COLONY AND PROTECTORATE OF KENYA

DEPARTMENT OF AGRICULTURE ANNUAL REPORT 1945

1946

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AGRICULTURAL DEPARTMENT ANNUAL REPORT, 1945

PART I—AGRICULTURE IN 1945

WEATHER

(For the following notes on weather conditions the Director of Agriculture is indebted to the Director of the British East African Meteorological Servic)

Taking the year as a whole, rainfall was slightly below average over Kenya. The main rains started late, but the period May to September gave good rains in all areas except at the Coast, where May was the only really wet month.

In those areas subject to the "short" rains, the total was not far short of the average, but it was confined almost entirely to November, As a result the dry seasons tended to be both longer and drier than the average.

Temperature did not differ markedly from average during the year except generally, in April, when day temperatures were above average as a result of the delayed onset of the rains and again, similarly, east of the Rift in November.

Rift.—The total rainfall for the year was 5 per cent below the average. The rains were very late in starting and (here was a deficit of 78 per cent during the first four months of the year, but May to September were all above average and this made up for the earlier deficit.

West Rift.—The trend of rainfall was the same as in the Rift area, January to April being dry, May to September wet and October to December relatively dry again. The annual rainfall was 8 per cent below average.

East Rift.—Conditions were similar to those in the two preceding areas, the annual deficit being 6 per cent.

Trans Nzoia,—The annual total for this area was 1 per cent above average, largely due to heavy rain in May. The first four months were very dry, as in other areas, but there was a slight deficit of 12 per cent in August and an excess of 38 per cent in December.

Kavirondo.—There was a deficit for the year of 11 per cent compared with average, the shortfall of 76 per cent in April not quite being made good by the wet period of May to September. The last three months were below average.

Main Coffee Areas.—As in several previous years, this part of the country had the heaviest deficit, being 15 per cent for the year as a whole. May and November were the wettest months but although totals in excess of average were recorded in February, May, June, July, August, September and November both "rains" were of too short duration to bring the total up to average.

Coast.—-The only months recording an excess over average were May and November, but falls in these months were sufficient to limit the annual deficit to 4 per cent.

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GENERAL

In 1945. as in the three previous years, the system of controlled marketing of all types of agricultural produce, produced by both non-natives and by natives, played an important part in the organization of production and in the control of farming activities. In the case of non-native production, wheat, maize, barley,

oats, rye, flax, pyretrum, rice, vegetable seeds and grass seeds were scheduled-crops under the Increased Production of Crops Ordinance. This Ordinance, administered by the Agricultural Production Board, provides for the compulsory cultivation by farmers of scheduled crops and affords financial assistance to such farmers through the medium of guaranteed prices, guaranteed minimum returns per acre, and subsidies towards the cost of fertilizers. An important feature of the working of the Ordinance has been the establishment, under the control of the main Board, of district production committees and sub-committees the personnel of which is made up of experienced farmers, assisted by the local Agricultural Officers. These farmers have given their services voluntarily for the work and great credit is due to them for so willingly and so ably performing the many and varied duties which they have been called upon to perform.

In the case of coffee, sisal, tea, pyrethrum and flax, producers were assured of guaranteed prices under contracts made with the Ministry of Food and the Ministry of Supply.

In regard to native areas, marketing of produce such as cereals and pulses remained controlled under Defence Regulations which provide for a guaranteed return to the producer. In the Nyanza Province a flat price system giving producers the same price for the various types of produce at all markets in named zones—irrespective of distance from railhead—continued in operation. This system has the advantage of spreading the incidence of increased production evenly throughout the various zones and reduces the pressure on land in areas adjacent to railhead.

It will be understood that the system of controlled and organized production in non-native areas has imposed a great strain on agricultural staff working in these areas, and similarly, in native areas, the time of Agricultural Officers has been largely taken up with control and organization of marketing. Of necessity the advisory and investigational work of these officers has had to give place to those duties which resulted from the war-time demands for maximum production.

Since the last Departmental report was printed six momentous years have passed, years in which much experience has been gained, in which many difficulties have been faced and overcome, in which new organizations have been set up dealing with agricultural problems but in which the potential production of our land has deteriorated to an alarming extent.

From the early 1920's, when there was much development taking place, the first phase was a period of good prices, high yields derived from the inherent fertility of new land and general prosperity save for local difficulties arising from lack of knowledge of how to farm to the best advantage in this country. This period was quickly succeeded by the slump years when prices of agricultural products reached ever lower depths, when natural fertility was falling, financial embarrassments increased apace and farmers had a hard fight to keep their heads above water and were not in a position to pay much attention to the future. But adversity is an effective schoolmaster and during that period we had perforce to learn from bitter experience and by the late 30's there was a much greater realization of how we should farm the country and what were its possibilities, and a more general appreciation of the fact that the country was not one of inexhaustible fertility to be exploited and mined for an indefinite period.

Then followed the war period when farming policy had to be made subservient to the needs of the country and the world in general, and considerations of the needs of the land to take a second place. Not only patriotic motives but those of personal gain demanded further exploitation of the dwindling fertility

of the land to the greatest extent possible and this exploitation has of necessity been encouraged by Government through loans, grants and guarantees. The response, both in non-native and native lands was excellent and the immediate and pressing needs were fulfilled. Those needs have not ceased hut are even more urgent now, but the time has come when we must realize their cost.

As the result of the three phases through which we have passed since the early 20's, it is believed that it would be true to say that the production capacity of the average acre in native areas has fallen by not less than 50 per cent, and the figure for non-native areas cannot, be much less. In spite of increasing knowledge, of improved methods, of varieties of crops and of the application of some fertilizer, yields per acre have fallen, in many areas disastrously, and in some cultivation has ceased to be worth while. While we may say that this position has been forced upon us by circumstances and that the same has happened elsewhere, the fact remains that our land is our major asset, that it has deteriorated greatly and that it is deteriorating with increasing rapidity each year. It is up to us who now hold this land to take urgent steps to ensure that the heritage we bequeath to our successors is not completely valueless.

There are areas of native lands under cultivation that do not yield an average crop of two bags of maize per acre, there are coffee plantations yielding an average of less than ½ cwt. per acre, there are pyrethrum fields giving less than 50 lb. per acre, and wheat and maize fields that never pay their way. Why do they remain under cultivation and why do the farmers continue the struggle? Far better for both the farmer and the land to give up such cultivation now and restore the land to grass than to go on until inevitable ruin overtakes both farmer and land. There are others whose average results are better but who are working areas just as unprofitable and who would do far better if they gave up cultivating such areas.

Other lands have not reached these depths but are continuing to deteriorate. They may with less difficulty be restored, but even the best land is liable to deteriorate under present conditions unless very definite steps are taken to maintain fertility. For some 25 years we have taken from the land all we could get, we have put back over that period negligible quantities of fertilizer and feeding stuffs and the bulk of the land has never had either. The time has passed when it was possible either on native or non-native lands to forsake deteriorated land and break new. and we have to face the issue of building up fertility on our arable lands or cease to exist as an agricultural country.

Cereal growers should not now lack money to enable them to improve their methods, and prices may be expected to he reasonable for some years to come. Acre yields must be raised if the country is to continue to support itself. How can this be done? We have talked of terracing as the answer, of manuring, of grass leys, of phosphatic fertilizer, each of which has its advocates. Not one of these practices alone will save our land, but together, and with the proper use of live stock, they can. We must ensure that the soil remains on our fields and that the soil structure is of such a nature that it will remain, and that it will retain water supplies adequate to bring a crop to maturity. We can afford to neglect no opportunity to improve our soils by the methods noted above nor by making the utmost use of slock in the maintenance and improvement of fertility, for which purpose supplementary feeding with foodstuffs imported on to the farm and home-grown forage, silage and hay crops must all play their part. While it is true that we farm under certain disabilities, such as rainstorms of great intensity and a burning sun, we have corresponding advantages —particularly the capacity to produce large quantities of bulky and nutritious forage crops and the opportunity to purchase cheap concentrated foodstuffs, of which the maximum use must be made.

NATIVE AREAS

Much has been written and spoken about the present condition of native reserves, in particular of Machakos district, and the causes which have led up to this state of affairs are well known. A most disquieting feature of the problem is the fact that internal demands for the staple food of the African—maize—are now so high that relatively fertile native reserves have, in present circumstances. to be drained of their fertility to meet the needs of those districts which are not now in a position to feed themselves. The Machakos district, in particular, will have to be a large importer of grain for many years to come, but a halt must be called as early as is possible to a policy which, while admittedly necessary during war years, is rapidly bringing about in those areas used as suppliers of grain the same conditions of desolation as now exist in many of the native reserves of the Colony.

From the agricultural point of view no radical change for the better can be expected until a solution can be found to certain basic problems. It is clear that the aim must be a drastic reduction, in native areas, of the acreage annually planted with maize and the introduction of grass leys as an integral part of the farming system. Stock and stock products must to an increasing extent be looked to to provide the necessary family income. Before any such system can be introduced, however, an outlet must be found for surplus populations, for many areas are at present carrying a population density which, from agriculture alone, could not be supported under any system of farming. These areas are low in inherent soil fertility and they are further handicapped by indifferent rainfall. Again the introduction of grass leys, shortened though they might be by the proper and adequate use of manure, must entail a reduction in cash income since grassland is not as productive in terms of cash or food returns as is arable land. This is in conflict, therefore, with the desire of the Government—and indeed of the people themselves—to encourage and to adopt a higher standard of living, for which purpose an adequate cash income is of vital necessity.

To effect an immediate solution of a problem of this complexity is obviously impossible; there are certain main lines of work, however, which should be and are being undertaken. Some are long range in scope, while others are of more immediate application in that they are designed to arrest, in so far as is practicable, further deterioration under existing conditions. From the long-range aspect investigations have been begun into the possibility of obtaining additional suitable land to which surplus populations could be moved and in which they would farm under strictly controlled conditions. Problems of bush clearing, fly elimination and the provision of adequate water supplies are major factors which will have to be overcome before any material progress on these lines can be made. Of immediate application are such works as terracing, the introduction and use of manure, grass planting, the closure of areas to grazing and the protection of the banks of rivers and streams. In this connexion the following extracts from reports of Agricultural Officers working in native areas are of interest: —

"In Kiambu district there is a rapid awakening taking place to the urgency of maintaining soil fertility and already ample proof has caused the tribesmen to purchase £2. 000 worth of imported *boma* manure. This is an expensive expedient, but they realize it is the quick way to get their worn-out land back to production. The beneficial effect of grass pasture is less spectacular, but already a number of men are seeking cash from dairy farming and are planting grass for increased feed for their cows. In turn we shall hope to see grass leys put down in the rotation to serve a broader purpose. "

Fort Hall District: "Though great progress cannot be reported and land mining for low-priced crops like maize is still the order of the day, there is

at least a growing realization of the value of manure. In the upper areas, where there is a great increase in grade cattle and sheep, more and more owners are housing their beasts at night for the improvement of their health, if not for the manure."

Dealing with anti-soil-erosion and soil conservation measures in the Central Province, the Senior Agricultural Officer writes: "Most of that work is done by voluntary labour, either by community organization or by individuals on their own land, A very small proportion is done by paid labour from the funds of Local Native Councils and Goverment and is restricted to selected areas and demonstration centres or for the purchase of tools. As there was no increase of staff over the previous year the improvement in attainment indicates the change of attitude which is growing rapidly amongst the cultivators".

	1944	1945
Narrow base terraces	4,680 miles	6,922 miles
Live wash stops (Meru only)	177 miles	152 miles
Area strip cropped	21,317 acres	13,550 acres
Spill drainage ways—grassed	1,464	1,299
Cattle tracks repaired	384	115
Eroded land closed to grazing (approx.) , .	26,400 acres	35,942 acres
Land planted to grass (approx.)	8,005 acres	13,700 acres
Grass paddocks made	3,207	2,739
Dams built and completed	10	14
Cattle sheds built	253	1,310
Land contour-planted with bananas	57 acres	43 acres
Compost pits made	No record	12,495

In such work as grass planting it is impossible to record the total attainment, since much of it is done by individuals. Meru had its first organized grass-planting week, which was enthusiastically taken up late in November, but much of it died due to the early return of dry conditions. In terracing, Kitui is outstanding in having done 786 miles in the first year of this work, which eclipses the Machakos effort of only 572 miles. Embu records 2,640 miles and Kiambu 1,422 miles, but Fort Hall—a late starter—did a total of 3,479 miles. There is quite a variance in quality of work from district to district, depending largely on the daily task marked out for the workers. The workmanship in Fort Hall is average and done over two days tasks per week with the task small enough to allow the workers to finish before 9 a.m. By this method the daily village activities are uninterrupted.

Agricultural committees are doing much to organize and enthuse workers in the urgency of saving the soil, and parties from districts have had the opportunity of examining methods and work in neighbouring districts. After a three days trip to Machakos by five chiefs and elders of South Nyeri, they vowed they would do their best to prevent such a condition arising in their own district through unwise use, laziness and denudation.

The most outstanding committee is perhaps the one in the Chura Division of Kiambu and is described by the Assistant Agricultural Officer as follows:—

"The committee appears to be formed by a number of members from each *Itura,* the whole under a chairman and secretary. The committee select the areas which they consider should receive priority; they then demarcate arbitrary lines cutting off slopes too steep for anything but grass and/or indigenous trees and below this line the land is immediately terraced and discharge drains selected.

"The Agricultural Officer who, naturally, is not a member, is then invited to inspect the layout and make suggestions for any alterations needed. Instructors come directly under the supervision of the committee, who appear to work them not only well but hard.

"Meetings are held once a month and the District Commissioner and Agricultural Officer invited to attend. These meetings have been interesting as the committee is anything but a body of yesmen and ideas put forward are constructive and well reasoned. It is amusing and gratifying to sec the late left wingers being the most assiduous workers and willing co-operators."

The strip cropping, as recorded above, is almost entirely being done in Fort Hall and the Assistant Agricultural Officer writes as follows: —

"A considerable proportion of the terracing done has been with a view to carrying out strip cropping. The principle of alternate strips of *shamba* and grass has not had universal support from these land-hungry people, but a considerable amount has been planted to grass, even though every alternate strip may not have been. Some people are beginning to appreciate the soundness of growing a strip of good grass, then folding their beasts on it to restore fertility and feed the beasts at the same time. Considerable progress is expected. All terracing in reclamation areas which are for grassing and closing to cultivation is planned for strip cropping. When the fertility is restored to a sufficient extent to permit of re-cultivating, only alternate strips may be opened up."

In respect of the Nyanza Province the Senior Agricultural Officer's report presents a less favourable picture. He writes: "Little real progress on permanent lines can be reported, although broad-base terrace construction has continued in Kitosh. In South Kavirondo the laying of trash lines (along the contour) has been extended to the Luo country only by administrative pressure. In Kericho district a realization of the dangers of soil erosion is apparent with the Kipsigis, but little in the way of remedial measures has yet been achieved. By far and away the greatest obstacle to soil conservation is the apathy of the native authority. Before the production drive in 1942 some real progress had been made, but since officers' duties have had to be largely diverted from soil conservation to food production the native administration has slackened its puny efforts".

In the Coast Province the only really active work in soil conservation was carried out in the Teita hills, where some 2,700 acres were contour-pegged; of this area, contour banks were completed over an area of 2,300 acres, in addition to live wash-stops planted over 300 acres.

AGRICULTURAL EXPORTS IN 1945

The total value of agricultural produce exported in 1945 amounted to £4.720,215, as compared with £3,883,397 in 1944 and £3.235,718 in 1939.

