in bulk. Given these facilities, the farmer can begin to develop methods for handling, storing and transporting his crop in bulk. Such a plan discriminates against farmers served by stations which would be intermediate storage points, unless buildings are designed initially for ready conversion to use as granaries in which grain would be stored in bulk on the floor. In addition to suitably designed godowns, capable of conversion to "granary" storage, provision would have to be planned for the future installation of equipment for weighing wheat in bulk on receipt and prior to delivery, together with the necessary simple handling plant for reception and delivery. By limiting the choice of intermediate storage points to areas in which the incidence of insect pests of grain is low, and by restricting the number of such points (consistent with the overriding need to keep mills provided with satisfactory blends) a reasonably efficient set-up could be achieved, consistent with a minimum outlay in capital and recurrent expenditure.

17. The ultimate aim should be to replace intermediate storage at Nakuru and Eldoret with bulk storage. The initial bulk installations should be planned to this end. On the figures used in this note bulk storage tonnages would thus be raised at Nakuru from 3,850 tons to 12,800 and at Eldoret from 5,300 tons to 20,450. Such provision does not imply the ultimate redundancy of initial intermediate storage in shed (or granary) form, since it is reasonable to hope that the Colony has not reached its ultimate level of wheat production.

18. As regards Nairobi, the plan should be to provide additional storage as the need arises by extending the bulk storage there. This would raise the load on the Railway in the period ending April, but by the time this happens it is probable that the Railway will be equipped to deal with some peaking.

19. The plan proposed in this note is intended to provide the cheapest and most efficient short- or medium-term solution to a difficult problem. No extension of initial intermediate storage is visualized: rather its future integration in a system of bulk handling and storage from farm to mill.

20. It is worth noting that any railhead storage that may already exist at stations other than those suggested in paragraphs 11 and 12 (e.g. Thomson's Falls, Ol Joro Orok) would reduce the total of 670,000 sacks intermediate storage proposed in this note. Unfortunately such contributions will be almost negligible.

21. Mention was made at paragraph 7 of the possible provision of intermediate storage on the Kinangop, for subsequent delivery to Naivasha for railing to Nairobi. This suggestion would overcome the storage of a large tonnage of wheat at Naivasha station in a climate most unsuited to the prolonged storage of wheat in sacks (or in a granary) over the second half of the season. The break in journey between farm and railhead is undesirable but the need to preserve the grain in good condition outweighs the disadvantage.

22. This note has confined itself to suggesting the main outline of a plan which is thought to offer the basis of as sound a scheme as can be devised (having regard to capital cost), to put the handling of the wheat crop onto lines which will lead over a period of years to the efficient transfer of the harvest in "bulk" from the field to the mill.

Nairobi,

17th November, 1952.

APPENDIX "O"**BIBLIOGRAPHY**

- (1) Report of an Inquiry into the 1951 Maize and Wheat Prices and to ascertain the basis for the calculation annually of a fair price to the producer for maize, wheat, oats and barley, and other farm products, the prices of which are controlled by the Government.—(1952) L. G. Troup, O.B.E.
- (2) East African Agriculture.—(1950) J. K. Matheson & E. W. Bovill.
- (3) To Farm in Kenya.—(1952) European Agricultural Settlement Board.
- (4) Settlement Committee Report.—(1939) Government of Kenya.
- (5) Colonial Annual Reports.—Kenya.
- (6) Report of the Agricultural Commission.— (1929) Government of Kenya.
- (7) Interim Report of the Agricultural Indebtedness Committee.—(1936) Government of Kenya.
- (8) Report of the Development Committee.—(1946) Government of Kenya.
- (9) Report of the Planning Committee.—(1951) Government of Kenya.
- (10) Report of the Board under the Chairmanship of Sir William Ibbotson on the Marketing of Maize and Other Produce.—(1952) Government of Kenya.

SUB-APPENDIX V (Farming Types and Zones)
Production Figures of Production Committee Areas as Indicated by Numerals on Zonal Map

