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Dear Mr. Rogers:

There are two interterritorial organizations in East Africa doing research in the broad field of agriculture, forestry, and animal husbandry, the East African Agriculture and Forestry Research Organization (EAAFRO) and the East African Veterinary Research Organization (EAVRO). These organizations have close cooperative arrangements, share a single large location at Muguga near Nairobi, and have a number of services such as library and workshops in common, including a joint Animal Industry Division.

Before describing them individually, mention should be made of their administrative and advisory superstructure. EAAFRO and EAVRO, as research organizations, are grouped under the Administrator of the High Commission as executive, and answer administratively to him. EAAFRO and EAVRO (and the fishery research schemes as well) now fall under the same advisory or "governing" body, the Research Organisations Committee. This Committee is in effect a kind of Natural Resources Governing Body covering approximately the same kind of subjects as are included in the portfolio of the Member for Agriculture and Natural Resources in the Kenya and Tanganyika Legislative Councils. Its membership consists of two each from Kenya, Tanganyika, Uganda, the High Commission and the Colonial Office, and one from Zanzibar, plus a Chairman. Experience will show whether the Committee is able to exercise its functions over several research organizations, or whether a separate governing body will ultimately be required for each.

The Research Organisations Committee was evolved out of the Standing Research Committee of the East African Advisory Council on Agriculture, Animal Industry and Forestry, the original advisory body for EAAFRO and EAVRO.* In 1950 the Standing Research Committee had to make executive decisions on

* The East African Advisory Council on Agriculture, Animal Industry and Forestry was set up to advise the territorial governments and the High Commission regarding agricultural, animal and forestry research policy and implementation. The Administrator was Chairman; other members included the territorial Directors of Agriculture and Veterinary Services and Conservators of Forests, the Directors of EAAFRO and EAVRO, and representatives of non-government research agencies. Six unofficial seats also were provided for, three to be nominated by the High Commission and one by each of the three East African territories. The Council had the task of advising priorities for central research, and of advising in matters concerned with the coordination of the several research programs of the three territories and the central organizations. The unofficial members were intended to help detect duplications in research efforts and, importantly, to represent the farming interests.

matters of finance and staff related to American aid under ECA and faced difficulties because of the purely advisory nature of the Council. The Standing Research Committee was therefore reformed in 1951 as the Research Organisations Committee, a body entirely independent of the Advisory Council and with a smaller membership than that of the Standing Research Committee. By the end of 1953 the Council had been abolished and the Research Organisations Committee was developing into the "governing" body.

The place of the old East African Advisory Council is to be taken by ad hoc Conferences called from time to time to discuss some specific general problem that might lend itself to this procedure.

In the case of EAAFRO there are two other sets of committees. The first consists of the Technical Coordinating Committees or T.C.C.'s. There is one for Forestry and one for Agriculture, whose membership is respectively the three Chief Conservators (of the mainland territories) and the four Directors of Agriculture (four, because Zanzibar is included in this committee). The Director, EAAFRO, is a member of each T.C.C. The High Commission provides a Chairman and a Secretary. The job of the T.C.C. is to discuss territorial and interterritorial research programs, to arrange for coordination, and generally to discuss common problems. For Animal Industry, the Agricultural T.C.C. and the Veterinary T.C.C. meet jointly. The reports and minutes of the T.C.C.'s go to the new Governing Body and also to the members of the territorial Departments. Below the T.C.C.'s are a variable number of so-called Specialist Committees, each dealing with one special subject, e.g. Insecticides, Plant Breeding, etc. Their membership consists of the appropriate research officers of EAAFRO and of the Departments, and these Committees report to the appropriate T.C.C.¹

The East African Agriculture and Forestry Research Organization

The need for a wider and more intense understanding of agricultural problems and potentialities in East Africa is too well known to require elaboration. Agriculture is the one outstanding industry; the principal sustenance and wealth of the population, indigenous and immigrant, comes from the surface soil. The climate, variant both in seasonal contrast and in its wide rainfall differences from area to area, has created a complex pattern of soil-plant interactions, the scientific study of which has been going on for only a few years. The need for agricultural research - of the practical sort to cope with immediate problems of local native overpopulation and damaging misuse of the smaller watered areas, and also of the basic sort to eliminate the present ignorance of soil potentialities - is pressing. The lack of similarity with temperate climate soils and the wide variation even from other tropical areas decreases the value of experience obtained elsewhere, making the task of EAAFRO - "the maintenance and enhancement of the productivity of agriculture including forestry" - difficult as well as important.

Centralized East African agricultural research dates formally from the year 1927, when the East African Agricultural Research Institute came into being at the site of the Amani Institute in Tanganyika. Amani Institute had been founded by the Germans in 1902, and the persisting disuse under British Mandate of its scientific facilities, assessed by the Ormsby Gore Report as very considerable, was deplored in this report in 1925. Though under the Germans it had been "a tropical scientific institute superior to anything in the British colonies and the protectorates and comparable with Fusa in India or the Dutch establishment at Buitenzorg in Java" its 250 cultivated acres and its laboratory equipment and specimen collections remained largely unexploited for some years after World War I.*

The Germans by 1914, according to the Report, had utilized Amani for research in plant breeding, analysis of soils and fertilizer performance, and study of plants indigenous to German East Africa. A journal was issued periodically and lectures were given to nearby agriculturalists. Forestry research was asserted to have been usefully begun. During the first year and a half of World War I, in support of the German forces, supplies were prepared under the supervision of the Institute, including - according to the Ormsby Gore Report - more than token deliveries of such variant items as foodstuffs, spices, foot powder, medicines, rubber products, soap, oils and candles, and other goods including 15,200 bottles of "whiskey." The early German achievement, though exaggerated in the Report, and the delayed British resumption hinted a greater ease with which a metropolitan power with few colonial commitments can concentrate energies and effect development. Also indicated was the strong emphasis on scientific research inside early 20th century Germany, as well as the instability and indecision of first a military occupation and later a League of Nations Mandate with its unconfident tenure.

The period of disuse was not allowed to transpire unprotected. The early British administration in German East Africa handed the Institute over to its agricultural department. In 1920 a skeleton staff of three was assigned, a Director, an Assistant, and a gardener, and it was recommended in a report of Sir David Frain, formerly of the Royal Botanic Gardens, that

* The Ormsby Gore Report, n. 36.

the Institute should not be confined under a single territorial agricultural department. It should be administratively answerable to the Governor of Tanganyika but with its research serving centrally the areas of Tanganyika, Uganda, Nyasaland, Kenya, and Zanzibar. An endorsement of these views by the Secretary of State in a despatch of August 11, 1920 was addressed to the Governors of the listed territories, requesting a joint contribution of £10,000.* The scheme was clearly rejected in March 1922 after a conference held at Amani the previous December because of the refusals of Kenya and Nyasaland to contribute the amounts allotted. However, the idea of a central research agency now was definitely underway and, despite the indication that Nyasaland felt disinclined for reasons of distance from joint research associations with headquarters in eastern Tanganyika, it slowly moved on.