Major increases were of bacon and ham, butter, sisal, maize, wheat and flour while substantial decreases occurred in hides, skins, cotton and flax.

TABLE A

QUANTITIES OF AGRICULTURAL COMMODITIES THE PRODUCE OF KENYA EXPORTED DURING THE YEARS 1941 TO 1945 INCLUSIVE

COMMODITIES	UNIT	1941	1942	1943	1944	1945
ANIMALS, LIVING—						
Cettle	No.	43	28	–	3	–
Sheep and Goats	No.	2,037	977	36	149	538
ANIMAL Products-						
Bacon and Ham	Cwt.	1,057	1,353	1,333	2,442	2,954
Beeswax		751	62	200	–	399
Butter		11,858	12,056	2,649	5,706	14.402
Cheese		336	414	77	96	213
Ghee		1,659	1.442	46	42	2,305
Hides (Shade dried)		44.820	37,159	44,352	33.198	26,958
Hides (Sun dried)		18,976	11,895	15,370	12.298	8,057
Skins (Sheep and goats) (shade dried)	No.	601,385	601,141	676,205	593,261	355,771
Skins (Sheep find goats) (sun dried) . .	No.	1,350.533	923.544	985.675	898,120	499,977
Wool	Centals	7J	–	6,856	8,315	22
CROP PRODUCE—						
Coconuts and Copra	Tons	36	31	159	246	40
Coffee	Cwt.	248,435	247.328	156,762	149,667	149,297
Cotton . .	Centals	42,123	33,692	26,030	22.803	16.053
Sisal	Tons	21,563	32,445	25.874	27.166	28,531
Flax		715	898	950	1,138	646
Beans	Cwt.	133,126	156,883	2.981	3,574	30,327
Maize		507,038	278,082	83,737	43,046	1,077,238
Maize meal and Hour		152,141	133,820	37.780	43,820	16,583
Pulses other than beans		4,664	5.529	146	289	18,815
Wheat		1,300	1,654	905	4,465	201,179
Wheat flour		77,347	74,626	105,882	158,656	120,010

TABLE A

QUANTITIES OK AGRICULTURAL COMMODITIES THE PRODUCE OF KENYA EXPORTED DURING THE YEARS 1941 TO 1945 INCLUSIVE

COMMODITIES	UNIT	1941	1942	1943	1944	1945
CROP PRODUCE—Contd.						
Grain, other than maize and wheat	Cwt.	39,160	55,697	8,556	46.352	110,458
Groundnuts	Tons	1,266	1,258	20	-	-
Linseed		59	—	13	157	1
Cashew nuts	Tons	48	44	41	46	25
Sesame	,,	553	12	-	-	3
Coconut oil	Imp gal.	122,972	59,200	6,296	20	115
Essential oils		1,670	998	713	5,051	5,856
Groundnut oil ..		7,764	12,767	15,725	-	20
Sesame oil	,,	52,484	46,365	876	7	40
Potatoes	Cwt.	87,877	14,962	21,871	57,375	117,920
Pyrethrum		127,203	105,448	72,269	115,126	108,187
Sugar	,,	47,334	56,906	33,222	17,155	27,566
Tea		92,592	102,854	85,074	82,480	85.052
Wattle Bark		187,889	130,977	127,944	216,076	184.859
Wattle Extract		145,155	190,879	139.934	185.663	171,163
Passion Fruit juice	Imp. gal.	15.579	10. 062	8.807	8.957	5,042
Rubber, plantation and wild	Centals	148	650	4.673	2,177	1,840

VALUES OP AGRICULTURAL COMMODITIES THE PRODUCE OF KENYA EXPORTED DURING THE YEARS 1941 TO 1945 INCLUSIVE

COMMODITIES	1941	1942	1943	1944	1945
	£	£	£	£	£
ANIMALS LIVING—					
Cattle	110	80	–	17	–
Sheep and goats	1,651	715	30	118	477
ANIMAL PRODUCE—					
Bacon and Ham	7,876	9,533	9,757	19,171	25,852
Beeswax	5,306	572	1,750	–	3,362
Butter	65,718	67,360	18,450	39,969	98,402
Cheese	1,720	2,055	410	502	1,170
Ghee	7,316	5,784	263	379	18,458
Hides (shade dried)	152,705	162,440	185,547	138,033	114,474
Hides (son dried)	39,277	32,341	39,267	31,253	20,678
Skins (Sheep and goats) (shade dried)	36,285	42,864	49,842	45,456	32,940
Skins (Sheep and goats) (sun dried)	70,778	56,362	57,549	52,540	28,749
Wool	142	–	27,445	33,425	168
CROP PRODUCE—					
Coconuts and copra	213	288	819	991	124
Coffee	575,259	699,308	562,651	528,844	639,433
Cotton	120,352	91,709	157,520	163,115	104,805
Sisal	399,934	593,367	555,563	707,746	769,494
Flax	73,055	89,968	102,351	123,750	72,486
Beans	78,503	117,695	1,625	2,254	27,533
Maize	133,118	69,742	28,655	15,178	458,294
Maize meal and flour	34,921	34,667	14,406	16,738	7,207
Pulses, other than beans	2.742	4,071	255	602	26,130
Wheat	529	869	794	3,214	166,319
	1,807,510	2,032,296	1,814,949	1,923,295	2,616,555

QUANTITIES OK AGRICULTURAL COMMODITIES THE PRODUCE OK KENYA EXPORTED DURING THE YEARS 1941 TO 1945 INCLUSIVE

COMMODITIES	1941	1942	1943	1944	1945
	£	£	£	£	£
Totals Brought Forward.....	£1,807,516	2,082,296	1,814.949	1,923,295	2.616,555
CROP PRODUCE—Contd.					
Wheat flour	68,327	69,240	117,750	181,612	153,950
Grain, other than maize and wheat . .	11,506	24.369	3,119	22,805	97,532
Groundnuts	20.850	20,857	350		
Linseed	2,137		498	3,408	14
Cashew nuts	4,115	5.403	5,413	6.507	7,534
Sesame	7,633	152			84
Coco-nut oil	10,884	6,765	1,072	5	29
Essential oils	14,470	9,383	6,091	12,128	17,074
Groundnut oil ..	1,177	2.426	3,045		8
Sesame oil	8,055	8,388	181	2	14
Potatoes	29,820	5.836	13.856	33,248	62.007
Pyrethrum	689,323	510,169	461,217	835,289	792,895
Sugar	32,586	38,902	27,320	16,088	27,521
Tea	541,725	629,481	512,146	512,628	532,447
Wattle Bark	72.723	48,345	50,440	93,034	89,448
Wattle Extract	120,072	155,256	124,448	173.962	165,103
Passion Fruit juice	4,137	2,817	2,569	2,714	1,685
Rubber, plantation and wild	364	6,316	27,736	11,814	14,900
Other Agricultural produce	95,909	100,359	48,628	64,858	141,415
TOTAL	3,543,329	3.726,766	3,220,828	3,883,397	4,720,215

CROPS

Coffee,—The 1944-45 crop amounted to 6,200 tons valued at £669,600, the crop for the previous year being 4.994 tons. The average payout to producers by the Coffee Control was Sh. 93/77 per cwt. (Sh. 87 per cwt. in 1944V The 1945-46 crop is estimated at 6,750 tons.

the small crop harvested in 1944-45 and the estimated small crop for the 1945-46 season are due to a continuation of the drought conditions throughout the main coffee areas. In addition to the unfavourable weather conditions experienced during the past four years, the industry has been faced with great difficulties in plantation management due to lack of European supervision, shortage of labour and inability to obtain essential requirements, notably manures and spray materials. That the present position is no worse reflects credit on the industry as a whole. Towards the end of 1945 the general position showed some improvement and a feeling of confidence in the future prevailed.

In areas east of the Rift the lower zones have suffered severely, but at higher altitudes moderate to good crops were harvested. The total crop from areas west of the Rift was small, largely due to the neglect of plantations during recent years in response to the appeal for maximum production of cereal crops. A revival of interest in coffee in these areas was, however, apparent during the year.

The small area of African grown coffee, being situated in more favourable rainfall zones, has yielded good returns and an increased interest in this crop is evident.

Maize.—The 1944 non-native crop yielded 839,276 bags from 119,734 acres, giving an average yield per acre of seven bags. The previous year's crop amounted to 729,917 bags from 107,686 acres. For the 1945-46 season 929,000 bags are expected from 131,563 acres.

Deliveries to the Control during the year were as follows: —

Non-native	545,515 bags	(1944: 401,378 bags)
Native (Nyanza)	716,459 bags	(1944: 646,924 bags)
Native (other)	99,990 bags	(1944: 16,151 bags)

Exports other than to Tanganyika and Uganda, which are participants in the Cereals Pool, amounted to 394,790 bags of maize and 8207 bags of mixed meal, 219,926 bags of meal were delivered during the year for famine relief within the Colony and 198,928 bags of meal were supplied to the Military.

The price to the non-native farmer for the higher grades was Sh. 13 per bag f.o.r sender's station, with a grant of Sh, 7/50 per acre for acreage authorized to be planted and a bonus payment for delivery in excess of a target figure of 400,000 bags of Sh. 7 a bag. The native received the equivalent of Sh. 13 a bag with a bonus payment of Sh. 7 a bag for deliveries in excess of 800.000 bags. This was not paid to the individual producer but into a fund for the benefit of the native areas concerned.

Wheat.—The 1944-45 non-native crop produced 593,286 bags (200 lb.) from 160,171 acres, an average yield of 3.7 bags per acre. The previous year's crop totalled 712,841 bags from 139,905 acres, an average yield of 5.1 bags per acre. From the 1945-46 crop 850,(KM) bags are expected from 184.500 acres.

The price received by the farmer for Grade 1 wheat was fixed at Sh. 27/50 per bag f.o.r. sender's station.

Flax.—Production during the year amounted to 228 tons of fibre and 401 tons of tow, giving a proportion of fibre to tow of 1 to 1,76. In addition to disappointing quality, yields from 1944 plantings were poor, averaging only

0.38 cwt. of fibre and 0.67 cwt. of tow per acre. Prices remained as in the previous year, averaging £176 per ton for fibre and £82 per ton for tow f.o.b. Mombasa.

The total gross value of flax and tow exported from Kenya since the revival of the industry in 1939 amounts to some £560,500.

The following extract from the report of the Flax Board is of interest:—

"The 1944 crop scutched in 1945 did not come up to expectations and was not calculated to enhance Kenya flax on the home market in regard to quality or quantity.

Vagaries of climate, together with insufficient and unskilled farm labour render flax growing somewhat of a gamble in most districts, whilst there is no doubt that high prices and quicker returns from other crops do not encourage growers to devote the extra care and supervision required by flax.

The crop grown in 1945 also had to contend with certain adverse factors; in some areas hail ruined considerable acreages, but that which escaped is probably the best crop experienced during the past three or four years, due to a great extent to excellent harvesting weather. Flax, unlike other crops, however, must again be subjected to weather conditions during the retting process and much will depend upon these conditions, together with the care exercised by planters, as to the eventual success of the crop."

Sisal.—During 1945 the whole of the production of sisal continued to be under the control of the United Kingdom Ministry of Supply. Small quantities of exportable fibre and all unexportable grades were purchased locally, mainly by Sisal Products (E.A.), Ltd., for the manufacture of bags, ropes and twines for internal use. Production from an area of 193,539 acres totalled 31,682 tons, but although 1945 production was greater by some 500 tons over 1944 there was a further marked reduction in the out-turn of long grades. This is due to the serious shortage of labour which prevented the proper maintenance of sisal areas and to the heavy cutting which has been necessary to maintain maximum production. Rotational planting is also behind schedule on many estates, again due to shortage of labour which must adversely affect future production prospects.

Tea.—Rainfall in most production areas was again below average and distribution was irregular, crop production was, in consequence, adversely affected. Total production during 1945 amounted to 13,023,000 lb compared with 31,789,000 lb. in 1944.

After providing for internal, civil and military supplies and the requirements of adjacent African export markets the balance of the crop. 5.850.000 lbs. was supplied to the Ministry of Food under contract.

The weight averaged f.o.b. contract price was 13.29 pence per pound. The Department of Agriculture continued throughout the year to carry out the duties of Tea Commissioner—the East African Agent of the Ministry of Food.

Cotton.—The 1944-45 crop amounted to 5,405 bales of 400 lb. This compares with a crop of 6,330 bales in the previous season. The reduction in the cotton crop during the war years, in both the Nyanza and the Coast Provinces, has been very largely due to the necessity of concentrating on the maximum production of cereals and oilseeds.

Pyrethrum.—Deliveries of dried flowers to the Agency appointed under the Pyrelhrum Ordinance amounted to 7,409 tons from 52,837 acres. The Ministry of Supply's contract price of Sh. 1/25 per lb. for Grade I flowers to the farmer remained unaltered throughout the year. Production of pyrethrum during 1945 and the steady increase in output which has taken place during the past few years is evidence of the satisfactory response which has been made by farmers to the call for maximum production of this commodity.

The following figures, taken from the annual report of the Pyrethrum Board showing deliveries by growers are of interest: —

Year	*Tons*	*Year*	*Tons*
1938 ..	1, 864	1942 ..	5, 469
1939 .	2, 869	1943 ..	4, 107
1940 ..	5, 859	1944 ..	6, 547
1941 ..	5, 763	1945 ..	7, 409

Passion Fruit. —During the year ended the 31st July, 1945, export sales amounted to 8, 408 gallons of juice with 1, 098 gallons sold on the local market. The net pay-out to growers during the year was increased from 4 cents to 5. 4 cents per pound of fruit. The demand for passion fruit juice from both overseas and interna] markets continued to expand.

Potatoes. —, Deliveries to the Control were as under: —

Non-native	5. 647 tons	(1944: 5, 220 tons)
Native.	21, 744 tons	(1944: 15, 980 tons)
Total	27, 391 tons	

Of the total production a large proportion was supplied to meet the demand of H. M. Forces, either as fresh potatoes or as a dehydrated product through the to Dried Vegetable Factories at Karatina and Kerugoya. 66, 000 bags were exported.

Miscellaneous Cereals. -—Acreages and production in 1944-45 and estimated for 1945-46 in non-native areas are as follows: —

	1944-45		1945-46		
	acres	*bags*	*acres*	*bags*	
R y e	13, 057	24, 862	4, 716	153	(200 lb.)
B a r l e y	12, 171	54, 269	10, 476	66, 143	(180 lb.)
O a t s	8, 085	44, 246	4, 609	32, 330	(150 lb.)

The decline in rye acreage and yield istricts.

Deliveries of millets from native areas included 8, 613 bags of sorghum, 23, 164 bags of finger millet andis due to the appearance of a new rust

disease of this crop which caused a complete failure in 1945 in the Trans Nzoia, Uasin Gishu and Nakuru d 7, 431 bags of bulrush millet.

Pulses. —In non-native areas the recorded acreage under beans decreased from 4, 036 acres to 2, 967 acres and under peas from 855 to 626 acres. Yields in the Central Province of native-grown beans and peas of all types were poor and the greater part of the harvest was consumed internally. Approximately 40, 000 bags, of a value to the grower of £84, 000, were sold from producing areas. In Nyanza Province yields of beans were also poor, though 300 tons of cowpeas were marketed.

Rice. —Rice purchased by the Control during 1945 amounted to 18, 700 bags of paddy from the Nyanza Province and 3. 842 bags of paddy from Taveta. Production was. however, considerably in excess of this but was largely consumed or marketed locally.