Zone No.	PRODUCTION SUB-COMMITTEE	Cereals, Wheat, Barley, Oats	Maize	Sunflower	Pyrethrum	Wattle	Tea	Coffee	Cattle	Pigs (Breeding sows only)	Sheep (Breeding ewes only)
		Acres	Acres	Acres	Acres	Acres	Acres	Acres	Head	Head	Head
1	Trans Nzoia NNW	8,890	12,930	1,540	—	—	—	250	12,680	160	2,040
2	NW	5,550	9,270	1,380	—	—	200	1,500	11,980	110	1,660
3	NE	190	10,890	2,320	—	500	—	500	20,690	270	2,140
4	WSW	550	10,300	2,240	350	100	—	250	14,520	330	2,440
5	SSW	40	9,400	2,090	—	750	—	500	9,680	230	1,750
6	SE	1,240	7,350	2,930	—	1,250	—	500	13,320	320	1,310
7	Turbo	290	6,230	2,750	—	12,500	—	500	10,680	210	1,610
8	Soy/Hoey's Bridge	4,280	5,140	1,380	—	16,500	—	—	9,800	160	1,580
9	Moiben	20,950	2,560	330	—	500	—	—	6,720	290	1,220
10	Eldoret	30,460	3,650	260	—	10,000	—	—	10,910	380	3,500
11	Elgeyo Border	27,660	3,160	50	—	10,000	—	—	9,630	220	3,220
12	Nandi	—	1,530	150	250	—	3,000	1,000	2,670	20	40
13	Kipkabus	16,060	2,320	150	2,250	12,500	—	—	14,070	340	3,550
14	Lumbwa/Songhor	1,380	5,370	330	500	250	—	3,750	24,660	440	800
15	Londiani	9,150	670	—	1,000	—	—	—	5,870	130	60
16	Eldama Ravine	2,910	1,660	300	250	—	—	250	5,360	140	2,620
17	Rongai	13,150	12,470	650	1,000	—	—	—	18,620	680	2,050
18	Sotik	70	3,280	440	—	750	1,500	250	23,790	120	470
19	Kericho	—	90	—	—	—	14,000	—	2,090	—	10
20	Mau/Molo	18,200	530	30	2,250	—	—	—	22,780	360	26,960
21	Njoro	19,050	3,930	200	—	500	—	—	16,580	150	1,940
22	Solai	3,080	6,330	950	—	250	—	1,500	12,200	250	580
23	Subukia	2,030	5,050	340	1,750	—	—	250	12,880	460	1,000
24	Thomson's Falls	4,740	90	—	500	—	—	—	4,380	50	120
25	Oi Joro Orok	4,780	40	—	1,500	—	—	—	4,200	60	410
26	Mereroni	4,220	980	140	750	—	—	—	10,280	150	470
27	Oi Kalou	13,000	30	10	500	250	—	—	6,130	160	660
28	Marnanet	5,400	850	40	—	—	—	—	7,980	110	650

SUB-APPENDIX TO APPENDIX V (Farming Types and Zones)—(Contd.)
Production Figures of Production Committee Areas as Indicated by Numerals on Zonal Map

Zone No.	PRODUCTION SUB-COMMITTEE	Cereals, Wheat, Barley, Oats	Maize	Sunflower	Pyrethrum	Wattle	Tea	Coffee	Cattle	Pigs (Breeding sows only)	Sheep (Breeding ewes only)
		<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>	<i>Head</i>	<i>Head</i>	<i>Head</i>
29	Rumuruti	—	—	—	—	—	—	—	48,640	—	1,950
30	Leshau	6,000	120	—	—	—	—	—	9,870	60	710
31	Nanyuki	2,050	940	10	750	—	—	—	55,370	300	33,340
32	Aberdares	7,760	40	—	250	—	—	—	10,860	130	6,640
33	Moyo Ridge	650	20	—	750	—	—	—	7,560	40	3,430
34	Naro Moru	1,030	40	—	—	—	—	—	14,920	190	3,620
35	Elmenteita	3,080	330	60	—	—	—	—	20,710	140	3,830
36	Lower Gilgil	4,460	60	—	—	—	—	—	17,410	20	1,890
37	Upper Gilgil	6,220	20	10	750	250	—	—	5,080	100	470
38	Oi Bolossat	15,280	100	10	500	—	—	—	8,600	140	2,060
39	Nyeri	50	130	—	—	—	—	1,750	5,260	70	770
40	Naivasha	1,480	330	—	500	—	—	—	27,250	150	9,420
41	N. Kinangop	25,000	30	10	3,000	—	—	—	7,780	140	3,730
42	S. Kinangop	10,060	60	—	1,000	—	—	—	6,860	120	2,510
43	Nairobi	110	10	10	250	3,000	1,000	14,250	17,830	370	960
44	Thika	—	230	160	—	750	—	26,750	21,930	80	770
45	Machakos	90	1,760	10	—	—	—	250	24,180	10	3,180
	TOTAL	300,640	130,320	21,280	20,600	70,600	19,700	54,000	635,260	8,360	144,140