In line with the recommendations of the Ormsby Gore Commission, Mr. Thomas offered two yearly grants of £1,000 by the Colonial Research Committee, suggesting in a letter to the treasury that Tanganyika provide £5,000 in its 1924-25 estimates and stating that he would, with treasury concurrence, invite the Governor of Uganda and the High Commissioner for Zanzibar to share equally a further contribution of £2,000. In the 1925-26 Tanganyika estimates funds of £4,000 towards capital, and £2,000 towards annual expenditures were provided. Though through the years leading up to 1927 the Institute remained under the agricultural department of a single territory, these expenditures enabled it to undertake a limited amount of research benefiting East Africa entire. The Hilton Young Commission, though dealing chiefly - and, as later proved, unrealistically - with political affairs, made mention of continuing work in agricultural research at Amani.

In 1927 the East African Agricultural Research Institute was set up on an interterritorial basis, and continued with a small staff, doing notable work, including Dr. H.H. Storey's work on virus diseases of plants. Lord Hailey's survey completed in 1937 plead for further cooperative research in Africa, and with the further development of the three territories it became recognized that the Institute would need to be relocated, at a point more central among the contributive territories, better to serve the growing research needs of the principal industry of East Africa. Much of the delay was attributable to the disruption of World War I and to world wide economic depression some eleven years later.

After two East African conferences in 1946 and 1947 attended by delegates from Great Britain as well as from the East African territories, an agreed plan was made in 1947 to shift to a location near Nairobi and to enlarge the staff of nine scientists and eight other European employees to thirty-five scientists with a commensurate increase of non-scientist staff during the period 1948-1952 inclusive. Colonial Development and Welfare Funds were to cover the initial or "phase I" capital needs, estimated at £285,000 and later increased to £296,000. Fifty percent of the recurrent costs were also subscribed, the remaining 50 percent to come from the East African governments. This five year or phase I period was to be followed by a phase 2 envisaging a further buildup by the year 1956 to a strength of forty-five scientists. The further growth would call for an increase in housing and in laboratory

* Tanganyika £3,000, Kenya £2,500, Uganda £2,000, Zanzibar £1,500, Nyasaland £1,000

facilities, but the original long-range concept allowed planning the administrative offices, library, gas generating equipment and several other facilities on a scale sufficient to accommodate staff augmentations during phase 2.

The Kenya Government provided the new central site, an area of some 1,600 acres fifteen miles from Nairobi bordering the Muguga forest. In November 1949 the principal building program was begun.

In the year 1950 the Workshop, the central store, and the housing for the gas generating plant were completed, as were three laboratory blocks totalling 13,000 square feet of floor space. The library building was almost ready for installation of shelving as was the block of administrative offices, which also provide office space for the East African Veterinary Research Organization, the International Bureau of Epizootic Diseases, and the Animal Husbandry Division. Twenty European houses, forty-six African quarters, and four Asian quarters were also completed during this year.

Along with this progress in building at the new site, the shift of research operations from Amani - the area which had been optimistically deemed so ideal for research by the Ormsby Gore Commission, but whose remote location now condemned it - was underway. The accounts section was moved to Muguga, the Herbarium to its new home in the grounds of the Coryndon Museum, Nairobi. The land annex of the Kamkoro Estate was handed over from Amani Institute to the control of the Tanganyika Government and the maintenance of the Amani-Muhesa road was taken over by the Tanganyika Public Works Department. The buildings of the Institute at Amani were readied for turnover to the East African Malaria Unit, for maintenance, at the beginning of 1951.

In 1951 the heavy task of shifting movables and staff from Amani to Muguga began. The hilly road between Amani and Muhesa railway station made lorry shuttles slow and loading had to be light. At the other end - a testimony to the constant strain of an overloaded regional transport system - the Railway was able to provide only one truck to haul between Muhesa and Kikuyu. The library books were moved and installed on the shelves of the new library by November 30, and by the end of the year the transfer from Amani was nearly completed. The hoped-for augmentation of plant through the arrival of new equipment was held up by delays in delivery of long ordered equipment from United Kingdom. The glass house and gas generator equipment items were particular frustrations, the latter requiring a total of three years from initial order to final assembly and operation. On 26 May of 1951 the Station was officially opened by the Secretary of State for the Colonies. Even with its limitations the installations at Muguga represented a new scale of scientific facilities for the further exploration and treatment of the problems of East Africa's prime source of wealth. The year 1952 was considered to be the first "full year" in terms of general readiness to undertake the task, with the main building program completed and principal equipment installed; but operations during that year were somewhat hampered by the Kenya Emergency.

The Organization, as a research service, is grouped under the Administrator of the High Commission as executive. In the strictest sense the Director is responsible to the Administrator and the Administrator in turn to the High Commission.

The main permanent headquarters is at Muguga, though the Herbarium at the Coryndon Museum, Nairobi, serves most headquarters functions for the Systemic Botany Staff. Field research is carried on all over East Africa, but outlying housing and field laboratory arrangements are set up for each project, and there is no permanent outlying plant.

The staff lists in the annual reports of the Organization for the years 1948, 1949, 1950 and 1951 respectively include the names of 33, 37, 45, and 48 European Staff. Research officers not including the Director and Deputy Director, numbered 12, 12, 17, and 19 on the lists, which include a number of departing personnel. In 1951 the remainder of the total of 48 consisted of 7 scientific assistants, 5 field and farm staff, and 15 administrative staff. Under special headings at the end of the three lists, additional staff of the Colonial Development and Welfare schemes administered by the Organization, and staff of the Clove Research Scheme, Zanzibar, were named. For 1948 only one scientific scholar was so included, for 1949 three scientists, for 1950 four scientists, and for 1951 seven scientists and one scientific assistant.*

After 1948 it had become clear that, due to rising construction and maintenance costs, housing and laboratory facilities to accommodate a corps of 45 scientists could not be provided within the capital grant. The original C.D. and W. scheme had provided for a body of 35 research officers by the end of 1952, but recommendations by the standing research committee for a downward adjustment to 25 scientists were enacted in 1950 by the Central Legislative Assembly. This was a considerable disruption: recruitment practices up to this point had presumed the earlier allowance of 35 scientists: some of the lower priority projects had already been staffed with this less stringent limit in mind, while some of the more important branches had not. The effect of this cut, imposed at midpoint on a long term program, was the leveling off of recruitment at a moment when the staff was neither quantitatively adequate nor properly proportioned as a team.

Recruitment during 1950 was reported as satisfactory, considering the scarcity of first rate candidates. In 1951 it was reported moving slowly, somewhat counteracted by resignations. Some of the difficulty in retaining staff, especially younger members, was attributed to delays in implementing the Colonial Research Service into which some of the staff had wished to be integrated. By 1952 the staff including the Director and Deputy Director had grown to 23½ scientists, the fraction representing the officer heading the Animal Industry Division, a unit jointly controlled by EAAFRO and EAVRO.

Outside sources may continue to contribute the services of scientists and scientific assistants. Four scientists of the Overseas Food Corporation were attached to EAAFRO for direction of their scientific projects; and the services of additional scientific assistants may be secured from time to time through negotiations with local growers interests such as the Pyrethrum Board and the Sisal Growers Association. Through a special grant under the U.S.A. Fulbright Act, a year's attachment of a reputable specialist in forest hydrology was arranged for 1952-1953. With the more accessible and attractive plant at Muguga - and with an anticipated growth of interest in African research

* These personnel did not in each case constitute the entire staff of the separately administered schemes.

as programs on other continents become more complete - an increasing number of qualified foreign scientists may wish to serve for varying periods at Muguga. Also, as it becomes a place of pilgrimage of scientific visitors to East Africa, the appeal of the headquarters as a place of employment for young men and women is expected to increase.