Oil Seeds. —In South and Central Kavirondo districts yields of groundnuts were poor and the acreage under this crop reduced. The simsim crop in the three Kavirondo districts was disappointing. Purchases by the Control amounted to 7, 500 bags of groundnuts and 5. 621 bags of simisim.

Coco-nuts and Copra. —Although the price of copra remained at Sh. 6/50 per frasila for local and Sh. 6/75 per frasila for plantation, sales dropped from 1, 069 tons in 1944 to 225 ions in 1945, The main reason for this is reported to he the

production of *tembo* in the Mombasa area, which would account for the loss of 1,500 to 2,000 tons of copra per year. High prices were paid for whole nuts, the control price for which was eight cents each. Very much higher prices than the control price were, however, obtained by growers—one grower alone in the Digo district disposed of 650,000 nuts in 1945.

Rubber.—The collection of wild rubber, under the organization set up by the Department for this purpose, continued throughout the year in the Coast Province, as did the collection and reconditioning of flotsam rubber. Production of Ceara rubber was maintained on three small estates operated by the Department and on two estates in private ownership.

Total production of wild and flotsam rubber amounted to 126,000 lb. and Ceara 153,866, or 125 tons in all.

Vegetables.—Production of dehydrated vegetables from the two factories at Karatina and Kerugoya amounted to 2.050 tons, an increase of some 400 tons over the previous year. Native growers in the Kiambu district continued to supply the Nairobi market and the East African War Supplies Board with vegetables to a total annual value estimated at £100,000. Native vegetable production in the Teita hills, supplying the Mombasa market, amounted to 2,000,000 lb. a considerable reduction from the 1944 figure of 3,000,000 lb.

Wattle.—Exports of bark and extract were slightly lower than in 1944: bark 184,859 cwt. (1944: 216,076 cwt.); extract 171,163 cwt. (1944: 185,663 cwt.)

The quality of native grown bark has on the whole been maintained at a high standard, but some from non-native sources was of very poor quality.

Sugar.—From the five factories established in the Colony 8,187 tons of sugar were produced from an acreage estimated at 8,460 acres. Some two million pounds of jaggery were also manufactured from an unknown acreage. With the severe drought early in the year yields of cane were again poor.

LIVE STOCK PRODUCE

Butter.—Creamery production for the year ended 30th June, 1945, amounted to 5,116,054 lb., an increase on the 1944 production of 4,404,869 lb. The pay-out to farmers remained constant at Sh. 1/50 per pound. The drought in the early-part of the year led to greatly reduced yields of both milk and butter-fat, but with good rains later the position rapidly improved. Steady development continues in the Naivasha-Thomson's Falls area and these creameries, with Nanyuki, produced nearly 70 per cent of the total creamery butter manufactured in the Colony.

Creamery production of cheese amounted to 536,850 lb.

Eggs.—The controlled marketing of native eggs in both the Nyanza and the Central Province continued satisfactorily, but with decreasing military demands consideration of the future of the egg industry is a matter of urgent necessity.

Figures of native eggs marketed during 1945 are as follows:—

	Number	*Value to Producer*
Central Province	9,290,743	£58,000
Nyanza Province	5,717,675	£20,000
Total..	15,008,418	£78,000

Corresponding figures for 1944 were a total of 6,709,386 eggs valued at £22,500.

Hides and Skins.—Exports were as follows:—

	1945	1944
Hides (shade dried)	26,958	33,198 cwt.
Hides (sun dried)	8.037	12,298 cwt.
Skins (shade dried)	355.777	593,261 No.
Skins (sun dried)	499,977	898,120 No.

Live Stock for Slaughter.—During the year purchases by the Control authorities were as under (the corresponding figures for 1944 are given in brackets):—

	Non-native	*Native*
Cattle	21,934 (17,150)	72,275 (133,553)
Sheep and lambs	27,045 (29,739)	—
Sheep and goats	—	143,583 (159,513)

In regard to pigs, during the year ended 30th June, 1945, deliveries of baconers and larders to bacon factories were 30,786 and purchases of porkers by the Control amounted to 17,002. a total of 47,788.

Poultry.—215.059 birds were passed for sale through inspection centres in the Central Province, the value to the producers being £25.729. The figure is more than double that of 1944.

Wool.—Sales by farmers amounted to 14,722 centals of 100 lb., with an average value of Sh. 1/10 per pound.

LOCUSTS

The outbreak of the swarming phase of the Desert Locust *iSchistocerca gregaria)* which began in December. 1942, continued throughout 1945 and by the end of the year there was still no indication in the East African area that the outbreak was diminishing. The hopper campaigns organized in Kenya and in neighbouring territories kept the swarm population in Kenya at a low level and no serious loss of crops occurred, in fact, by September, 1945, there were fewer swarms in Kenya than there had ever been during the outbreak.

Four hopper campaigns, the sixth to ninth, were organized and undertaken during the year, of which the sixth started in 1944 and the ninth ended in 1946. A feature of the year was the development of the civil effort to replace military assistance which had to be withdrawn consequent on demobilization at the end of hostilities.

The Sixth Locust Campaign.—The sixth locust destruction campaign, which involved all districts of the Northern Frontier District as well as Samburu, Tana River, Baringo, Meru, Embu, North Nyeri. Kitui, Machakos, Malindi, Teita, Digo, Magadi, Kajiado and Turkana districts and Southern Borana in Ethiopia, began at the end of October, 1944. and continued until February 23rd, 1945.

During this period seven companies of African Pioneer Corps operated in the Northern Frontier District, Samburu and in Borana. Ethiopia, Civil forces on locust destruction in Kenya numbered about 16,500 Africans and 60 Europeans, while the transport consisted of 100 civil and 500 military vehicles. The bait used during the campaign was either cotton-seed husk, which was used almost entirely by the Army (42,100 bags), or coffee-husk bait, which was used almost entirely by civil forces (46,600 bags). Civil forces operated over about 5,000 square miles of infested country, beating, burning and baiting, while the Army covered over 6,000 square miles by baiting.

The campaign was a successful one and few swarms of large size resulted from Kenya escapes, although further swarms from Somalia and Ethiopia entered Kenya. An unusual feature of this invasion was that many of the Ethiopian swarms entered Northern Turkana by way of the Omo Valley, and this resulted in an unusually heavy hopper infestation for that area during the ensuing campaign.

The Seventh Locust Campaign.—The seventh campaign (long rains, 1945) which was on a very much smaller scale than previous long rains campaigns, involved only Turkana. West Suk. Elgeyo. Baringo and Samburu districts. Locust destruction also took place in itemi Triangle (Sudan), in Karasuk and Karamoja (Uganda) and in Borana (Ethiopia). The usual heavy long rains infestation of the Northern Frontier District did not occur and only very small areas of Western Marsabit and Western Isiolo were affected. Locust destruction began on May 25th and ended on August 27th.

Two companies of African Pioneer Corps were engaged on the campaign in Turkana, but elsewhere civil forces, including 29 Europeans and about 8,000 Africans, were sufficient to deal with the infestation and, for the first time, the civilian effort exceeded that of the military in all aspects of the campaign. Military forces used 5,900 bags of bait and covered about 1,400 square miles of infested country, while the civil covered about 5,600 square miles and used 8,400 bags of bait.

Dinitro-ortho-cresol was introduced into the hopper destruction campaign on a field scale, both as a water-suspension spray and as a dust. Its use as a dust showed economies in manpower, transport and material in remote, difficult and almost waterless country. Very few sizable adult swarms resulted from this, campaign and no crop damage was reported anywhere in the Colony.

The Eighth Locust Campaign.—The eighth campaign (interim rains), which is normally on a very large scale in Turkana, was only small in that district—Samburu bearing the main brunt of the infestation, which also involved Western Isiolo for the first time. No military assistance was required and this was the first campaign employing only civilian forces in Kenya during the present outbreak.

There was practically no break between the end of the seventh and the beginning of the eighth campaign, owing to the Turkana interim rains being almost continuous with the long rains. The campaign ended on 28th October. Twelve Europeans and 2,390 Africans were engaged in hopper destruction covering an infested area of about 1,500 square miles, 1,163 bags of bait being used and 800 1 cwt. drums of D. N. O. C.

Only six swarms, three of which were small, resulted from this infestation. The number of locusts in the Colony was reduced below anything yet achieved during the present outbreak. Large numbers of immigrant swarms entered Kenya from October onwards from Somalia and Ethiopia, with the result that the ensuing campaign in Kenya was heavy.

The Ninth Locust Campaign.—The ninth campaign, which began at the beginning of November, involved the whole of the Northern Frontier District. Samburu, Turkana. Tana River. Kitui. Meru, Embu. Machakos, Voi. Taveta, Malindi, Kilifi and Digo, and continued into February, 1946. The campaign was undertaken almost entirely by civilian forces, but 373 African ranks and seven Europeans were made available by East Africa Command to assist in the southern areas of the Northern Frontier District and in Samburu. which help was much appreciated. Poison bait was the chief control method, but D. N. O. C. was also used on a considerable scale.

Unfortunately the forces available, particularly of European supervisors, were inadequate and the greatest number of escapes so far resulted—especially from Garissa district, which had a very heavy infestation. The resulting swarms have made their way to the south and south-east and many entered Tanganyika.

In general, it may be said that the action taken in the whole of the East African area so reduced the infestation that damage to crops in Kenya was negligible during the year. It is certain that lack of action would have resulted

in widespread destruction of crops with consequent famine or, alternatively, it would have been necessary to have endeavoured to import food on a large scale which would, in all probability, not have been possible in the conditions prevailing. The satisfactory results achieved were directly due to the excellent work and effective co-operation of all concerned; the Army, the Administration and the staff especially engaged for locust work. It has now been proved that, with such co-operation. locusts can be controlled over the whole of Kenya, despite all the great difficulties of terrain. It is to be recorded that the country owes a debt of gratitude to the Administration for the organization of locust control in the districts and to the Army for carrying out much of the work.

CROP PRODUCTION

The following tables give details of native produce sold for export from the producing areas during the year and values to producers. It will be understood that the figures given in no way represent total production for the reason that, in the case of food crops, by far the greater proportion of the total crop is consumed by the growers themselves.

CENTRAL PROVINCE

	Unit	1944		1945	
			£		£
Maize and Maize meal	Bags	16, 151	7, 268	3, 077	1, 511
Millets		–	–	7, 431	7, 452
Wheat		4, 909	4, 939	4, 743	5, 052
Legumes		38, 193	65, 538	39, 663	84, 014
Potatoes		25, 019	14, 020	93, 872	52, 014
Pyrethrum		–	–	–	3, 000
Tobacco (Fluecured green)	lb.	1, 268, 381	2, 677	1, 571, 896	3, 174
Tobacco (Native cured)	,,	100, 000	22, 994	266, 000	26, 000
Coffee (Parchment)..	Tons	38	2, 192	20	2, 103
Vegetables, fruit and flowers (approx)..		–	141, 960	–	116, 500
Bananas (approx) (inc. in Misc. in 1944)..	Tons	–	–	3, 800	17, 076
Onions	Fras.	15, 780	5, 500	6, 659	1, 197
Beeswax	,,	1, 298	2, 611	500	1, 170
Wattle Bark	Tons	24, 459	109, 578	22, 050	102, 246
Fuel and Poles (approx)	,,	–	25, 200	98, 800	24, 700
Charcoal	Bags	–	21, 700	282, 694	23, 265
Hides	Fras.	12, 980	10, 143	19, 397	20, 347
Skins	Scores	5, 295	5, 498	13, 277	16, 115
Ghee..	Fras.	693	74	190	475
Pigs.	No.	1, 778	4, 908	1, 326	3. 459
Poultry (table)		101, 943	12, 230	215, 059	25, 729
Eggs.		3, 226, 379	11, 242	9, 290. 743	58, 004
Miscellaneous			70, 00		5, 400
Dried Vegetable Project	lb.	40, 400, 614	49, 391	-	71, 506
			£ 589, 654		£ 671, 509

Stock sales to the Supply Board

Cattle estimated at 50/- per head.	16, 640	16, 600
Goats and Sheep estimated at 10/- per h e a d	74, 044	37, 022

Grand Total.. £ 725, 131

NYANZA PROVINCE

	Unit	1944		1945	
			£		£
Seed Cotton	lb.	6,306,652	40,370	5,775,207	43,605
Maize . .	bags	646,924	252,966	640,550	259,682
Beans/Cowpeas	,, ,,	227	113	3,700	5,779
Choroko	,,	107	182	1,608	2,814
Potatoes	,,	18,404	6,902	17,293	7,133
Simsim	,,	681	750	4,530	4,282
Groundnuts	,,	9,587	10,545	7,623	7,547
Rice (paddy)	,,	26,259	15,755	25,608	16,389
Mtama	,,	72,602	29,122	8,613	3,513
Wimbi	it	8,592	3,555	23,164	18,130
Wheat	,,	2,224	2,224	1,635	1,635
Coffee	cwt.	337	1,100	1,632	1,000
Firewood			7,500		10,000
Vegetables			7,500		8,500
Ghee	tins	22,600	27,131	30,271	36,375
Eggs	No.	3,483,007	11,320	5,717,675	20,012
Dried Cassava	bags.			4,397	1,099
			417,035		447,405

In regard to the Coast Province the main items of produce sold for export from the producing areas were: —

		Value to Producer
Vegetables (Teita Hills)	2,000,000 lbs.	£9,440
Cashew nuts	250 tons	£2,270
Copra	223 tons	£4,460
Fruit, fresh (estimated)	— tons	£50,000
Cotton	1,074 bales	£10,000

PART II—POLICY AND WORK OF THE DEPARTMENT OF AGRICULTURE

In the report of the Department for 1939 a statement of the Department's policy was included. This report was. however, not printed and it appears desirable to re-state that policy.

While the general principles then enunciated need no alteration the emphasis on particular aspects of that policy have changed somewhat in the light of the events and developments of the war years. During the year under review a new organization has been set up *vide* Sessional Paper No. 3 of 1945, whereby a Member of Executive Council has been made responsible for Agriculture and allied services. This new organization had not got fully into its stride by the end of the year, but it had already shown important advantages both to the Department and to the agriculture of the Colony in that there is now possible a more forceful approach to Government and more rapid and direct decision on matters affecting the agricultural industry than there has been in the past. Matters of genera! agricultural policy have passed out of the hands of the Department to those of the Member, although the Department is responsible for advice on technical matters.

It will be convenient to deal with non-native and native agricultural policy under separate headings.

NON-NATIVE

The European farming community of Kenya is one of the most advanced in general education, knowledge and initiative, it is not to be expected, therefore, that the Agricultural Department could or should endeavour to impose a farming policy on such a community. Moreover, the institution- during the war years of the Agricultural Production Board provided an organization for the discussion and formulation of agricultural policy mainly at the hands of the European farming community itself.

The functions of the Department are rather to advise on the technical aspects of proposals under consideration in the light of knowledge and experience and to influence the community towards sound methods and a policy practicable under circumstances existing.

The policy that will finally be adopted by individuals and the community generally will be determined by themselves in the light of the information they have before them. It is therefore essential that the fullest information on all aspects be available. The basic policy must be to ensure that the land of the country is used to the best advantage, giving the best return to the individual farmer commensurate with the maintenance of fertility and the development of the Colony as a home for a prosperous European community. The main lines of this policy consists of: —

(1) The stabilization of farming practices and the endeavour to ensure that the practices generally adopted are those known or discovered to be best suited to the particular area concerned, having regard to the following factors: —

(a) the maintenance and improvement of fertility and the prevention of degeneration of the land;

(b) diversification of farming, giving a more balanced agriculture and enabling market fluctuations and labour requirements to be evened out by the results of such fluctuations being spread over a number of activities;

(c) the introduction and fostering of stock husbandry as an integral part of the system;

(d) the state of demand for produce, both internally and externally, and the price levels for such produce prevailing or anticipated.

(2) Standardization and improvement of the quality of produce for export.

(3) Introduction, selection and breeding of crop plants to fit them better to the farming economy.

(4) Protection of crops from pests and diseases by placing the means of protection within the reach of farmers and by the application of compulsion in cases where individuals expose their neighbours to risk of infection.

(5) Collection and dissemination of information regarding prices, markets, costs and methods.

To enable the above policy to be carried out effectively two main services are required: —

(a) a research and investigational service: and

(b) an extension service to bring the results of investigation to the knowledge of the community.

These services are provided—albeit inadequately—by the Department, and consist of the following branches: agricultural, economics, plant breeding, chemical, entomological and plant pathological sections, grassland research, coffee, sisal and pyrethrum research, and general agricultural investigation and experiment. The coffee, sisal and pyrethrum industries are closely associated with the investigational work carried out on these crops and contribute to its costs. Extension work is carried out partly by research officers and partly by agricultural officers, who themselves normally carry out some investigations adapted to local conditions and are in a position to convey the information secured by the whole of the research staff to farmers. The research officers are in close touch with the boards, committees or other bodies representing particular industries and are guided in their investigations by the requirements of these industries as put forward by these bodies or as seen by the Department to be necessary.

NATIVE

The more general question of land utilization has been referred to and a statement of Government's policy made in Sessional Paper No. 8 of 1945—Land Utilization and Settlement—and Departmental policy naturally accords with this. The agricultural problem in the case of the African community is. however, very different from that in the case of the non-native.

The African in Kenya has not yet arrived at a level of education which enables him of his own accord to plan his agricultural economy successfully. He has little knowledge of farming possibilities other than those sanctioned by age-long practice or picked up while he is labouring on European farms or taught him by Departmental officers. He has no means of gauging the effects of external factors on this economy. In his case, therefore. it is essential that his general farming policy shall to a large extent be dictated to him in the light of the experience and knowledge of officers of Government responsible for his welfare. Agriculture is the base and foundation of the whole existence of the native living within his reserve. Without prosperous agriculture, which may result in a reasonable standard of living, he cannot advance above a very low level in health, education or general welfare and an adequate and effective system of agriculture is therefore of the first importance to his welfare. Because education and nutrition both play an important part in agricultural improvement, close collaboration must exist between the Departments responsible for this direct social welfare work in the native areas, and because this work must always accord with administrative policy, the collaborative machinery must always employ the advice and assistance of the Native Administration.

A policy for African agriculture in the present stage of the development of the African must make provision for the following matters in the order given: —

fa) A sufficiency of food to maintain life or the means of obtaining such sufficiency.

(b) Maintenance and improvement of fertility to enable an increasing standard of production to be maintained.

(c) Adequate nutrition to ensure a healthy and energetic population.

(d) The production of marketable products from the land sufficient to enable those living by agriculture to obtain their cash requirements.

It is necessary to lay down the general lines of such a policy for the guidance of all concerned and to enable Government to ensure that all officers work towards a common aim, but such policy cannot be static and must change as circumstances demand, though it must also be continuous. The general lines which are advocated to put such policy into effect are: —

(a) In areas of reasonable rainfall the production of cereal and other food crops suited to the altitude and climatic conditions, grown in rotation together with such subsidiary crops as are desirable to provide adequately for nutrition requirements, and with grass leys on which are grazed the numbers of production stock that the land can carry without damage. Stock husbandry must be an integral part of the farming economy, both from the aspect of nutrition and the maintenance of fertility, and supplementary feeding of stock, mainly on forage crops grown on the farm, must keep pace with any increase in production capacity of that stock.

(b) In areas of lower rainfall, where arable cropping is uncertain, an economy based on dairying and the sale of dairy products, employing rotational grazing methods, the production of hay and forage for stockfeed, and such arable crops suited to the conditions as can be grown, such arable crops to be regarded as subsidiary to the main activity of dairying.

(c) The adoption of measures necessary to maintain fertility additional to those provided by good farming practice, such as contour-ridging of cultivated lands, the preservation of grazing areas by rotational grazing, the closing of slopes which are too steep for this purpose to cultivation, prevention of cultivation up to the banks of rivers, streams and roads.

The view is gaining ground, as the result of observation and experience, that co-operative efforts should be encouraged rather than individual holdings and that only as a result of some form of co-operative organization can the land be used to the best advantage and the living standard of the people and the productivity of the land be raised or even preserved.

The question of cash crops is a vexed one, but the native of Kenya is becoming accustomed, on an increasing scale, to living on a cash basis. Indeed at the present stage he must be in a position to obtain some of his returns in the form of cash. His first cash crop must and will naturally be in excess of some of the crop or crops he is growing for his subsistence. His production of such crops will vary according to climatic conditions and to his estimated needs in cash, and in favourable seasons he will produce a surplus which he will sell. But he is able to go further than this and over large areas of the country to produce additional crops for sale which he himself cannot consume, either because he does not require them for consumption or because they are of the type that he cannot consume directly—e. g. cotton or wattle. Having started to produce them he lends to increase his production to provide for his increasing

cash needs. This is a development which particularly needs direction, on the one hand to prevent soil deterioration and on the other to ensure that his food supplies do not suffer, although in less advanced areas the women always ensure the planting of a sufficiency of food crops. It has been argued on the one hand that such crops should not be encouraged because of the possible effect on labour supplies and on the other hand that they should be increased in order to advance the standard of living, and that where cash crops can be efficiently produced they should be grown and food should be purchased. The real argument on which policy must be based is the effect on the land and on the people. It is evident that so long as the fertility of the land does not deteriorate and the nourishment of the people is adequate cash crops should be encouraged.

Such a policy involves work by the Agricultural Department on lines somewhat similar to those described in the case of European agriculture, and in particular to: —

(a) Investigational work to determine—

(1) the crops best suited to particular areas:

(2) how these crops can best be fitted into a system of farming that will maintain and increase fertility and will conserve the soil;

(3) methods of conserving the soil suitable to the small or communal holding:

(4) the types of stock and methods of managing them that will fit best into the systems;

(5) what new crops or varieties of crops can be introduced or bred to fit the needs better than existing crops;

(6) an extension service to endeavour to ensure that practices known or proved to be sound are adopted.

The extension service has in the past made use of demonstration, precept and, in certain cases legislation. The results of some 25 years' work on these lines has been to indicate clearly that unless some direct pressure is applied to urge improved methods and practices and unless such pressure is continuously applied the results obtained are extremely slow. Localized improvements obtained by the devoted work of individual officers have by no means made up for. or even halted, the general deterioration rapidly going on. While changes in method should not be too immediate and radical and should be based as far as possible on existing customs and tribal organizations and must be based on proved methods, the view is held that it will not be possible to save the fertile areas of the Central and Nyanza Provinces from deterioration to the appalling state of Kamasia and Machakos, without the application of compulsion under legislation to enforce improved agricultural practices.

EXPERIMENTAL WORK

In consequence of the many additional duties that have had to be discharged by Departmental staff during the war period, of which work in connexion with the Increased Production of Crops Ordinance in non-native areas and marketing organization in native areas, together with the general drive for increased production have been the most arduous, little time or opportunity has presented itself for experimental work in districts. Such work of this nature as has been carried out has been in co-operation with the technical sections and is detailed in the reports of the Senior Agricultural Officers, Senior Coffee Officer, Agricultural Officer (Pyrethrum Services) and technical sections, which follow.

AGRICULTURAL EDUCATION

In July the Secondary European School at the Egerton School of Agriculture was closed and the school prepared to undertake its proper functions. Before it will provide the normal courses to equip the young men and women of the country as farmers it will handle those candidates under the Settlement Schemes who need such training. Building and equipping the school for this purpose was proceeding during the latter half of the year.

Native agricultural education was still entirely inadequate. No physical progress was made, although plans were drawn and considered, with the Agricultural Schools at Embu and Maseno for which the Colonial Development and Welfare Fund has approved provision. Of the three very unsatisfactory, small schools at Machakos, Fort Hall and Embu, only the last was kept open, some of the pupils from the former two being transferred to it. An Agricultural Officer responsible for a large district in which he is required to travel extensively cannot run a school satisfactorily, particularly without buildings for the purpose.

Bukura continued to provide instruction on small holdings and agricultural training for a limited number of students.

It is to be noted that the number of students who take agriculture at Makerere is extremely small and becoming yearly even smaller. Although an endeavour has been made to make the terms of service of African agricultural staff equivalent to those of other Departments of Government the better educated African will not undertake agricultural work. Until this outlook changes no great or rapid advance in native agriculture, and hence in the standard of life in the native areas, can be expected.

FRUIT

Increased interest in being displayed in the possibilities of developing the fruit industry, both deciduous and sub-tropical. Some 93 growers are known to the Department as having varying acreages under fruit. Local demand for fruit trees of all kinds is very greatly in excess of the capacity of local nurserymen. Some importations were made from South Africa, but importation from that source continued to present difficulties.

A large number of rootstocks for apples, pears and plums were imported by the Department from the East Mailing Research Station for trial in Kenya. Some of these already show considerable promise; the trials are being continued and it is hoped to make further importations during 1946.

An interesting development is the interest being taken in fruit by native growers in Fort Hall and Kiambu districts of the Central Province. A rough census showed the following number of fruit trees in these districts: oranges 20,000, lemons 3,600. mangoes 2,400. avocados 1,400, plums 1,200. There is no doubt that from the nutritional point of view there is a real need for increased consumption of fruit by Africans.

One cause of the slow expansion of the Kenya fruit industry is uncertainty with regard to markets, coupled with, in many cases, the very poor quality of the fruit produced in relation to the price demanded. Only first quality graded fruit should be offered on the local fresh fruit market, and the same applies to fruit for canning and bottling, though there is an outlet for the inferior quality for juice extraction. It is quite wrong that some of the local processing plants have to obtain from overseas a considerable portion of their requirements.

VEGETABLE SEED PRODUCTION

During the war years it became increasingly difficult, and sometimes impossible. to obtain from sources overseas the supplies of vegetable seeds required not only for the ordinary internal market but also to meet the large demands for seed of the dried vegetable factories and Civil Affairs Branch of the East African Command. To safeguard the position the Department organized a seed production branch under the immediate control of a seed specialist trained in the United Kingdom and arrangements were made to produce the stocks of seed required partly from departmental stations and partly by private growers under contract with the Department.

Towards the end of 1944 and during 1945 the seed production branch of the Department turned its attention to the possibilities of building up a post-war export trade in both vegetable and flower seeds and, with the co-operation of growers interested, a promising start has been made. In 1945 some 20 growers grew vegetable seeds under contract, producing seeds to the value of £2, 000.

Samples of Kenya-produced vegetable seeds have been sent to wholesale seed merchants in various parts of the world and to such institutions as the Official Seed-testing Station, Cambridge, and the Royal Horticultural Society's Gardens at Wisley. Laboratory tests and field trials undertaken by the recipients were in practically every case satisfactory and the physical qualities of the seeds were reported to be very good. From the United Kingdom wholesale orders for 1946 production have been received to a total value of £14, 000.

During the year a Seeds Advisory Committee was appointed to inquire into the desirability of introducing legislation to meet the requirements of the seed industry and to make recommendations in regard to the constitution of a Seed Growers Association. By the end of the year legislation had been drafted having as its objects the improvement of the standard of internal seed supplies, the protection of seed buyers from being supplied with seed of unknown origin and quality and also to assist in the building up of a reputable export trade in those kinds of seeds which experience is showing can be satisfactorily produced in the Colony.

The need to ensure that clean, good quality seed is available to, and is used by growers, is of particular importance in connexion with the European cereal crop of over 330,000 acres. During recent years there has been a marked increase in the prevalence of noxious weeds in many of the cereal areas, spread, to a great extent, by the use of contaminated seed. In addition to the legislation proposed, plans were drawn up to provide adequate seed-cleaning machinery at suitable centres to serve the cereal growing areas.

PRODUCE INSPECTION

Nyanza Province.—Reasonably rigid produce inspection of the 1944 maize crop sold during the first six months of 1945 was maintained. Before marketing of the 1945 maize crop commenced it was decided to grade the Nyanza crop; this was done at the request of the Maize Controller, who had experienced difficulty in obtaining maize of sufficiently high quality for export in the previous year. European graders appointed by Maize Control were posted to the Province at the beginning of the season. A total of 735, 000 bags of produce was inspected at market centres during 1945.

Central Province.—This Province during the year produced only small quantities of grain and pulses for export, hence, apart from wattle, poultry and, to a lesser extent, potatoes, no great calls were made on produce inspection staff, whose time was devoted largely to checking on illegal movement of produce. Over 22. 000 tons of wattle bark passed through the inspection centres.

LIBRARY

Books.—Some 112 volumes have been added to the library during the year, but many of the books on the year's indent have not yet been received at Head Office.

Articles, Publications.—A list of articles contributed by officers of the Department to the *East African Agricultural Journal* and to the *Monthly Bulletin of the Coffee Board of Kenya* follows:—

PUBLICATIONS

East African Agricultural Journal

VOL. 10—JANUARY-APRIL.

"A New Bacterial Disease of the Potato in Kenya"—R. M. Nattrass, Senior Plant Pathologist.

"Growing and Curing Flue-cured Tobacco in Central Province, Kenya"—N. D. Spranger.

"East African Supplies of Phophates and their Utilization"—G. H. Gethin Jones, Soil Chemist.

"D. D. T. "—V. A. Beck ley. O. B. E., Senior Agricultural Chemist.

"Spraying Small Areas Against Potato Blight"—R. M. Nattrass, Senior Plant Pathologist.

VOL. 11—JULY-DECEMBER,

"Notes on the Effect of Day Length on Potato Yields"—R. W. Rayner.

"Some Notes on Soil Fertility with Particular Reference to African Farmers" —M. D. Graham.

"From a Seed Grower's Notebook"—F. Hawkins,

"What is Wrong with European Agriculture in Kenya?"—V. Liversage, Agricultural Economist.

"A Canker of *Cupressus Macrocarpa* in Kenya caused by *Monochaetia Unicornis"*—R. M. Nattrass, Senior Plant Pathologist.

"The Cutting and Treatment of Seed Potatoes"—R. M. Nattrass, Senior Plant Pathologist.

"Golf Greens and Lawns in East Africa"—M. D. Graham.

"The Goat: Friend or Foe?"—Colin Mahrer, Senior Soil Conservation Officer.

Monthly Bulletin of the Coffee Board of Kenya

"Conditions in the Western Area of Kenya"—M. Halcrow.

"Mealy Bug; Green Scale, and *Asterolecanium.* Practical Recommendations" A. R. Melville.

"Bordeaux Spraying: A Reminder"—M. Halcrow.

"Leaf Scorch"—R. W. Rayner.

"A Reminder on Spraying for Thrips"—A. R. Melville.

"A Further Note on Spraying for Thrips"—A. R. Melville.

"The Coffee Thrips"—A. R. Melville (Annual Report Coffee Services, 1944).