Withall, the problem of staff recruitment and maintenance has been serious. The delays in building and moving from Amani were damaging, as was the delay in implementing the Colonial Research Service. The unbalanced composition due in part to the sudden reductionⁱⁿ recruitment quotas in 1951 had been partly overcome by 1952, and the director's complaint in 1950 that the result was "very inefficient use, both of the buildings provided under the grant, and of the recurrent grant for staffing and running expenses"² was only mildly echoed in the 1951 report (published in early 1952). However inadequate from the original-plans point of view, the staff of EAAFRO constitute a pool of useful scientific talent available in East Africa, and by the end of 1952 the Organization had completed a number of useful investigations.

The laboratory facilities and other properties, the great majority of which have been obtained recently and a smaller portion inherited from the East African Agricultural Research Institute at Amani, make EAAFRO the most heavily endowed research agency in East Africa. EAAFRO holds tenure of some 1,600 acres of land at Muguga, with various improvements including housing for staff, water, electricity and gas supply amounting in cost to some £150,000. Laboratory and other buildings, erected at a cost of £134,900, plus scientific apparatus and books inherited from Amani are among the further properties, as is the East African Herbarium with its properties and collections set up on the grounds of the Coryndon Museum, Nairobi.

The operational and administrative equipment and buildings account for the following capital expenditures:

<u>Item</u>	<u>Cost (£)</u>
Laboratories	34,300
Library	13,000
Offices, Bureaux, etc.	21,100
Site Works for above items	4,700
Workshops, Stores, etc.	5,200
Equipment, Scientific and General	42,300
Animal Industry Division	<u>14,300</u>
	134,900

The two tables below provide a breakdown of expenditures and sources of funds, for the period 1948-1950. Revenue totalled £618 in 1948, £2,905 in 1949, and £4,171 in 1950.

Table 1. Expenditures, EAAFRO, 1948-1950 (£)

	<u>1948</u>	<u>1949</u>	<u>1950</u>
<u>Capital</u>			
Purchase of land for EAAFRO (R.92)	7,668		
Preliminary Capital expenditure on preparation of site for headquarters, EAAFRO (R.153(b))	1,501		
Joint headquarters EAAFRO and EAVRO (R.301)		30,110	146,143
Coryndon Museum Herbarium		<u>4,195</u>	<u>5,020</u>
Total Capital	<u>9,169</u>	<u>34,305</u>	<u>151,163</u>
<u>Recurrent</u>	19,135	42,309	49,677
<u>Director</u>	4,920	3,335	2,872
<u>Secretary</u>	595	582	682
<u>Fertilizer Experiments</u>	15,166	15,736	16,519
<u>Research Schemes</u>			
Botanical Research - Coryndon Museum (R.255)	260	525	264
Meteorological Data and Systems of Permanent Husbandry (R.276 & A)		1,109	300
Termite Research (R.328 & A)		565	2,460
Training of Ecologists (R.396)			<u>2,737</u>
Total Research Schemes	<u>260</u>	<u>2,199</u>	<u>5,761</u>
TOTAL EXPENDITURES	49,243	98,465	226,674

Table 2. Sources of Funds, EAAFRO Net Expenditures, 1948-50 (£)

	<u>1948</u>			<u>1949</u>			<u>1950</u>		
	<u>CD&W</u>	<u>E.A.</u>	<u>Total</u>	<u>CD&W</u>	<u>E.A.</u>	<u>Total</u>	<u>CD&W</u>	<u>E.A.</u>	<u>Total</u>
Capital	9,169		9,169	34,305		34,305	150,662		150,662
Recurrent	9,258	9,258	18,516	20,058	20,058	40,116	23,161	23,161	46,322
Director	4,920		4,920	3,271		3,271	2,872		2,872
Secretary	595		595	582		582	682		682
Fertilizer Experiments	10,110	5,055	15,166	10,058	5,029	15,087	10,863	5,432	16,295
Research Schemes	<u>260</u>		<u>260</u>	<u>2,199</u>		<u>2,199</u>	<u>5,670</u>		<u>5,670</u>
Total	34,312	14,313	48,625	70,473	25,087	95,560	193,910	28,593	222,503

As Table 2 indicates, all capital expenditures, necessarily high during the initial three year period, were met by C.D.&W. grants. Of the net recurrent costs, half were contributed through C.D.&W. and the other half was shared equally by Kenya, Tanganyika, and Uganda, less a small sum provided by Zanzibar. For purposes of accurate analysis it is also noteworthy that in the initial years the emoluments of the Director and his secretary were paid from C.D.&W. funds under special schemes and were not listed as part of recurrent expenses. Two-thirds of net expenditures on Fertilizer Experiments were met from C.D.&W. funds, and the remaining one-third from contributions by the East African territories. C.D.&W. schemes administered under the Organization, though apart from the regular EAAFRO budget, are listed: without their inclusion the volume of operations supervised under EAAFRO would appear deceptively small. The percentage of total net expenditure provided out of C.D.&W. funds was 70 percent in 1948, 73 percent

in 1949, and 87 percent in 1950.

"The maintenance and enhancement of the productivity of agriculture, including forestry, in East Africa"³ is the overall mission of the Organization. Soil fertility and plant health within the three territories and the island of Zanzibar are two main objectives of the research program. The former is subdivided under three investigative headings: (1) soil chemistry, physiology, and microbiology, (2) plant physiology relative to nutrition and fertilizer reactions, and (3) plant and forest pathology. This broad frame of inquiry seemed inevitable to scholars of the area, who have become familiar with the almost standard remark, by scientists long in the area, that in East Africa there is a crying need for the elementary biological knowledge which in the Western world is now taken for granted. Before the more refined and specific areas of research currently being attacked in Europe can be concentrated upon in East Africa a leaven of the basic, prerequisite but often forgotten knowledges of the soil and climate, which have been accumulated in Europe and North America during more than two centuries, must be laboriously redone for this equatorial area of very different soil, rainfall, and sunlight interactions.

A field experiment team, by 1952, had operated for three seasons on over a hundred agricultural sites in a program investigating the "fertility status of tropical and sub tropical soils."⁴ Nitrogen and phosphate fertilizers - including phosphate mined in Uganda - were tried on different crops and soils, and responses were recorded. Parallel studies to assess nutritional needs were made in plant physiology, under controlled conditions, and were particularly successful in determining the proper balance between nitrogen and phosphorous. This finding was economically important, to avoid an otherwise likely wastage of fertilizer materials.

Through the year 1951 a single soil surveyor made a start on the sorting out and gathering of soil samples, his reconnaissance tours revealing that although many different localities have soils classifiable within a Soil Series, there are great variations in such similar soils due to local soil histories. There is, furthermore, an apparently inordinate number of different natural soil classes produced by the variation in moisture and varied geology of East Africa. This is said to require ultimately - to be reasonably complete - the working out of a special permanent system of classification to accommodate a large number of new sets of conditions. The obvious question which enters the layman's mind upon reading such enumerations of the difficulties and the vastness of research tasks here is whether or not the potential production of this maze of variant soils in this locally variant climate is great enough to justify the scale of research required to provide a usefully complete picture. The Organization's Director, Sir Bernard Keen, in 1953 told the writer that this complexity need not discourage: that area and project priorities were clear enough to indicate "where to start" and to assure fairly quick and useful results.