AGRICULTURAL LEGISLATION

The following comprises the more important legislative changes affecting agricultural industries in 1945: —

Ordinances

SISAL INDUSTRY ORDINANCE, 1945. —Amending and consolidating the Sisal Ordinance, **1939.** Parallel legislation has been enacted in Tanganyika. The Ordinance provides for a larger and more representative Sisal Board, including two representatives of the Tanganyika Sisal Board. The main provisions of the **1939** Ordinance are retained but the Rule-making powers have been extended to make it possible to ensure the closest co-operation with the Tanganyika Sisal Industry in all matters affecting East African sisal.

CONTROL OF GRASS FIRES (AMENDMENT) ORDINANCE, 1945.—Amending the Control of Grass Fires Ordinance, 1941. The Ordinance transfers to Municipal and District Councils the power to prohibit the burning of vegetation and to declare a state of danger which in the principal Ordinance was vested in the Director of Agriculture.

INCREASED PRODUCTION OF CROPS (AMENDMENT) ORDINANCE, 1945. —Gives a greater flexibility and a stricter control over farming operations in respect of those crops which come within the scope of the principal Ordinance.

Rules and Regulations

Coffee Industry (Financial Assistance) Ordinance, 1944: Coffee Industry (Financial Assistance) (Forms and Fees) Rules, 1945. Crop Production and Live Stock Ordinance, 1926: Native Eggs Rules, 1945: Native-grown Coffee (Amendment) Rules, 1945. Increased Production of Crops Ordinance, 1942: Acreage Grants for Maize Rules, 1945: Guaranteed Minimum Returns and Grants Rules, 1945: Preservation of Soil Fertility (Amendment) Rules, 1945. Land and Water Preservation Ordinance: Land Conservation Rules. 1945. Plant Protection Ordinance. 1937: Plant Protection (Amendment) Rules. 1945.

STAFF

The Deputy Director, after a period of secondment as Maize and Produce Controller, returned to the Department in March and shortly afterwards proceeded on leave returning in November.

The Director served as Chairman of the East African Anti-Locust Directorate throughout the year, as for the previous 18 months, and Dr. Le Pelley remained seconded to this organization.

As throughout the war period officers of the Department ha\c been called upon to undertake many and various duties and functions outside their normal work, while the Department has remained considerably under establishment strength. In spite of these handicaps all departmental services have been continued. though in some cases on a reduced scale.

Each additional call that I have had to make on the staff of the Department has met with a ready and cheerful response and to all officers of the Department I would express my most sincere and heartfelt thanks.

D. L. BLUNT,
Director of Agriculture

19th June. 1946.

PART III—SECTIONAL REPORTS

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER, RUMURUTI (LAIKIPIA, NORTH NYERI AND NAIVASHA DISTRICTS), 1945

Meteorological

For the third year in succession the March-April-May rains were a failure but, with the exception of the Naro Moru area, the main July-August-September rains were good and in the higher areas precipitation was unusually heavy. In the lower areas the total rainfall for the year was below average, but at the higher elevations it approached normal. The April-May-June drought affected grazing conditions and stock farming generally to a much greater extent than other agricultural activities, not only from the grass and fodder point of view but also water supplies in many areas became precarious.

During the year a Meteorological Station, incorporating an evaporating pan, was opened on the Experiment Farm, Ol Joro Orok.

Crops

General.—The drought conditions earlier in the year retarded the efficient preparation of the land for cereals. Rapid progress was made after the commencement of the rains, but fields could not be cleaned of volunteer crops and annual weeds as thoroughly as one would have wished. This aggravated the position as far as endeavouring to maintain pure varieties of crops was concerned. The heavy rains during August, and especially the unexpected heavy precipitation during September, caused waterlogging in the low-lying fields, but with the warm and dry weather which followed crops grew away well.

Harvesting commenced in October (North Nyeri) and November (Naivasha and Laikipia) and by February, 1946, a record crop had been secured. The following figures give an indication of the development of cereal growing in the areas under review between 1938 and 1945:—

Grain Crop	1938		1942		1945	
	Acres	Yield	AcreB	Yield	Acres	Yield
		bags		*bar/s*		(approx)
Wheat..	4, 530	13, 733	21, 348	62, 123	34, 513	182, 331
Maize	1, 533	10, 948	678	2, 534	1, 001	5, 270
Rye	97	500	533	1, 517	131	
Barley..	777	4, 662	1, 399	8, 394	3, 059	18, 945
Oats	368	2, 576	1, 354	9, 478	1, 597	10, 431
Totals	7, 395	32, 419	25, 313	84, 046	40, 301	216, 977

The acreage under cultivation practically reached its peak in 1944, when the area under grain cereals was 39, 028 acres. The total 1945 acreage shows but a negligible increase over the 1944 figure; this is due mainly to two factors:—

(1) The bulk of the naturally good land is now under the plough and very little more is available for breaking-up for crops such as wheat. Any further cultivable land is now mainly confined to the poorer soils which will require treatments such as drainage and heavy phosphatic fertilizing before they can be made productive.

(2) The machinery and man-power at present available have now reached their limit of production.

Wheat.—No. 117**A** has continued to give excellent results between altitudes of 6,000 ft. and 8,300 ft.; above this elevation it has suffered slight to moderate Yellow Rust attack. Equator wheat (locally known as K.T.I.) is, at present, the best variety for the highest regions, while Sabanero, D.C. x Ceres 721 and N.B. 230 (in addition to 1 17**A**) are the most suitable varieties for the "intermediate" areas. In the lower areas Australian 26**A** has not proved successful over a two-year trial, but 192 Q.2.A.L. has grown and yielded well.

Rye.—The decline in the rye acreage in 1945 was due to the appearance in 1944 of a new stem rust and until more is known about this disease the growing of the crop is being discouraged.

Barley.—The area continues to produce excellent crops of both malting and feeding barley and in the marginal Naro Moru area this crop is replacing wheat to a large extent.

Oats.—The acreage under this crop continues to increase both for grain and fodder; varieties recommended are Lampton for stock-feed and what is now locally known as "Algerium" for grain.

Flax.—Following the closing of the Kinangop Flax Factory in 1943 and the 01 Kalou Factory in 1944, it was decided also to close the 01 Joro Orok Factory at the end of the 1945 season. It is not expected that any flax will be grown in 1946; for economic and labour reasons it cannot compete against crops such as pyrethrum or cereals under existing conditions.

Pyrethrum.—Flowering was delayed owing to dry weather during the first half of the year, but the crop flushed excellently during the latter half and, although in most areas picking ended quicker than was expected, a good harvest was obtained. The acreage under this crop is now 15,799 acres, as compared with 1,405 acres in 1938.

Potatoes.—There has been a distinct tendency towards a reduction in acreage under this crop, mainly due to the effect of Late Blight.

Vegetables.—These continue to be grown in a few selected areas which have facilities for irrigation. A small quantity of selected seed is now grown in the South Kinangop area.

Stock

Cattle.—Despite the severe drought early in 1945, the year ended successfully from the cattle industry point of view. Supplies of butterfat to the Naivasha and Thomson's Falls Creameries continue to increase, but deliveries to Nanyuki are decreasing proportionately. This reduction is due to several factors, not the least of which is overstocking and grazing mismanagement. The following figures give an indication of the development of the dairying industry generally:—

Supplies of Butterfat to Creameries (in lb.)

	1940	1942	1945
Naivasha	978,200	1,229,220	1,435,562 (approx)
Thomson's Falls	520,783	775,800	894,795
Nanyuki	666,554	911,760	722,261
Totals	2,165,537	2,916,780	3,052,618

In 1945 the above Creameries produced almost 70 per cent of the total creamery butter manufactured in the country.

There was a good distribution of rainfall in the main pastoral areas during the latter half of the year and grazing conditions were better than for many years past.

The supplementary feeding of dairy cattle, especially during the dry weather, is increasing but there is still too much reliance placed on purchased concentrates and too little attention devoted to the production of home-grown feeds such as silage and hay. Although the acreage of fodder crops has increased from about 1,000 acres in 1938 to some 4.000 acres in 1945 the amount still grown is lamentably inadequate.

Sheep.—Sheep have now practically recovered from the disastrous situation in 1943, flocks have done well and good wool clips have been obtained. In many of the major "sheep areas" it is becoming evident that sheep farming alone is causing a deterioration of the natural pastures and that a balanced combination of sheep and cattle farming is necessary.

Pigs.—During the war years there was a disappointing decline in the quality of pigs produced. This may have been unavoidable to some extent owing to the necessity for expanding the industry rapidly at a time when feeds were in short supply. However, as the industry is now assuming more normal proportions the re-introduction of strict grading of pigs is welcomed. The industry too has suffered from lack of imported blood during the past four or five years and it is hoped that the importation of breeding stock will not be unduly delayed.

Soil and Pasture Conservation and Improvement

Fertility and Control.—Although during the past seven years the arable acreage was increased by some 600 per cent it is fortunate that up to the present there has been relatively little serious erosion. This is due. mainly, to the fact that the bulk of the land now cropped was completely virgin land at the outbreak of war with inherent fertility and good structure. Generally speaking, there has been no serious or rapid decline in the actual fertility of the soil (indeed some soils have been improved under the plough) since the application of phosphatic fertilizers is now a general practice and the ploughing in of straw, in preference to burning it, is becoming more general, although many farmers are still averse to the latter practice and avoid it wherever possible. Nevertheless, the soil structure of the older fields is deteriorating rapidly and further prolonged cultivation is bound to result in disastrous erosion. A few fields in the Aberdares. Ol Joro Orok. Ol Kalou and Thomson's Falls areas have already reached the erodable stage and only quick action over the next few years in the matter of re-grassing, rotating and terracing all arable land in the district will avert disaster.

As the bulk of the naturally rich cultivable soils are now under the plough, attention is being given to improving the poorer soils in order that they may take their place in the proper economy of the farm and so. for the next few years at any rate, ease the cultivation pressure now being put on the naturally good soils. It is fortunate that oats, well fertilized with a phosphatic fertilizer (preferably Seychelles guano or bone-meal) will grow successfully on this class of soil. Encouraging results are being obtained from so growing this crop and ploughing in the straw for, say, two years; by this time the land is often enriched and "sweetened" enough to grow wheat, which also must be fertilized. Following two or three years of wheat growing (fertilized and straw ploughed) the land will usually carry a successful grass ley. On the South Kinangop. Mr. J. M. Nightingale, in collaboration with Mr. H. T. Lloyd, Assistant Agricultural Officer. Gilgil. has.

been reclaiming exceedingly poor soil (too poor to grow even oats when fertilized) by night-paddocking cattle on it in small areas for up to two years and then growing oats, which are folded off. In this way a very poor veld has been converted to land capable of growing good crops and pasture leys.

Water Conservation.—Following the issue of some 67 Soil Conservation Orders, mainly in the Oldoroto, Moyo, Amboni, Upper Gilgil and Turasha areas, and the patrolling of rivers and streams by River Scouts, squatter cultivation and destruction on the steep valley sides has been reduced considerably and slopes to water are becoming covered with protective vegetation. For failing to carry out a Soil Conservation Order one farmer in the Uaso Nyiro areas was prosecuted and fined Sh. 100 and an African in the Thomson's Falls area was fined Sh. 80.

Dam-making continues and in the Ol Kalou area the Construction Company have made three large and excellent dams.

Requests for the drilling of boreholes now exceed the capacity of the machinery available.

There is a growing realization that stock cannot be watered at streams for all time and, hand in hand with farm development, greater attention is being paid to pumping and piping water from streams and generally improving farm water supplies.

Pasture Improvement.—In 1945 it was hoped to put back a considerable acreage of arable land to grass but unfortunately this was not feasible for two reasons: (i) the absence of sufficient suitable grass seed, and (ii) the need for maintaining full production of all food crops. In preparation for the more extensive establishment of temporary leys in 1946 production of *Bromus marginatus* seed was arranged under the Increased Production of Crops Ordinance and it appears that the 1945 crop may exceed the present demand. Several difficulties have arisen concerning the harvesting of large fields of *Bromus,* but the hand harvesting of good quality seed can be undertaken satisfactorily on smaller acreages and better yields are also obtained by this method.

In the pastoral areas grazing is suffering from the result of land use which has, in the past, been carried out with apparent success but which is now showing signs of breaking down. The adoption of so-called "dairy-ranching" in dry areas, which are more suited to beef production, is showing the disastrous effects which arise from carrying out types of farming unsuited to the natural controls; the smaller farms are being grossly overgrazed and severe deterioration of the pasture is evident. Even bearing in mind the ultimate and correct methods of grazing management, which must be coupled with fencing and improved water supplies, many farms are economically too small and an endeavour is being made to regroup the land into units sufficiently large for successful beef ranching. This Re-grouping Scheme is voluntary and is being carried out in collaboration with the Aberdare District Council and the Laikipia, Nanyuki and Ngobit Farmers Associations. The effective operation of the scheme will, of course, depend largely on the foresight, co-operation and good-will of the farmers concerned.

Tree Planting.—Farm tree planting is progressing slowly; the system of siting nurseries on farms is proving successful and it is hoped to extend this activity.

Pests and Diseases

Locusts.—During the latter half of the year small swarms were moving about the district, no laying took place and the damage caused to crops and grass was negligible.

Cereal Pests.—In some of the higher areas the Dusty Brown Beetle (*Dasur simplex)* caused severe local damage to wheat which, in several cases, necessitated replanting. Crop Weeds, such as Darnel and Bind-weed *(Polygonum* sp.) are noticeably on the increase. It is certain that much of the spread is due to using dirty cereal seed and farmers are being urged to winnow all seed thoroughly since attempts to eradicate these weeds by cultivation methods will be of no avail so long as they continue to be propagated by direct planting.

Cereal Diseases.—The incidence of Stem Rust on wheat was almost negligible; Yellow Rust made its appearance in the higher areas late in the growing season but caused very little damage. *Fusarium* caused some loss of crop in isolated parts of the wetter areas and there were one or two minor outbreaks of Take-all.

Pyrethrum Diseases.—In the dry weather of January and February several cases of *Fusarium ami Sclerotinia* wilts were reported. The infection, however, appears to have subsided and consequences do not appear serious.

Economic and General

Over most of the area 1945 was a satisfactory and successful farming year. Prices for all farm produce remained good and, as far as the supply of materials allowed, the development of farms has progressed.

An indication of the expansion of rural activities, especially in the mixed farming areas, may be gathered from the following figures:—

TRAFFIC ON THOMSON'S FALLS BRANCH LINE (K.U.R. & H.)

	Thomson's Falls		*Ol Joro Orok*	
Year	*In & Out Goods*	*Passengers*	*In & Out Goods*	*Passengers*
1939	6,773 tons	4,855	closed	closed
1941	8,974 tons	6,851	3,276 tons	3,551
1943	24,092 tons	9,739	7,110 tons	5.403
1945	27.458 tons	20,827	7,199 tons	11,163

In areas such as the above-mentioned it is safe to assume that the bulk of goods traffic is either directly or indirectly concerned with the land.

Advisory and Routine Work

Some 750 visits were made by the Senior Agricultural Officer. Rumuruti, to farms for purposes of advising on general farming matters. In addition much time has again been devoted to work in connexion with the Increased Production of Crops Ordinance.

General advisory services on all branches of farming have continued and office work associated with these services and other matters is increasing steadily.

Investigational

During the year a 1,000 acre farm near Ol Joro Orok was purchased for developing as an Experiment Station. Although plans for both houses and farm buildings were completed by the middle of the year, the P.W.D. could not find it convenient to allow the building programme to be carried out.

A 300 acre block of land on the Naro Moru Township is earmarked for an Irrigation and Experiment Station.

Work has continued on the Rumuruti Grassland Experiment Station throughout the year.

Wheat Variety Trial.—A statistical yield trial was carried out at Ol Joro Orok with the following results:—

Variety	*Mean Yield in hags! acre*	*No. of days*	*Bushel Weight*	*Statistical Result*
Regent	13. 3	175	63	157
3I8. 0 . 3. B. 2.	13. 2	175	64	155
294. M. 7. C. 6. C	12. 7	170	64	149
294. M. 7. C. 1	12. 4	165	62	146
294. AN. 5. B. 3	11. 8	155	59¼	140
D. 43. 04	11. 8	160	60½	140
294. H. 2. A. 3.	11. 2	160	62½	132
294. B. 2. A. 3	10. 9	160	63	130
Pure Equator	10. 5	196	63	124
Farm Equator	10. 0	196	62½	118
I17. A	10. 4	175	62¾	122
Sabanero (Rhodes)	8. 6	175	60	102
N. B. 230	8. 5	170	62½	101
Sabanero (Farm)	8. 1	175	60	96
D C. x Ceres 721	7. 1	175	62½	84

Under the column "Statistical Result" any two varieties which differ by more than 27 should be regarded as having significantly different yields.

Barley Variety Trial.—*A* statistical yield trial was carried out at Ol Joro Orok with the following varieties of barley: Prior, Abyssinia. Maltworthy, Maltworthy Selection 6, Research, German.

Unfortunately the plots were laid so badly that it was not possible to harvest them. Research and German, although longer maturing than Prior or Maltworthy, tended to stand better.

Fertilizer Trial.—A statistical trial was carried out to test the effect of various phosphatic fertilizers, especially the new modified Uganda Rock Phosphate *{Silicophosphate)*. The following are the results obtained from applications to a crop of wheat:—

		Yields per acre	
	Dressing per acre	*Grain*	*Straw*
Silicophosphate	185 lb.	6 75 bags	1. 34 tons
Super Phosphate and Rock Phosphate Mixture	190 lb.	5. 0 bags	1. 0 tons
Uganda Rock Phosphate.	285 lb.	3. 75 bags	0. 68 tons
Control	nil	3. 6 bags	0. 71 tons

There was a very significant difference in the effect of both Silicophosphate and the Super-rock mixture as compared with either Rock Phosphate or the Control.

Blight Resistant Potato Variety Trial.—The following varieties of potatoes were planted at 01 Joro Orok for the purpose of watching their resistance to blight, and yielding qualities. Unfortunately the tubers were received in a very immature state late in the season and so no definite conclusions could be drawn: —

Variety	*Variety*
Craig's Defiance	No. 931
Dutch Robyjin	No. 855
Salaman 1	No. 835
Salaman 2	No. 834
Salaman-Clarke 1	No, 833
Salaman-Clarke 2	No. 655
Salaman-Clarke 3	No. 653
Salaman-Clarke 4	No. 914
Reddick 18	

Of the above No, 914, No. 835, Salaman I, Salaman-Clarke I, and Craig's Defiance appear promising varieties.

Pyrethrum Experiment.—In collaboration with the Agricultural Officer (Pyrethrum Research) a set of statistically designed experiments was laid out at Ol Joro Orok, incorporating the following: —

Interplanting pyrethrum with maize and beans.
Effect of applications of fertilizers.
Spacing and cultivation effects.
Effect of repeated trimming.
Time of cutting back.
Seedlings versus splits.
High toxic versus ordinary pyrethrum.
Planting methods.

In addition to the above some 80 plant-to-row selections were made from various pyrethrum fields in the Gilgil, Thomson's Falls and ol Joro Orok areas.

The Agricultural Officer, Molo, will report fully on the results obtained to date, but the following brief observations are worth recording: —

(i) In the interplanting experiment both the maize and broad beans depressed the yield of pyrethrum flowers far beyond a point where the maize and bean crops did not compensate for the loss of flowers.

(ii) Phosphates applied in the holes at planting time stimulated initial flowering considerably, but this effect of the fertilizer decreased steadily throughout the picking season until ultimately the yields from both the fertilized and control plots were approximately similar.

(iii) During the first year the closest spacing (2 ft. by ft.) has given the greatest yield and there is a progressive decline to the widest spacing (3 ft. by 3 ft.).

(iv) The seedlings were much slower to come into flower than the splits, but they were flowering well towards the end of the season.

Trees.—An initial trial windbreak, some 800 yards long, was planted. Unfortunately the trees suffered severely from a fire caused by the railway adjoining the plantation.

The following varieties were planted: *Cupressus arizonica, Cupressus lusitanica, Cupressus macrocarpa, Eucalyptus globulus. Eucalyptus maiden't. Acacia malanoxyton.* Mexican green ash, *Cedrela toona. Dodonea viscosa,* Kei apple.

The windbreak at Rumuruti is growing well despite the fact that the average annual rainfall has been only 18.2 inches since it was commenced in 1942 and in no one year has precipitation been greater than 19.97 inches. It is now

evident that plantations in these dry areas can only be established satisfactorily provided strict attention is paid to clean cultivation to preserve the soil moisture. The following are the varieties under trial: —

Eucalyptus albetis (T)XX
Eucalyptus siderophloia (T)
Eucalyptus maculata (T)XX
Eucalyptus maideni (T)0
Eucalyptus melliodoro (T)XX
Eucalyptus paniculata (T)XX
Eucalyptus sideroxylon (T) X
Eucalyptus crebra (M)X
Tarchonatus camphoratus (D)
Cupressus arizonica (M)XX
Schmus molle (M)XX
Ceratonia siliqua (M)XX
Prosopis juliflora (M)0
Acacia saligna (T)XX
Aberia caffra (D)XX
Euclea lanceolata (D)X
Dodonea viscosa (D)X
Erythrina tomentosa (M)?
Casuarina stricta (T)X
C. *cunninghamiana* (T)X
Brachyciton populneus (M)X
Caesalpinia sepiaria (D)O
Hakea saligna (M)0
Euphorbia tirucalli (D)X
Jacaranda (M)X
Carissa edulis (D)X
Agava sisalana (D)

Key to abbreviations—

(T) = Tall growing for leeward rows.
(M) = Medium for intermediate rows.
(D) = Dwarf for windward rows.
XX = Growing excellently and recommended.
X = Growing well and recommended.
O = Not recommended.

Grasses and Legumes for Pasture Leys. —Small plots of the following have been planted at Ol Joro Orok for observational purposes: —

Bromus marginatus. —This grew extremely well, its grazing qualities have been proved and generally speaking this is at present the best grass for using as temporary leys in the higher elevations having a rainfall of 35 inches and over.

Perennial and Italian Ryegrasses. —The grasses made relatively poor growth and require a climate such as that obtaining in the 01 Bolossat-Wanjohi and Kinangop areas.

Beckeropsis uniseta. —This produced an extremely heavy yield of palatable fodder within a few weeks of planting. It is a vigorous grower but is susceptible to frost and prolonged drought. It is not yet proved as a grazing grass, but the Assistant Agricultural Officer, Gilgil, is keeping a close watch on its behaviour on several plots which he has established in his area.

Pennisetum salifex. —Appears very palatable but doubtful if it is as good as Kikuyu grass *(Pennisetum clanderstinum)* for pasture purposes.

Pampas grass. —Growth exceedingly slow.

Panicum makari. —Poor growth.

Eragrostis curvula. —Poor growth.

Phalaris tuberosa. —Strains of leafy plants selected and planted plant-to-row.

Cynodon sp. —(Bradley grass?) Promises to be a good lawn grass, drought resisting.

Digitaria swazilandsensis. —Poor growth.

Lucerne. —The growth of Provence, Hunter River, Hairy Peruvian and Siberian Cossack has been disappointing.

Hubam Clover. —Has grown exceedingly well.

Subterranean Clover. —Growth fair. P. T. F. No. 1504 flowered and seeded profusely.

Red Clovers. —Failed.

During the past five years numerous grasses from America, South Africa and Australia have been tried at Rumuruti, but the majority proved unsuccessful. In any case it is clear that pasture improvement in the pastoral areas will result from proper management rather than from the introduction of exotic grasses.

The few remaining grasses still under trial are: Perennial Kavirondo Sorghum, *Cenchrus ciliaris* (tall strain), *Panicum makarikariensis,* Molasses grass, *Digitaria Smutsii, Eragrostis curvula.*

These grasses are being maintained not so much for use in the pastoral area but more as ley grasses for the marginal and difficult type of country which runs in a belt along the foothills of the northern slopes of the Aberdares and western slopes of Mount Kenya between the well-defined pastoral region and the zone of higher rainfall. *Eragrostis curvula* is a recent introduction and from preliminary trials it promises well in the dry warm areas.

Improvement of Permanent Pasture.—(i) Suppression of *Pennisetum Schimperi.*—The encroachment of this grass in the higher Oat-grass areas is becoming a serious problem, especially on rough or broken land which cannot be ploughed for a ley rotation. A co-operative experiment has now been running for two years on Mr. E. H. G. Augeraud's farm on the Aberdares (8, 300 ft.) with a view to suppressing *Pennisetum schimperi* (wire grass) by controlled burning. Briefly, the main treatments are as follows:—

(a) Annual burning with no grazing.

(A) Annual burning followed by grazing until about August and then protected until the next burn.

(c) Annual burning followed by protection until about August and then grazed.

(d) Control—normal farm practice.

Other treatments have been introduced such as the effect of haying and singeing or light burning after rain has fallen.

Caution is needed in interpreting results which are becoming evident, but it appears that "hot" burn is definitely suppressing the *Pennisetum schimperi* and encouraging the *Themeda triandra* (oat-grass). There is a striking difference between the herbage on treatments (a) and *(d).* Treatment (a) shows the greatest improvement, followed by (b); the difference between (c) and *(d)* is not so great.

(ii) *Pastoral Area Grazing Improvement and Management.*—At Rumuruti. oat-grass pasture investigations have been in progress since 1941 and the results of the various treatments are both striking and encouraging. In 1941 the present experimental area of 120 acres was a severely damaged and overgrazed piece of Rumuruti Township. The grass cover, if it could be called such, was mainly a poor growth of *Aristida* spp., *Eragrostis* spp., *Chloris pycnothrix. Michochloa abyssinica, Harpachne schimperi. Tragus Berteronianus* and other pioneer species; the stand of *Themada triandra* (oat-grass) and other good grasses was extremely sparse.

Early in 1941 the whole area was fenced and divided into six 20-acre paddocks; thereafter it was completely rested until 1943 in order to allow some recovery and seeding. A fair sprinkling of oat-grass seedlings appeared after the long rains (July-August) of 1941 and 1942, so that this seed must have been lying dormant in the ground. By the beginning of 1943 there was a thin stand of oat-grass and a more detailed investigation of the various problems was commenced. Broadly speaking work was devoted to studying the following:—

The best type of management necessary to effect quick recovery of damaged pastures.

The effect of grazing at different times of the year.

The effect of mowing for hay.

The effect of burning, with both protection and grazing.

The effect of complete protection.

The behaviour and growth of oat-grass.

Grazing management.

The effect on the pasture by grazing at different times of the year is becoming marked. Since 1943 five 20-acre paddocks have been grazed in rotation for 73 days each per year with an equal number of stock.

Paddock No. 1.—Is always grazed towards the end of the dry season and thus obtains a full year's growth of herbage and seeding. There has been a decided improvement, but the oat-grass seedlings are rather weak and "drawn-up" due to the heavy canopy of mature grass.

Paddock No. 2.—Is grazed after No, 1 and during any growing period there may be following the short April-May rains. The improvement here is not quite so rapid.

Paddock No. 3.—Is grazed after No. 2 and during the longer July-August rains. It is obvious that oat-grass is quickly and detrimentally affected by this continual annual grazing during the growing season. The plants are becoming weaker, the ground between the plants is bare—even the Pioneer grasses are poor—and there are definite signs of weed and small bush encroachment. There is almost a complete absence of oat-grass seedlings and generally throughout the paddock are signs of deterioration of the grazing.

Paddock No. 4.—Is grazed after No. 3 at the beginning of the dry season. The herbage then is usually somewhat succulent but the bulk of the seed has fallen. Here the pasture is improving rapidly, there is good ground cover and seedlings of the better grasses are making good headway.

Paddock No. 5.—Is grazed after No. 4 in the middle of the dry season and the improvement is similar to that of the former paddock.

It should be noted that in Paddocks Nos. 1, 2, 4 and 5 it has been possible to establish a good crop of oat-grass seedlings without recourse to burning.

The burning experiments (although results are not yet conclusive) appear to indicate that burning has a detrimental effect on the grazing in this dry area, Burning is carried out biennially at the end of the dry season and at the onset of the April-May rains.

The effect of yearly cutting for hay appear to affect the grazing adversely if the hay is made at the correct stage (i.e. before the seed is fully ripe), but if the quality of the hay is sacrificed a little by cutting slightly later in the season (i.e. after some seed has fallen) there is not the same deterioration of the mown vegetation.

Even in the height of the dry season the low country herbage remains a good feed, whereas at higher altitudes the grazing becomes useless at this time. The reason for the difference is probably that in the low country rains usually end abruptly, dews and frosts are seldom experienced and a standing "hay" crop is produced. In the wetter areas, on the other hand, showery weather, dews and frost all combine to "ret" and destroy the leafy herbage in the dry season.

It is obvious that under the present and all too common uncontrolled, extensive system of grazing—especially where overgrazing is occurring—the carrying capacity of the pasture must deteriorate and not until ranches are properly paddocked and watered to enable a form of deferred grazing to be adopted, can any improvement of pastoral areas be attained.

Conclusion

This report would not be complete without recording the assistance and co-operation of farmers and, in particular, that given by the Chairmen and members of the various Production Committees and the Honorary River Wardens is gratefully acknowledged.

In conclusion, the keen way in which Mt. H. T. Lloyd, Assistant Agricultural Officer, Gilgil, continues his hard work is greatly appreciated.

T. Y. WATSON,
Senior Agricultural Officer.

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER, KITALE, 1945

Meteorological

Rainfall over the year was up to average but the rains were late in commencing, not setting in until the beginning of May. This caused delay in maize planting and a reduction in the final yields but, as in 1943. wheal yields following a prolonged dry spell have been excellent.

Rainfall	1945	12 *Years Ave*
January	0. 16 ins.	0. 54 ins.
February	2. 01 ”	1. 65 „
March	0. 48 ”	2, 38 „
April	0. 35 ”	5. 86 „
May	13. 49 ”	7. 15 „
June	4. 33 ”	5. 02 „
July	4. 89 ”	6. 24 „
August	8. 06 ”	6. 42 „
September	7. 10 ”	3. 81 „
October	1. 99	2. 20 „
November	1. 33 ”	2. 31 „
December	1. 77 ”	1. 33 „
Totals..	45. 96 ins.	44. 91 ins.

Storms of the following intensities were recorded on the Fries self-recording rain gauge: —

Date	*Total hall*	*Intensity*
12. 5. 45	1. 14 ins.	LOO ins. in 20 minutes
20. 5. 45	1. 34 „	0. 70 10
10. 8. 45	1. 36 „	0. 60 5
24. 9. 45	1. 08 „	1. 00 20
23. 10. 45	1. 18, ,	0. 80 10
18. 12. 45	1. 25 „	0. 70 10

Experiment Station during the follows: —

Coffee	21 acres
Maize	46 ”
Ensilage (Maize)	21 ”
Fodder (Oats)	14 ”
Lupins (for seed)	8 ”
Green Manure	Nil
Nursery and Trial Plots	4 ”
Temporary Grass Ley	45 ”
Improved Grazing	38 ”
Veldt	151 ”
Tree Plantations—windbreaks..	28 ”

A new workshop and nursery store was built and a store for coffee drying trays. Two large fodder stores, on cedar posts with thatched roofs, and a weaner calf shed of similar construction were built. Three new water troughs were installed and water is now laid on to all but two paddocks. A further 1½ miles of fencing sub-dividing paddocks was completed and there now remains only one fence to complete the paddock lay-out.