"The moisture status of tropical and sub-tropical soils" received the major attentions of an officer loaned to EAAFR by the Kenya Department of

Agriculture during the year 1951, who reported on experiments in which technical equipment belonging to SAAIRO was used. Permeability and pore space distribution of soils - primarily coffee soil types - "and their relation to various techniques of soil serving measurement"⁵ was one line of inquiry. The relative capacities of various structures of soils for absorption and for loss of moisture, for run off, evaporation, transpiration and percolation were assessed. Experience in using the core sampling and tension plate equipment was gained.

Included under these researches were observations, using the electrical resistance method, of water distribution under bamboo and cypress at Kinale. Root systems of full grown plants of local bamboo were washed out to determine the lower depths of water drawing by the plants. Tentative findings (after the pits had been dug by the Kenya Forestry Department which also furnished fire fighting hose and other equipment) indicated that the indigenous bamboo can draw water with complete efficiency to a depth of twelve feet, and with diminishing efficiency down to seventeen feet; that Cypress (*C. macrocarpa*) reaches very effectively to a depth of six and with fractional absorption to sixteen feet; and that pine (*P. patula*) has equivalent depth ranges of fourteen and eighteen feet. From this soil physics research, the important practical conclusion emerged that cypress, besides providing a source of income when felled for timber, actually allowed more water to reach the underground reserves than bamboo did. A further experiment at Kongony to determine the relation of meteorological data to water use by Kikuyu grass revealed, among other things, the capacity of Kikuyu grass for water retention when planted on hillsides. Arrangements were made for a comparative study of fallow periods and two-year-rotated land at Kongwa in respect of moisture conservation, and an OFC staff member spent some six weeks at the Kenya Coffee Research Station to learn the use of gypsum blocks, core sampling and root washing methods and equipment. Liaison visits were made to Manulonge and Kawanda, Uganda, for discussions with cotton research staff on soil physics and meteorology measurements.

The effect of termites upon the productivity of land is being studied by one researcher. The soil microbiology approach in the study of fertility status was not undertaken during 1951, but an agreement for the secondment from Rothamsted Experimental Station of a knowledgeable officer was made, to investigate several higher priority avenues while plans to form a Soil Microbiology Section by 1954 matured.

Studies in plant pathology, though slowed up by the death of one staff member and the absence on vacation leave of two, continued through 1951. The attempt to develop through breeding a cassava plant which will be resistant to mosaic and brown streak diseases and yet edible and nutritious is an effort of immediate practicability in view of the widespread use of cassava as a reserve food.

Investigations of virus diseases of groundnuts have been carried on, with specific tests of certain other legumes suspected of harboring the disease from season to season. Determination of the bionomics of the aphid vector of rosette was another research target, with current investigation of a possible hybridization to produce immune plants.

A disease, thought to be virus, of sweet potatoes had been examined, and it has been determined that the disease does not spread except within certain ranges of altitude. With the Kenya Department of Agriculture doing the mycological work, the Plant Physiology Section participated in a joint investigation of pyrethrum bud disease. Dampness conducive to the fungus is hinted to be related to the moisture influences of the planted clump of flowers, the lower buds being more likely to attack. Reduction in expense and effort were possible in this undertaking by virtue of the existence of an interterritorial research organization. The Pyrethrum Board of Kenya was not forced to search out and hire a specially qualified researcher.

In Forest Pathology the fungus of cypress canker disease has been studied in culture, as has the degree of resistance to canker. Field and survey work have related the susceptibility of the tree at different ages to the timing of thinning operations in the plantations. Comparative data on various cypress strains have been gathered. Further work on other tree diseases, and investigations of fungal rot of boat planking in the waters of Lake Victoria have been made.

A general forestry research program for several years was agreed upon in consultation with the territorial conservators of forests. A second silviculturist arrived. Rather than emphasizing pure research, a number of investigations of immediate problems were planned. Included were the collection and distribution of silvicultural information to further improvements in current nursery and transplanting methods and to help determine favorable short-term tree crop cycles. Some research was underway to sort out the results of widespread hybridization of soft woods. The counting and measuring of trees to provide yield statistics and the problem of replacing depleted growths of hardwoods were assessed as important and difficult.

In the special area of Clove research a team was formed under a separate CD&W scheme in charge of a seconded EAAFRRO officer, to work on "sudden death" and "die back" diseases of the economically paramount clove crop of Zanzibar. Some positive though not decisive results were reported for the year 1951. The cause of the latter disease - a fungal wound parasite - was identified, and preventive advice was given. Careful picking and trimming, with hygienic attention to raw tissues exposed, was described as a means of reducing the disease to small proportions.

"Sudden death" disease was thought to be of virus origin, but exhaustive tests failed to bear out the virus theory. A fungus has been found associated with sudden death, and its observation has suggested a means of arresting the spread. A happy by-product of the clove investigations was the clear discovery of the cause of the gumming disease of coconuts, which has inflicted considerable reduction in harvests on the mainland as well as Zanzibar. A species of ant suspected of association with the sudden death disease of cloves was observed inhabiting coconut trees - and those trees so inhabited invariably were free of gum disease. A coreid bug who attacked the fruits and flowers of the trees, and who was exterminated by the ants in individual trees, was the cause.

More than incidentally, the accident of the discovery brought forth arguments for continuous (and perhaps unspecific) research. Alert scientists, working on an almost unrelated hypothesis, diagnosed a serious problem inadvertently and in order to carry through it was necessary to alter a fixed line

of planned research, leaving for the moment the clove disease and attending that of coconut trees. This brought up the controversial issue of research organization under government. The normal procedure in obtaining authority to switch the direction of research would have involved (1) the drawing up of an entirely new scheme to be submitted to the Zanzibar Government and waiting for its approval, which in many similar cases might subject the matter to political debate; (2) the forwarding of the scheme to the Colonial Office where it would be examined by a scientific research committee; and (3) with Colonial Office approval, finally undertaking the new work. Such delays, in re-routing research would try scientific patience and possibly demoralize the researchers concerned. In this particular instance the delays were circumvented by reason of close personal relationships between the Director, EAAFRO, and the authorities concerned, and the red tape was cut. But the experience might have been very different had the director been young, newly appointed, and more cognizant of bureaucratic channels. The Director made a special point of telling the writer that this was an excellent example of the need for simple and flexible arrangements to enable basic research to be re-oriented swiftly when the occasion arose.

Research into insecticides was reduced by fiscal and personnel considerations, but one officer so occupied was stationed at the Uganda cotton research station at Manalonge. The selection of problems first deserving exploration was undertaken and a Specialist Committee on Insecticides was formed.

A plant breeding section was reshaped after a meeting of the Specialist Committee on plant breeding. Cassava, maize and groundnuts will be taken over and work will be done on the genetic aspects of the resistance of sorghum to a parasitic weed Striga.

The East African Herbarium, after a year in the grounds of the Corvndon Museum, Nairobi, had begun to function as a clearing house for specimens, loaning, exchanging and naming procedures having been instituted.

Statistical work was continued in the form of examinations of laboratory data in EAAFRO and Kenya Fertilizer Scheme records. Statistical assistance was given in the sampling techniques for determining transit losses of pyrethrum being exported; in attempting to assess the efficiency of insecticide; in the arrangement of experiments to test herbicides; and in artificing recordable means of measuring the spread of weeds. Rainfall prediction was an inevitable field of study as was the assessment of gambling odds in planting in localities of doubtful or uncertain rainfall patterns.

The Joint Animal Industry Division, shared with the E.A. Veterinary Research Organization, worked projects in the clearing of land, the planting of a variety of crops and fodders, and the trial storage of some of the crops in pit silos. A complete knowledge of farming conditions in the climate and altitude of Muguga is one aim.

The study of termite mounds and their effect on the productivity of land (imperically known to be sometimes stimulative, sometimes not) was undertaken during 1951 by one researcher. The 1951 EAAFRO annual report mentioned the understandable presence of large amounts of clay in the mounds but was uncertain regarding the presence of calcium, often in nodular form, in evidence after the insects have vacated the heap.

Other C.D. and W. schemes were the Ecology Training Scheme and the study of Climatic Data in Relation to Agriculture. The Ecology Training Officer, while awaiting the post-graduate training of subordinates at Oxford, reconnoitered in East Africa to select useful training areas and discussed territorial needs for ecological research with the respective departments. Laboratories were equipped to utilize air photo studies and mapping work. The officer of the second scheme is testing a formula for the measurement of radiation at Kew Observatory in England, utilizing data from East Africa.

During 1952 three new sections were set up to initiate or continue long term research of the types indicated by their titles, the Forest Entomology Section, the Soil Microbiology Section, and the Soil Physics Section.

Liaison contacts and visits overseas and elsewhere in Africa by members of the Organization included membership of a forestry officer in an International Mission for the Study of Tropical Forestry which traveled in the U.S.A., and a series of rain, vapor, and radiation investigations by a meteorological officer sent to the Meteorological Office at Kew, England. Such visits are hoped to provide a cosmopolitan pattern of contacts for the Organization, keeping it abreast of developments in agriculture and forestry abroad.

The East African Veterinary Research Organization

The purpose of the organization as put forward in the 1950 annual report is "the betterment of the peoples of East Africa and their livestock, by research - together with the guidance of its application - which leads to the solution or control of their welfare."⁶ The prevailing emphasis was to be on problems of interterritorial importance, and priority would be given to research in control and eradication of diseases of economic importance.

The Director-Designate of the East African Veterinary Research Organization (EAVRO) arrived in Kenya by the end of September 1947, and the process of building the new organization was begun through the absorption of the Central Veterinary Research Institute, a C.D.&W.-financed agency located at Kabete and under the earlier supervision of the Director of Veterinary Services, Kenya, the recruitment of new staff and the transfer of experienced personnel from the Kenya Veterinary Department. The new financial arrangement provided for the entire capital outlay of EAVRO from C.D.&W. funds, with recurrent expenditure to be provided for by C.D.&W. funds, by contributions by the East African governments, and by revenue from the sale of sera and vaccines. EAVRO was one of the initial High Commission services, taken over at the inception of the interterritorial organization on January 1, 1948.

Two houses built in 1940 with C.D.&W. funds at the Kabete site became EAVRO property, and five European houses, a small block of African quarters, a small production block for certain vaccines, and an experimental cattle dip and spray were completed or nearly completed during 1948. Administrative offices were set up in wooden huts, and temporary wooden houses were used by some staff. The Farm Manager was seconded from the Kenya Veterinary Department, and fencing and water supplies of the farm area allotted to EAVRO at Kabete were improved. A small animal house was improvised from a block of animal stalls, and an animal attendant began setting up a large rabbit colony. In 1949 a temporary helminthology laboratory was improvised from part of the wooden office hut, and some workspace, including cattle stalls, was made available by the Kenya Veterinary Department for research on antrycide and related problems. With funds from C.D.&W. Scheme R. 318 three small rooms were added, providing temporary space for research in bovine pleuropneumonia. The necessity of having these quarters was acknowledged in the 1950 report, with a note of thanks to the Director of Veterinary Services, Kenya, and the statement that operation of EAVRO otherwise would have had to be suspended during the interim. The accommodations erected at Kabete were, however, of a temporary nature since the permanent organization was to be set up later at Muguga.

The first half of 1948 was occupied mainly in gathering and organizing staff in order to take over from the Kenya Veterinary Department the production of biological products. This task proved difficult and had not been adequately finished by the end of the year; serious results were later to be attributed to the Organization's premature participation in the production of biologicals from July 1st of that year. With most professional officers occupied full time with vaccine production during 1948, research work was forced into second place that year. Animal Husbandry work was postponed pending the development of a site at Muguga near the EAAVRO headquarters.

In 1949, following the distribution and use of two large batches of Kabete Attenuated Goat Virus (K.A.G.), which had been prepared and issued in December of 1948, a serious epidemic developed in Kenya and Tanganyika of what was found after investigation to be rinderpest. Considerable cattle deaths resulted, the percentage of deaths varying in different areas where the vaccine had been used. The program was interrupted and all effort for awhile was concentrated on remedial actions. The responsible rinderpest virus was isolated in laboratories, but the means by which the vaccine had been contaminated and the virus had remained undetected was reported not ascertained. This was some six months after EAVRO had formally taken over the production of vaccines, but with the laboratories still located at Kabete, shared with the personnel of Kenya Veterinary Department. "Close intermingling of the two organizations, ... shortage of staff and of accommodation facilities" were considered by the Director, EAVRO, to have so endangered the essential preparation of biological products. Single control became a paramount consideration and in April of 1949 the responsibility of preparing the biological products reverted to Kenya; and some 31 professional, technical and clerical officers and most of the African staff of EAVRO were transferred or seconded to the Kenya Department. The production block, a small isolation block for attenuated rinderpest vaccine, and a few other buildings were placed by EAVRO at the disposal of the Kenya Department.

It was emphasized in the 1949 annual report that the decision to restore a biological production section at the location of Kabete could not quickly be worked out by EAVRO. The project now had to be newly considered, and plans were drawn up to move to Muguga-North, an area near the proposed Joint EAAFRRO-EAVRO administrative center at Muguga where the Kenya Government had made land available.

The Governor of Kenya, as Chairman of the High Commission, had expressed a hope that the occupation of Muguga premises in 1953 would be followed by the undertaking there of the manufacture of biological products. Considerable resistance to this idea was recorded in the Kenya Legislative Council in late 1952, when after heated recriminations over the "disaster" involving the loss of "something like £250,000 worth of stock," a motion was made against the restoration of the manufacture of biologicals to any agency of the High Commission. The concerned unofficial member referred to "negligence and incompetence displayed at that time by the E.A. Veterinary Research Organization in the manufacture of biologicals," urging that "an organization which is capable of such pronounced inefficiency is not a suitable one to take over again, after such a short time, the manufacture of these biologicals." Also emphasized was the fact that EAVRO "scientists engaged in the work were responsible only to the Administrator of the High Commission and to certain technical committees from the various Territories whose advice was frequently ignored. The motion contained no date at which a transfer would take place, and the member who put it forward indicated that it should not be handed over "until the council was persuaded" of the efficiency of the new organization.⁸ This was in opposition to the intention, mentioned in the 1950 EAVRO annual report that the production of all biologicals except those obtainable more easily from South Africa or elsewhere was to be taken over by a phased plan. The first phase was to include biologicals for rinderpest and bovine pleuropneumonia. Implementation of the plan would have been difficult before 1952. Throughout 1951 interim accommodation was still required at Kabete, although administrative offices at Muguga were ready for occupancy and other preparations at Muguga were going on.