Expenditure and revenue during the year was as follows: —

Expenditure:

A.—CAPITAL—

	Sh.	*Cts.*
Implements	733	70
Buildings	3. 328	46
Fencing	995	52
Live Stock		
Labour and Rations	1. 824	67
Total	6, 882	35

B.—RUNNING—

Manures, Seed, Sprays	1. 323	01
Repairs, Renewals and Small Tools	1, 906	66
Feeding Stuff and Veterinary	4, 039	99
Miscellaneous	350	58
Labour	6, 588	84
Rations	1, 102	68
Fuel and Oils	998	08
Total..	16, 309	84

Revenue—

Sale of Pigs	3, 055	51
,, Coffee	4, 196	28
,,,, Butter Fat	1. 861	03
Milk	580	33
,,,, Live Stock	623	97
Total..	10, 317	12

Crops

Maize.—The maize acreages in the Trans Nzoia and Uasin Gishu for the five years 1941-45 are as follows: —

	1941	1942	1943	1944	1945
Trans Nzoia..	40, 000	37. 649	47, 886	55. 006	58. 906
Uasin Gishu..	12, 513	14, 933	21, 266	26, 321	28, 446

Average yields in bags per acre for the four years 1942-45 are as follows, the yield for 1945 being an estimate: —

	1942	1943	1944	1945
Trans Nzoia....	8. 5	8. 3	8. 3	7. 1
Uasin Gishu....	5. 3	5. 9	6. 6	5. 6

The lower average yield may be attributed to several factors: the long rains were a month late in breaking and a shorter growing period reduced yields, especially in the lower areas on light, sandy soils; a considerable amount of dry planting was done and resulting stands were poor and cultivations were difficult owing to incessant rain once the rains had broken. In addition to the foregoing, however, the main reason for diminishing yields are bad farming methods and worn-out lands due to overcropping and soil erosion.

Wheat.—Wheat acreages in the Trans Nzoia and Uasin Gishu for the five years 1941-45 are as follows:—

	1941	1942	1943	1944	1945
Trans Nzoia..	8,000	7,651	7,224	8,709	10,714
Uasin Gishu..	45,816	57,724	60,921	70,683	79,070

Average yields in bags per acre for the four years 1942-45, the years for 1945 being an estimate, are as follows:—

	1942	1943	1944	1945
Trans Nzoia....	4.1	4.9	4.5	5.2
Uasin Gishu....	2.5	4.2	3.5	4.5

As in 1943, wheat crops following a prolonged dry spell were excellent; there was very little rust and good weather was experienced for harvest.

Rye.—The rye acreage in the Trans Nzoia and Uasin Gishu for the four years 1942-45 are as follows:—

	1942	1943	1944	1945
Trans Nzoia....	146	1,249	776	Nil
Uasin Gishu....	457	6,240	6,226	3,354

This crop suffered badly from rust in 1944 and has proved a complete failure from the same cause in 1945. It has been withdrawn from the list of scheduled crops under the Increased Production of Crops Ordinance and no further plantings will take place.

Flax.—The 1944 crop scutched in 1945 was again disappointing, neither yield nor quality of fibre being up to a standard to enhance the product on the home market or encouraging for the future of the crop in the area. The vagaries of our climate, together with labour who even after four or five years' experience of flax are still unskilful, undoubtedly make flax a crop to which a considerable amount of gamble is attached.

The crop grown in 1945 has had to contend also with certain adverse factors; in some areas of the district hail ruined considerable acreages but that which escaped is probably the best crop experienced during the past three or four years, due to a great extent to excellent harvesting weather. Flax, unlike other crops, however, must be again subjected to weather conditions during the retting process, and much will depend on these conditions, together with the care exercised by planters, as to the eventual success of the crop.

Flax acreages in the Trans Nzoia and Uasin Gishu for the four years 1942-1945 are as follows:—

	1942	1943	1944	1945
Trans Nzoia....	7,905	7,789	5,881	5,462
Uasin Gishu....	4.318	4,977	3,127	2,290

It will be noticed that for some lime acreages have been steadily decreasing. This in itself would not have affected the ultimate return to the farmer to any great extent, if the quality and yields had increased proportionately; such, however, has not been the case and considering that the Ministry of Supply are not guaranteeing the price for the 1946 crop, and the Guaranteed Minimum Return will likewise not be operative, the future outlook for flax is somewhat gloomy. It is premature to predict the future of flax, but it is felt that small acreages cultivated and handled with increased care should be continued in an endeavour to maintain a crop in the country which might prove a useful adjunct to other farming activities.

Coffee.—The rains being late in breaking had an adverse effect on the coffee crop: a flowering took place in February, most of which was lost in the following dry two months. A further flowering took place in May with the result that the picking on most farms was very late. The dry March-April spell also brought along quite a heavy infestation of thrips in some areas on the slopes of Elgon.

Barley.—Small acreages of this crop are grown mostly for feeding purposes. Yields will be higher than last year.

Oats—The best crops are grown in the higher areas of the Uasin Gishu and better yields than last year are expected.

Pyrethrum.—Late rains delayed flowering, but yields on the whole were fair. Some thrip damage ensued following a dry spell on the cessation of the rains.

Pests

Locusts.—Apart from a few scattered swarms of desert locusts which caused negligible damage the European areas have been free from this pest. Two successful campaigns were carried out by the East African Auxiliary Pioneer Corps in Turkana which saved an invasion and damage to cereal crops.

Chafer Grub.—The incidence of this pest has been less this year than last, probably, it is thought, on account of slight rains in February which induced a flighting period of the adult beetles and laying which failed to hatch in the following dry spell in March-April. Experiments and observations are being continued.

General

As in 1944. the year has been a prosperous one for the farming community and a genuine effort is being made by many to effect the change-over to mixed farming and alternate husbandry, although this has been rendered difficult by lack of essential supplies such as fencing wire, piping and cement. There are some, however, who, with guaranteed prices, are adopting the policy of making hay while the sun shines and are giving no thought to the future of themselves, or, more important, their land. This question of the decline in fertility of arable lands, especially maize lands, is shown clearly in the estimated average maize yields for 1945, which was not, for good farmers, a poor maize year. The only powers at present given by law provide for the closing of these worn-out lands to cultivation, but it is felt that while this may prevent the ultimate destruction of the piece of land in question, it does not prevent the process of land exhaustion continuing and. although it may put the farmer concerned out of business, it does not impress upon him his duty towards the land or prevent him from ruining other land which he may acquire. Provision is made by law for enforcing terracing of land but, whilst terracing is one of the first essentials, the fertility and structure of the soil, upon which the maintenance of any efficient terracing system mainly depends, can only be kept up by proper rotations incorporating the use of farmyard manure and grass leys. It is realized that it is impossible to make a good farmer out of a confirmed bad one by legislation, and the main line of attack must be continuous propaganda, but legislation regarding rotations and systems of cropping is required as a backing to this and, as such, would have the wholehearted support of every thinking farmer.

R. E. T. HOBBS,
Senior Agricultural Officer.

ANNUAL REPORT OF THE AGRICULTURAL OFFICER, NAKURU, 1945

Weather Conditions

The 1945 season started off very badly. The "grass rains" failed completely and the main rains were delayed by one or two months. Thus, many areas received no rain until late April whilst in the Njoro district the first good rain did not fall until the end of May, eight weeks overdue.

High and persistent winds accompanied the drought and the countryside became completely parched. Water supplies fell to dangerously low levels. Fortunately, once the rains really started excellent and well distributed falls were experienced continuing well into September, a month later than is usual. In the higher areas planting was delayed by almost continuous rain and a few farmers have been unable to sow their full acreages.

The short rains coincided, in many cases, with harvesting operations and have resulted in the loss of some grain in these areas.

In spite of the early drought the total rainfall for the year, 34. 87 in. at Njoro, approximated very closely the average rainfall of 35, 73 in. over 17 years.

Month	*Average Rainfall over 17 years*	1945
January	0. 89	1. 02
February	1. 40	0. 69
March	2. 94	0. 62
April	4. 56	0. 33
May	4, 34	3. 27
June	3, 39	7. 89
July	4. 89	6. 93
August	4. 84	6, 48
September	2. 08	4. 03
October	1. 85	1. 17
November	2. 74	1. 86
December	1. 81	0. 59
	35. 73	34. 88

Stock

Stock suffered considerably during the first part of the year from lack of grazing and water, which led to greatly reduced yields of milk and butterfat. Pastures rapidly recovered with rain, and butter rationing was discontinued in November.

Crops

Despite its inauspicious start the season has turned out extremely well and good yields of small cereals have been reaped over the lower areas of the district. In the Njoro and Solai areas excellent wheat crops have been harvested with yields averaging six or more bags per acre. Individual fields have yielded as high as twelve bags per acre. Harvesting has just started in the higher areas and yields are expected to be of the order of seven or more bags of wheat per acre.

Owing to the shortness of the season, maize yields in general will be only moderate. Subukia is an exception to this and expects an overall average of about ten bags per acre. Maize crops have been seen here of an expected yield of twenty or more bags per acre.

Rye, the acreage under which was fortunately drastically cut down by Sub-committees, has again proved a complete failure due to stem rust. It may be considered a complete "write-off" in so far as Kenya is concerned. It has already been removed from the list of scheduled crops.

Flax was also removed from this list during the latter part of the year.

The areas under the five scheduled crops listed during the years 1943 to 1945 are shown. It will be seen that the total acreage in 1945 is equal, to all intents and purposes, to that in 1944. Rye has suffered a large decrease, whilst the acreage under maize has declined slightly. These decreases are just about offset by the increased acreage under wheat.

	1943	1944	1945
Wheat	44. 776	50. 606	55. 885
Maize	24. 951	25. 089	23. 686
Rye	5. 844	5. 012	1. 418
Barley	3. 146	5. 606	5. 205
Oats	2. 248	2. 605	2. 126
	80. 965	88. 918	88. 320

Machinery

Machinery has been in much freer supply and most farmers have been able to obtain their essential requirements. The Control operated by the Agricultural Officer has been continued in order that machinery may be allocated to the best advantage.

The short season has led to a telescoping of harvesting operations, but thanks to the invaluable help again given by the Machinery Pool no crops have been lost through lack of machinery.

Soil Conservation

The Soil Conservation Service has recently been strengthened by two new apointments. an Inspector under the Land and Water Preservation Ordinance and an Assistant Soil Conservation Officer.

One of the many duties of the Inspector will be the control of squatter cultivation on steep slopes and on banks near rivers and streams; and in this very necessary work he will fill a long-felt want.

The European farming community in the district is now extremely soil-conscious and we have a long waiting list for terracing.

Mr. Paul Nixon, Field Assistant, left the Department in order to join the American Forces in February. Mr. Nixon, whose work was always of a very high standard, enjoyed the full confidence of the farming community and his resignation was a great loss to soil conservation work and to the service. Mr. Nixon's departure threw an extra burden of work on Mr. Newton. Assistant Soil Conservation Officer, who. although single-handed, carried out a large programme of conservation work during the year, and acknowledgment is made to him for the very efficient manner in which he carried out his duties. The following work has been accomplished: —

(1) 4, 731. 0 acres of broad-based terracing, involving 373. 8 miles of terraces.

(2) 814. 3 acres of narrow-based terracing, involving 133. 3 miles of terraces.

(3) 109. 3 acres of squatter ***shambas***, involving 36. 6 miles of terraces.

In addition, 11,278 yards of cut-off drains and 18,506 yards of drainage-ways were constructed, and 22,603 yards of farm roads made. These figures include, in addition to work done by the S.C.S. D.6 tractor, work also done by farmers' own tractors under our supervision and the loan for a short time of a tractor from the Machinery Pool.

Approximately 150 acres of Nubian *shambas* in the Ravine township have been narrow-base terraced, involving about 50 miles or more of terraces. The necessary cut-off drains and drainage-ways have also been constructed. Anti-erosion terraces have been made in the eroded areas in the Nubian village and grassed down. A start has been made with terracing in the Swahili village.

Ol'Doroto Watershed.—A considerable amount of time was again spent in the Ol'Doroto watershed area, partly in company with the Senior Agricultural Officer, Rumuruti, in connexion with uncontrolled squatter cultivation and indiscriminate forest destruction on steep slopes and right down to the edges of springs and rivers. Orders under the Land and Water Preservation Ordinance were served on farmers in the catchment area falling under my jurisdiction, requiring them to move their squatters back progressively from rivers and steep slopes. The Senior Agricultural Officer, Rumuruti, took similar action in his own area which adjoins. As a result there is already a marked improvement and there is no doubt but that if this area could be spared the unwelcome attention of squatters a cover a vegetation would rapidly come in. Mr. Watson's help in this matter is gratefully acknowledged.

It does seem a pity that the recommendations of the Official Reconnaissance Party, which reported on the area in March, 1944, to the effect that certain areas of the watershed be acquired by Government, has not been put into effect. Had these recommendations been carried out the springs and rivers in this important catchment area supplying water to the farming areas below would have been preserved completely.

River Scouts.—The scheme has continued to work reasonably well. A great deal of work has been done pushing squatters back from river banks and off steep slopes. Squatters "in possession" of farms lacking in European supervision have given trouble—in some cases necessitating disciplinary action. The appointment of a full-time Inspector will allow much fuller supervision to be given to this work.

In conjunction with the Clerk-supervisor to the Nakuru District Council, a number of cases of quarrying on river banks, accompanied by the throwing of over-burden into the river, were looked into and stopped. As a result. District Council promulgated rules governing, locally, the cutting and quarrying of stone on river banks and requiring prior inspection of sites by the Clerk-supervisor or the Agricultural Officer.

The River Scouts attended a short refresher course in elementary soil conservation methods at the beginning of the year at Kitale. The organization now consists of 15 hon. River Wardens and 12 native River Scouts, covering all the important and many of the lesser rivers and streams in the district.

Rongai Valley Survey.—The topographical survey of the Rongai basin and surrounding country draining into it, commenced by Mr. R. O. Barnes, Soil Engineer, about a year ago, has now been completed.

This work has revealed the presence of many natural drainage lines which, in effect, form a complete river system and which carry off flood waters during heavy storms.

Mr. Barnes' survey has been of Ihe greatest value in our soil conservation work in the area. We are now using these natural drainage lines ourselves for the disposal of surplus water. Terracing in the valley can now be planned as a co-ordinated whole into which framework the individual farm pieces may properly be fitted. This is a great advance on the old piecemeal methods of terracing, in which each farm was treated as a separate unit.

Already several farms in the area have been completely redesigned (old fences removed, square fields altered in shape and swung round to lie on the contour, old roads realigned or completely discarded and new ones made, etc.) to allow of contour farming methods being adopted. These farmers have adopted these methods voluntarily as they fully realize the advantages to be gained. Others require to be persuaded, but it is hoped eventually that all will follow these good examples.

Marketing of Native Produce

The Grading and Inspection Services have continued throughout the year.

43,128 bags of first grade maize and 2,215 bags of second grade maize; was purchased by the Control from forest squatters in the district during the year.

The total number of native potatoes purchased by the Control at markets in the district during the year was 94,920 bags, of which 71,600 bags were exported.