As one of the research agencies, the Organization falls under the executive of the Administrator, and responds administratively through him to the High Commission. Oversight as regards policy and programs was initially provided through the East African Council for Agriculture, Animal Industry and Forestry, after it had absorbed the functions of the old East African Standing Veterinary Research Committee, the latter having met for the last time in February, 1948 at Kabete. By the end of 1953 this oversight was taken over by the "governing body". More specific consideration was given by a Veterinary Coordinating Committee and an Animal Industry Division Coordinating Committee. The former consisted of the territorial Directors of Veterinary Services, the Chief Veterinary Research Officers of Kenya, Tanganyika and Uganda, and the Director and Deputy Director of EAVRO. The latter was made up of the three territorial Directors of Veterinary Services, the three territorial Directors of Agricultural Services, the Director of EAAFRRO and EAVRO, and the Head of the Animal Industries Division. For the respective agencies these committees considered problems to be undertaken and sought agreement on "broad outlines" of programs. They also provided a device for less limited informal discussion. In either case the details were decided at organizational levels.

At the end of 1948, while the Organization retained responsibility for preparation of vaccines, the staff was listed as including a Director, an Assistant Director, 6 research workers, 9 technical staff, and six clerical and administrative officers, and 180 African staff. In 1949 the number was reduced to 10 professional and scientific staff (including 3 seconded to the Kenya Veterinary Department), 7 technical staff, and 3 office staff plus a much reduced number of African staff. At the end of 1950 the staff consisted of 8 professional and scientific, 5 technical, including one each seconded to EAAFRRO and Kenya Veterinary Department, and 3 office staff, including one seconded to Desert Locust Control. There was little change during 1951, and at the end of December 1 Director, 6 research officers, 6 technical and 3 administrative personnel were on the list. Recruitment to the full establishment of 18 research and 17 technical officers in addition to the Director, Deputy Director and administrative staff was postponed, in 1951, pending construction of research facilities to accommodate the enlarged complement. In early 1952 the enlargement remained suspended, the strength of the organization being 10 scientific officers (or 10½ including the head of the Joint Animal Industry Division shared with EAAFRRO) and 13 European other staff.

The physical plant and properties, in addition to the administrative offices and library at the joint headquarters block with EAAFRRO, was to include 12 three-bedroom and 2 two-bedroom European houses near the headquarters, and ⁸⁰independent two story laboratory block having 20,000 square feet of floor space, land and miscellaneous extra buildings and equipment. The land provided by the Kenya Government amounted to nearly 1,000 acres located adjacent to the 1,600 acres earlier set aside for EAAFRRO and EAVRO at Muguga South. The buildings and equipment and improvements included a two-mile access road to the laboratory site, water supply and electricity, a special fenced-in area near the laboratory for breeding animals, sterilizers, freezers, etc., a store for laboratory and office equipment, a post mortem building, carcass disposal plant, Dutch barns, silos, dirs, and isolation arrangements for infectious diseases. A mobile laboratory and a sleeping quarter, consisting of two specially adapted caravans was a further property. The laboratory,

furniture, animal equipment and fittings, amounting to some £50,000, had been ordered by the end of 1951, and the carcass disposal plant, steam boilers, and an oil gas plant were in process of procurement or delivery. In the 800 acre area allotted to the Joint Animal Husbandry Division improvements including paddocks, roads, and planted crops had been made. In much of this work, the assistance of the Kenya Department of Veterinary Services was acknowledged.

EAVRO expenditures in the period 1948-1950 were as follows:

	<u>1948</u>	<u>1949</u>	<u>1950</u>
<u>Recurrent</u>			
Personal Emoluments			
Professional Staff	7,771	15,747	10,565
Technical Staff	2,865	5,608	2,539
Clerical Staff	1,818	4,349	2,298
African Staff	<u>2,095</u>	<u>4,152</u>	<u>2,009</u>
Total	14,549	29,856	17,461
Other	<u>16,811</u>	<u>29,670</u>	<u>7,282</u>
Total Recurrent	31,360	59,526	24,743
<u>Extraordinary</u>	<u>29,439*</u>	<u>9,289**</u>	<u>6,242***</u>
TOTAL	60,799	68,815	30,985

Revenue during the three years was as follows:

	<u>1948</u>	<u>1949</u>	
<u>Scheme R.192A</u>			
Sale of biological products	10,109	16,363	
Miscellaneous revenue		576	737
Rents		<u>623</u>	<u>648</u>
Total	10,109	17,562	1,385
<u>Scheme R. 301-Capital</u>	<u> </u>	<u> </u>	<u>13</u>
TOTAL REVENUE	10,109	17,562	1,398

Net recurrent expenditures in the three years (£21,251, £41,893,**** and £23,358) were covered by C.D.&W. Scheme R.192A for "Establishment of E.A.V.R.O." Under this scheme, 47/87ths of recurrent expenditure was met by C.D.&W. funds. The remainder - 40/87ths - was contributed by the East African territories. Of the East African share Kenya and Tanganyika contributed 37.5 percent each and Uganda 25 percent in 1948 and 1950. The estimates for 1949 were in the same proportions, but actually Kenya contributed 28 percent, Tanganyika 42 percent and Uganda 30 percent in that year.

* Including £16,319 for housing for staff and £6,536 for production block.

** Including £4,495 for production block.

*** Including £3,711 for buildings, Muguga.

**** This figure was obtained by subtracting from the total recurrent expenditure (£59,526) not only the revenue of £17,562 but also £70 capital expenditure which had previously been charged incorrectly to recurrent expenditure and was adjusted in 1949.

Capital expenditure in 1948 (£29,439) was provided entirely by C.D.&W. funds under Schemes R.192A and R.192. The financial reports of the High Commission do not explain the source of capital expenditures in 1949 and 1950.

The Organization claims two principal functions, the preparation of biological products (mainly vaccines) for the East African territories and in lesser quantity to other African territories, and research into animal health, disease and husbandry. The prepared biological products are in some instances issued directly to territorial veterinary departments and in others to the stock owners.

Before 1952 the organization obviously was not in a position to operate fully. The difficulties arising out of the participation of two separate organizations in the production of biologicals is covered above. There were impediments to research work as well, with an organization just getting under way without its own plant and short of experience, but a certain amount of research was reported.

For some time after inception the organization intended to concentrate research efforts upon a few of the more important diseases, mainly rinderpest, contagious bovine pleuropneumonia, East Coast fever and Helminthiasis. The stated intention was to gain the demonstrated advantages of the intensive "team" approach to scientific problems. The main functions of the Virus Disease Section were planned to be long term research on rinderpest and its biological products, intimately linked with the production of vaccines.

During 1948 the vaccine production difficulties forced research work into second place, few personnel being left for other tasks. In 1949, due to transfers of personnel and the disruptions occasioned by the rinderpest outbreak, work on East Coast fever and cattle dips had to be interrupted. In 1950 these projects were underway, and in 1951 the list of activities included helminthiasis and nutritional researches and special investigations of ticks. The effects of the drug Antrycide were being investigated in cooperation with EATTRRO and the Tanganyika Department of Veterinary Services. Work on biologicals, despite its higher priority, was also badly hampered at the start. Laboratory conditions were not satisfactory, the setting up of laboratories having been concurrent with the production of vaccines with only five officers being available for both functions. It was perhaps out of these conditions of overwork and dual responsibility that the infectious vaccine difficulty arose and the need for reorganization became apparent.

The residual effort expended in research, however, did provide further facts regarding rinderpest, largely related to vaccines development and application. In 1948 survival periods of rinderpest virus in the blood of convalescent cattle, and in spleen emulsions and bone marrow were roughly ascertained for certain conditions. In experiments with eggs, attenuation of the virus was found to be rapid, dying out after from 30 to 100 passages, and through 1948 strains for egg passage were being sought. Lapinized virus received from Shanghai after some 800 rabbit passages was successfully maintained, and preliminary experiments indicated that dried liver, spleen, or blood of infected rabbits would protect cattle against losses from rinderpest virus. This investigation was followed up with attempts to

determine the loss of virus in the drying process.

In 1950 experiments to determine the relative usefulness of serum-saline extracted vaccine, K.A.G., and saline extract worked out in favor of the former. Further tests of K.A.G. virus indicated that it could be passed alternately through cattle and goats, remaining unaltered in character and virulence. An apparent increase in virulence to cattle was observed during alternate bovine-rabbit passages. Further experiments in passage of virus by contact, in duration of immunity after vaccination, in effects of vaccine upon pregnancy and milk-yield added to accumulating knowledge. Trials by Uganda and Tanganyika Veterinary Departments indicated that Ankole native cattle could be immunized, though showing a marked thermal reaction, and cattle suffering from trypanosomiasis could be immunized successfully. Investigations at the end of 1950 continued an attempt to adopt a lapinized virus method to replace the more cumbersome spleen vaccine method. The development of a means of in vitro detection of antibodies was also being sought in the interests of abbreviating present inoculation procedures. One line of inquiry remained hopeful at the end of 1950, but no success was achieved by the end of 1951. Techniques for reducing the moisture content of vaccines in various drying procedures were refined by means of experiments continuing through 1951.

Several researches into East Coast Fever have been undertaken since the inception of EAVRO. In 1948 experiments with controlled single tick infections of Zebu and grade calves hinted a greater resistance on the part of native calves, and in another experiment observations of lymph glands related their swelling and recession to the course of the disease and helped to ascertain the routes of lymph drainage. In 1950 two lines of research were indicated, one concerned with "changes in tissues and parasites in fatal and recovering cases" and investigation of the disease in calves to determine incidence, nature and mortality in the infested areas. The cellular picture in the glands was emphasized in a continuation of the 1948 work, which increased the diagnostic value of gland smears - though these observations were found to be complicated by the presence of a second, non pathogenic parasite. In 1951 a survey of calf mortality in enzootic East Coast Fever areas, though hampered by the lack of an accurate earlier cattle census, disclosed that true calf mortality was probably far lower than previous estimates. To further this work arrangements were made for a Commonwealth Fellowship to permit an officer to visit the U.S.A. where he would study lymphoid tissues.

Helminthic diseases were also studied to some extent. Research on development bionomics of Strongyloid larvae of domestic ruminants in pasture under local conditions was begun in 1949. The effects of sunlight, shade, moisture and relative dryness were the first facts to be sought. In the same year a survey of paramphistome distribution and importance was begun, with laboratory studies to identify the snail intermediate hosts. The mesenteric virus of some 486 Tanganyika cattle indicated that S. bovis was prevalent in Lake and Western Provinces but not in Masailand. In 1950 a preliminary survey of cattle stomachs in Kenya disclosed infections of several species of stomach flukes, and a collection of freshwater snails suspected as intermediate hosts was made for laboratory tests. Several species were successfully infected as experiments continued throughout the year. The development and bionomics of Haemonchus contortus larvae provided a fresh field of investigation, and experiments which continued throughout 1950 provided a body of facts regarding life cycle and larval habitat preferences. In 1951 investigations continued, surveys of bilharzia incidence in stock were made; studies of diet effects in

strengthening resistance to roundworms were undertaken; and "good progress ... in elucidation of some of these important problems as they occur in East Africa" was reported.⁹ Other researches in 1951 revealed that snail hosts, without reinfections, could retain the parasite for as long as 504 days, indicating how long pastures might remain contaminated after removal of all contaminated stock. A new species of fluke was discovered and its range in East Africa was estimated; systematic counts were made of eggs in feces and tissue of laboratory infected cattle; and investigations regarding the larval stage of Haemonchus contortus indicated that the cool weather of June to August comprised an unfavorable period during which (local) environmental conditions alone could control infection.

The continued research afterwards with the drug antrycide on cattle trypanosomiasis added to already substantial evidence of the inadvisability of employing the drug preventively in any widespread manner. As early as 1949, despite the proven usefulness and low toxicity of the drug as a cure, it was suspected that the drug did not afford a sterile prophylaxis but only acted as a suppressive. In the last quarter of 1949, as the joint C.D.&W. Scheme R.318 was being set up under EATTRRO and EAVRO, in an experiment at Kiboko, drug fast strains of both T. congolense and T. vivax had developed in cattle receiving regular injections. In 1951 the absence of symptoms and of the parasite from the blood of experimental birds gave rise to hopes that the prophylactic (or suppressive) use of the drug could be employed to allow herds to move into watered but tsetse infested country during dry season periods. These cattle, which appeared in good health, had been given injections at one and two month intervals, and tri-monthly injections were begun in 1950. Calving and pregnancy had seemed normal. In the latter months of the scheme, however, it was announced that though the drug could be used as a cure, there was no proof that it afforded sterile prophylaxis. Most probably its action was merely suppressive, keeping symptoms from appearing but permitting cryptic infections to develop and causing rapid production of drug fast strains. In 1950 an officer had gathered evidence in laboratory that cryptic, secondary forms of the disease existed, affecting the heart tissues though no parasites were evident in the blood. To ascertain effects of cryptic infections the symptom of anemia was studied in late 1951. The drug has also failed in treatment of infection in the chronic stage, bringing the conclusion that it was dangerous as a preventive measure and fallible as a cure.

In 1948 plans for a tuberculosis survey were laid out and a mobile laboratory was purchased and equipped. In 1949 the plans were completed, an officer was appointed in January, and the survey got underway. The officer had to be withdrawn later in the year because of the rinderpest epidemic in Central Province, Tanganyika. However, some 2,500 cattle were tested in Dar es Salaam and vicinity. One herd had 33 percent incidence, the rest in the Dar es Salaam area had 4 percent. Outside the incidence was less than one percent. The unit then moved to the Southern Highlands setting up at Iringa where it was reinforced by a Tanganyika veterinary officer. Some 1,500 cattle were tested showing 3 percent infectivity; at the Iringa market 59 percent of cattle showed lesions. In 1950 some 14,625 tests were made in Iringa, providing a sample indicating that some 20,200 out of the 145,000 vulnerable stock might be expected to react positively. From these tests it appeared also that native stock was as susceptible as European. Conclusions reached at this stage were that cattle tuberculosis is probably not a serious

disease. In theory it could spread rapidly, but no sound predictions could be made that it would increase and become a bovine disease of economic importance. At the end of 1951 further work in Northern Province, Tanganyika, involving the testing of 39,607 cattle, numerous post mortems, and experiments with eggs and guinea pigs in the portable laboratory, it was felt that the disease was more likely to spread, and in the event to present a severe problem, due to the difficulties in applying control measures developed in Europe to primitive areas and peoples. The Tanganyika Government, on the basis of these findings, was warned to consider means of fighting the disease under primitive conditions.

Work on bovine pleuropneumonia was reported begun and proceeding satisfactorily in 1949. Study on the organism in developing chick embryos indicated that it might be possible to use the embryo as an experimental animal, cattle being the only present means of trial. Further work on possible attenuation by passage in eggs was deferred because of administrative obligations until 1950. No information of resumption of this work was given in the 1950 or 1951 organization reports.

In support of work on tick borne diseases laboratory studies of ticks were undertaken and breeding stocks were maintained. In 1949 a zoologist with special training in entomology was engaged to join a tick borne disease team to be organized at Muguga and was briefly trained in techniques of tick care and breeding in the Veterinary Research laboratories at Onderstepoort, South Africa. In 1950 two strains of Theileria parva were maintained and large stocks produced for experimental purposes. Nine other breeding strains were also acquired and planned to be maintained. A collection from wild animals and birds was begun, valuable in the determination of tick natural food sources. The detailed study of anatomy and histology of Rhipicephalus appendiculatus, studied to gain helpful knowledge regarding the structure of intermediate hosts, was proceeding slowly. In 1951, in close association with East Coast Fever research, twelve different species of ticks were being maintained in the laboratory, and material descriptive of larvae, nymphae, and adults of two species was being prepared for publication by the officer concerned. Various species of game animals were received from the wardens of Kenya National Parks for further research purposes. A program of detailed tick counts on 10 calves in the Kikuyu tribal reserve had to be discontinued because of disinterest in the project by the African owners.

In the branch of Animal Nutrition by 1949 a certain amount of work was underway on chemical analysis of fodder plants and in assessing seasonal variations in nutritive value of several species of grasses. Equipment, including sheep nutrition cages, had arrived and was assembled. In 1950 studies continued on relative digestibility of different grasses and legumes and seasonal nutritional variations of pastures. A mineral survey to assess mineral content of various grasses was undertaken, and chemical analysis was employed along with the legume digestibility trials to determine their value as fodder. Six grasses in Kabete plots were tested on sheep and found to be generally poor, and especially low in digestive protein. Three species of grasses which were tested for seasonable variation were found to follow, in nutritive rise, the rainfall increases, after a 10 to 14 day lag. These grasses also were found to be low in protein content. The legumes were found to be very nutritive as hay, and unlike the grasses the protein content was found to be generally higher than UK standards. In the mineral analysis

the silica content was found much less than in the grasses. Investigations of suspected aphosphorosis in Kikuyuland, involving some 103 blood samples collected from near Nyeri, Fort Hall, and Kiambu did not confirm the suspicion. In 1951 five digestibility trials and mineral analyses were done on a grass Bothrichloa inculpta, with sheep being fed in metabolism stalls. The results added to knowledge but led to no applicable conclusions. Monthly analysis of grass food values continued, and the phosphorus content of 200 blood samples was tested. A higher level of phosphorus was discerned in cattle which were not producing, the non-productive animals apparently being able to retain the larger content. Difficulties in estimating crude fibre content, due to the 6,200 foot altitude at Kabete, were overcome by calibrating variations by means of collative experiments at sea level undertaken with the Tanganyika Government Chemist at Dar es Salaam.

Some laboratory and field observations were aimed at making various livestock dips more effective, more economical, and less dangerous. The old arsenic dips, though simple to employ, were dangerous to stock and men. Benzene Hexachloride was found to be effective but unfortunately more complicated to apply, because of "preferential removal" of material by dipped cattle. Experiments resulted in a new method of titration, by which dip strength could be measured and losses related to numbers of cattle dipped. Material was prepared for publication, with procedure devised for stopping up the dip and replacing lost chemicals. Experiments in protecting hides during storage from hide beetles were undertaken, also in order to provide a substitute for the standard use of arsenic. The emulsion type of BHC cattle dip was tried and found to be effective.

As would be expected with an organization doing research on such internationally important problems as rinderpest, numerous outside relationships with beneficial exchanges of information are developing. This was expected to increase with the setting up of the Inter African Bureau of Epizootic Diseases at Muguga in 1951. The Organization was visited in October 1948 by delegates to an international rinderpest conference, the assistant director (production) attended an Agricultural Bureau Conference in Edinburgh and the Eighth World Foultry Conference in Copenhagen. An officer attended the meeting of the International Scientific Committee for Trypanosomiasis Research in French West Africa in June 1951. A senior veterinary research officer was granted a Commonwealth Civil Service Fellowship for a year of research and study in the United States. Much work was in cooperation with the territorial governments. The services of Kenya Departments of Agriculture and of Veterinary Services were acknowledged for assistance at Kabete. Outside Africa, in addition to other correspondence and contacts, special supplies of marrow from cattle infected with the virus of Rift Valley Fever and for "measles" (Cysticercus bovis) infection were sent to Britain for experiments in treatment of human cancer.

Several visits and liaison trips were reported for 1949. One officer spent a fortnight at the Veterinary Research Laboratories, Onderstepoort, and at the South African Institute for Medical Research at Johannesburg, in connection with plans for the new centre at Muguga. An officer attended the XIVth International Veterinary Conference in August of that year at London. Other stays of three weeks at Onderstepoort were arranged in the interests

of improved blackquarter vaccine and related problems, and to familiarize one staff member with tick-breeding and maintenance techniques.

Sincerely,

John B. George
John B. George

P.S.

Footnotes

1. Interview, Sir Bernard Keen, Director of EAAFRO, December 7, 1953.
2. East Africa High Commission, East African Agriculture and Forestry Research Organisation, Annual Report 1950, p. 8.
3. East Africa High Commission, Interterritorial Cooperation: Work of the East Africa Central Legislative Assembly, Despatch No. 1/52, 19th May, 1952, from F.E. Mitchell, Chairman, East Africa High Commission to Secretary of State for the Colonies, par. 64.
4. East Africa High Commission, East African Agriculture and Forestry Research Organisation, Annual Report 1951, p. 6.
5. Ibid., pp. 67-68.
6. East Africa High Commission, East African Veterinary Research Organisation, Annual Report 1950, p. 6.
7. East Africa High Commission, East African Veterinary Research Organisation, Annual Report 1949, p. 2.
8. Kenya Legislative Council, 1952, Vol. III, pp. 644-664.
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