Oatura Stramonium

This plant was gazetted a noxious weed under the Suppression of Noxious Weeds Ordinance, 1933, which was brought into force with effect from 1st September, 1945.

Accordingly, the drive which had been started to eradicate this noxious weed from the district before the Ordinance came into force was given added impetus. The campaign took the form of personal approach and demonstration in methods of eradication, propaganda at Farmers Association and Production Meetings, in the Press and over the wireless. Handbills were also printed and posted up in prominent places in clubs, post offices and police stations. They were also circulated to all plot holders in the Nakuru Municipality, warning them of this poisonous weed and advising them of control methods.

It is considered that some progress has been made. The K.U.R. & H. and the Nakuru District Council have co-operated fully in clearing the weed off the permanent way, station precincts and road reserves. The farming community is also very conscious of allowing this dangerous weed to continue unheeded on their lands and farmers have made, in most cases, some attempt at control. Unfortunately, it is not sufficient to pull up the plants once and think that the work is done. Constant supervision is needed since the germination of the pest is irregular and new crops appear after each shower.

The chief value of the campaign this year has been to make farmers and others "datura-conscious". Success in the eradication of this pest will, however, only be achieved by active and sustained effort over a period of years.

Farmers' Meetings

Farmers' meetings have been attended whenever possible. Talks were given to the Subukia and Dundori Farmers Associations on "Ley Farming",

Nakuru District Council

Meetings of Council were attended and advice given and co-operation sought in connexion with water problems, conservation, River Scouts, quarrying on river banks, etc.

Close liaison was at all times established with the Clerk-supervisor in all matters in which we met on common ground and proved very valuable in resolving difficulties, especially in connexion with water problems caused by overlapping of responsibility in the Water Ordinance and the Land and Water Preservation Ordinance,

I was co-opted to serve on Council's Water Committee during the year.

Experimental Work

Trials of fertilizers on a field scale were again continued. Two trials were laid down, one at Njoro and one at Molo, and included in them were two new fertilizers, Rhenania and Super Rock Mixture, produced by the Chemical Department.

These experiments will form the subject of a separate report.

Farming Prospects in 1946

In view of the concern which is felt regarding the declining fertility of our soils due to over-cropping and the directive from the Production Board that old land must be rested (Circular Letter APSB 14/45 of 26/10/45) it is likely that there will be a drop in arable acreage in 1946, followed by a gradual and progressive lessening of land under the plough and a return to a more balanced type of farming.

Acknowledgments

Thanks are due to Messrs. A. J. Stewart, Njoro; L. J. Steevens, Molo; J. R. Pickford, Londiani, and W. Jackson, Londiani, for permission to carry out experiments on their land and for help and co-operation in carrying out the work.

H. C. THORPE,
Agricultural Officer,
Nakuru District..

ANNUAL REPORT OF THE SENIOR COFFEE OFFICER (COFFEE SERVICES), 1945

Introduction

The disastrous drought which has persisted in the main coffee areas since 1943 continued with unabated severity during the period under review and as a consequence experimental and investigational work on many of the cultural problems has been severely restricted. Results obtained from experimental work during this period may well prove misleading when normal climatic conditions again prevail. It cannot be too strongly stressed that under such variable climatic conditions as experienced in this Colony conclusive results on a long term crop such as coffee can only be obtained after many years of experimentation.

From the technical aspect, the main features of importance during 1945 were the satisfactory results obtained using the Entomologist's new spray as a control for thrips (*Diarthrothrips coffee)* under large scale estate conditions; the appearance of a hyperparasite of *Anagyrus* sp. near *kivuensis;* which was responsible for a breakdown-of the biological control of the common coffee mealy bug *Pseudococcus Kenya* in isolated areas; and the further investigations carried out on the causes of the Upper Kiambu type of liquor. These subjects are fully dealt with in the reports of the Entomologist and the Plant Physiologist.

Staff

Officer in charge, Mr. S. Gillet (January 1st—April 30th), Mr. M. Halcrow, O. B. E. (May 1st—December 31st); Entomologist. Mr. A. R. Melville; Plant Pathologist/Physiologist, Mr. R. W. Rayner; Assistant Agricultural Officers, Mr. E. Cottington and Mr. J. T. T. Schouten.

Mr. Halcrow proceeded on transfer on promotion to Barbados in March, I 1946. Mr. Gillett re-assumed duties as Officer in charge from the 1st January,; 1946.

Meteorological Data

Meteorological records were kept at all the main stations and sub-stations throughout the year. The following table shows the monthly rainfall distribution from eight stations: —

	S. A. L. Nairobi	Karimani Thika	Coffee Research Station Ruiru	Anmer Kiambu	Kent-mere Upper Kiambu	Kapr etwa Elgon	Una Estate Solai	Experi-ment Station Kitale
	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
Jan	1. 46	1. 14	0. 54	0. 68	0-99	Nil	0. 17	0. 16
Feb.	2. 85	3. 07	2. 41	4. 46	2. 59	1. 56	0. 09	1-99
March	2. 59	5. 06	5. 03	2. 96	2. 16	0. 19	0. 13	0. 48
April	2. 10	3. 10	2. 70	3-18	2. 58	0-58	1. 04	0. 34
May..	7. 31	6. 12	6. 47	6. 97	10. 18	11. 22	3. 40	13. 40
June..	3. 43	2. 56	3 56	4. 48	3. 65	2 45	10. 55	4. 31
July	1. 61	0. 37	0. 50	4. 90	12. 04	4. 57	5. 72	4. 89
Aug.	2. 00	1. 71	2. 45	3 72	1. 94	6-63	3. 89	7. 76
Sept.	1. 10	0. 49	2. 13	1-71	3 45	5. 47	3. 98	7 10
Oct	0. 12	1. 40	0. 87	0. 71	0. 58	3 33	3. 81	1. 97
Nov	6-45	9. 44	9. 36	7. 77	7. 27	2. 24	2. 96	1. 33
Dee.	1. 25	0. 95	0. 84	1. 00	0. 08	1. 79	0. 48	1. 77
Total	32. 27	35. 61	36. 85	42 54"	47. 51	40. 03	36 22*	45. 50
No. of days	100	98	128	128	143	135	144	149

Stations, Suit-stations, etc.

Coffee Research Station, Ruiru.—The main efforts of the Coffee Services during the year were concentrated on the development of this new Station. Much has been achieved, but much still remains to be done. Early in the year some of the coffee planted on the poorer land was uprooted, the area was cleaned and planted to Napier grass. A total of 101 acrcs has been left under coffee, all of which is being regenerated. About 60 per cent of the total acreage is being established on the multiple of stems system and the remainder on the single stem system. Forty acres of land have been planted to Napier grass. Shade trees were established on the coffee plots to be devoted to natural shade trials. The whole area has been contour terraced. A replanting programme, designed to replant the whole coffee area over a period of 30 years, has been commenced. In order that an early start can be made with the establishment of new seedlings, the first two areas replanted will only be rested under Napier grass for a period of two years. Subsequent areas will remain under this grass for three years, as recommended in the article entitled "A Policy for Improved Husbandry on Coffee Estates" which was published in the Coffee Board Bulletin, Vol. IX, No. 107, November, 1944. Construction work undertaken during the year has included the establishment of a large nursery, the installation of a hrydram to supply water to the labour lines and dairy, the building of a cattle dip in stone, the construction of a water tank having a capacity of 17,000 gallons and the erection of sundry stores. In addition, a start was made on the dairy buildings and a new stone bridge over the Komassie, which will replace the present temporary bridge and will make provision for a better approach to the Station.

Scott Agricultural Laboratories.—A reduction in the acreage under coffee was effected during the year. Certain experiments were continued to the end of the year in order that another season's recordings could be obtained. The individual tree and selection work has been maintained and it is hoped that records from these plots will be continued for several more seasons.

Kitale Experiment Station.—The coffee experiments and nurseries have been maintained on the station. No new areas were planted to coffee but a large number of seedlings of selected types were raised in the nursery for distribution to planters.

Sub-stations.—The sub-stations at Kapretwa Estate, Elgon: Kenmere Estate, Upper Kiambu: Karimani Estate, Thika, and North Kitito Estate. Makuyu. were continued but suffered through lack of supervision on account of the shortage of European staff.

Co-operative Experiments.—Recording of crop yields on the shade tree trials at Kituamba Estate. Kiambu. was carried out. Liquoring reports on samples of coffee taken from under the different shade trees were also obtained.

Experimental Work

(a) Size of Pluming Holes Experiment, 1940-41 *to* 1945-46 *inclusive)*

Scott Agricultural Laboratories.—The treatments were as follows:—

A. Holes 3 ft. x 3 ft. manured
B. „ 2 ft. x 2 ft. „
C. „ 1½ft. x 1½ft. „
D. „ 1 ft. x 1 ft. „
E. „ 6 in. x 6 in „

Comparison of Six Year's Results.—Average yield of cherry per tree in lb. - six years' total:—

	A	B	C	D	L	*Signif. Difference*
	26.28	23.63	24.80	23.39	20.63	3.68 (5%pt)
Per cent of mean..	110.6	99.5	104.4	98.5	86.9	15.5

The results, though inconclusive, indicate that there is some advantage in the preparation of larger holes at the lime of planting. A study of the behaviour of the different treatment in different years showed that, on the whole, no treatment group was independent of the fundamental seasonal trend. It is considered that the unfavourable weather conditions which have persisted during the past four years have masked the differences due to treatment. Throughout the period, crop yields on all treatments have been exceptionally low.

Kitale Experiment Station.—The treatments were as follows:—

A. Holes 1 ft. x 1 ft.
B. „ 1½ ft. x 1½ ft.
C. „ 2 ft. x 2 ft.
D. „ 2½ ft. x 2½ ft.
E. „ 3 ft. x 3 ft.

Comparison of Six Years' Results.—Average lb. weight cherry per tree in total six years:—

	A	*B*	*C*	*D*	*E*	*Mean*	*Signif. Difference*
	21.9	22.2	23.3	24.0	24.0	23.17	3.50
Per cent of mean..	95	96	100	104	105	100	15

This analysis of the results indicates that there was not enough difference between the treatments for significance. Nevertheless, the trend of increasing yields with increased size of planting holes is so regular that there has obviously been some benefit. The difference in average yield between 1 ft. x 1 ft. planting holes and 3 ft. x 3 ft. holes was a total of 2.5 lb. cherry per tree in six years, which is equivalent, theoretically, to a difference of nearly 2 cwt. clean coffee per acre.

Again, the table of interaction treatment x season is not included in the report because it does not appear to bring out any particular interaction.

(A) *Pruning and Cultivation Experiment,* 1940-41 *to* 1945-46 *inclusive*

Scott Agricultural Laboratories.—The treatments were as follows:—

Main Plots (Cultivations)—
1. Box Ridging.
2. Alternate row mulching,
3. Complete mulching.

Sub-plots (Pruning)—
1. Ordinary single stem.
2. Modified single stem (Poppleton).
3. Modified single stem (Hard Spiral).
4. Multiple stem.

Comparison of Treatments—Average of Six Years' Results—

Cultivations:

	1	2	3	*Signif. Difference*
Clean cwt. per acre ..	4.72	7.63	7.02	1.72 (1% pt)
Per cent of mean..	73.1	118.2	108.7	26.0

It is obvious that mulching is highly advantageous in the circumstances.

Pruning:

	1	2	3	4	*Signif. Difference*
Clean cwt. per acre	6.73	6.26	5.87	6.95	0.89 (5% pt)
Per cent of mean..	104.0	97.0	91.0	180.0	15.0

It appears that the difference between ordinary single stem pruning and multiple stem is negligible in the circumstances. The modifications of single stem pruning (Poppleton and Hard Spiral), that have been found beneficial at the low elevations, appear to be at a disadvantage at the Scott Laboratories, but the reduction in yield in not very significant.

Interactions— Cultivation x Pruning.—The following table brings out an interesting point:—

Average Cherry weight per treatment—

	Ordinary Single Stem	*(Poppleton)*	*(Hard Spiral)*	*Multi stent*	*Average*
Box Ridging	1, 623	1, 337	1, 554	1. 443	1, 489
Alternate Mulch	2, 382	2. 270	2, 342	2. 636	2, 407
Complete Mulch	2, 369	2, 320	1. 662	2. 499	2. 212
Average	2, 125	1. 976	1, 853	2. 193	

Standard error for this table = 140. 0.

It appears that the multi-stem has been able to derive additional benefit from the mulching treatments.

(ii) *Cultivation x Seasons.*—In this case there was no significant interaction effect, although there is a slight indication of higher yields from alternate row mulching. The table is not included here.

(iii) *Pruning x Seasons.*—Here again, the table has been omitted from this report because it does not appear to throw any light on the question of the relative merits of different systems of pruning in different years. There was no significant interaction.

(c) Mulching Experiment, 1942-43 *to* 1945-46 *inclusive*

Kitale Experiment Station.—The treatments were:—

A. Mulch between the rows.
B. Mulch under the trees.
C. Complete mulch
D. Control—no mulch.

Comparison of four years' results—

	A	*B*	*C*	*D*	*Mean*	*Signif. Difference*
Clean cwt. per acre..	4.97	4.89	4.90	4.02	4.70	0.64 (5% pt)
Per cent of mean..	106	104	104	85	100	13. 5

There was, therefore, no difference in the relative effects of the three mulching treatments. All mulching treatments were very significantly better than the control treatment "D".

The interaction treatment x years table was as follows:—

lb. Cherry per treatment:

	A	*B*	C	*D*	*Total*
1942-1943	917	863	929	957	3, 566
1943-1944	984	962	699	858	3, 503
1944-1945	1, 258	1, 273	1, 569	762	4, 862
1945-1946	458	458	369	446	1. 731
Totals..	3. 617	3, 556	3, 566	2, 923	

The perusal of these figures brings out a point which has been observed in similar experiments at the Scott Laboratories, namely, that the benefit of

mulching appears to lie in the ability of mulched trees to take advantage of a good season. The fluctuation in yield from season to season was greater in the mulched plots than in the control.

Selection Work

Selection for trees having high yielding propensities, together with good bean and quality characters, has been continued. At the Scott Agricultural Laboratories the grafted progeny of many of the parent selected trees have cropped satisfactorily, indicating that the high yield is an inherent character of the parent. The adverse climatic conditions have, however, been responsible for a general lowering in yield and in consequence the progeny recorded during the years 1941-1945 have given smaller yields than their parents, which were recorded during the years 1937-1941. Recording over a further period of years is necessary before conclusive results can be expected. On the sub-station at Kentmere Estate, Kiambu, selection has been continued in an endeavour to find a type showing resistance to the Upper Kiambu characteristic flavour. One tree—K20—would appear to show these qualities and arrangements are in hand for its multiplication by both sexual and asexual methods. Over a period of five years this tree has consistently produced a nice type of bean, which has liquored well. It has yielded an average of 2 lb. of clean coffee per annum.

Seed of certain types proved to be highly resistant to Coffee Berry Disease *(Colletotricum coffeanum)* in the Belgian Congo, were received during the year by the Department, through the courtesy of the Belgian authorities, and planted in the nurseries. Germination has been good and the seedlings will be established in the trials at Savani Estate, Nandi, and on the Kitale Experiment Sation.

Advisory Work

Heavy calls were made on the limited staff for advisory work during the year. The Entomologist, in particular, spent much of his time visiting estates in response to requests for assistance on problems connected with either thrips or mealy bug and in consequence his pure research work was seriously hampered. It is hoped that when the staff position improves technical officers will be available for ali advisory work, thus allowing the scientific officers to pursue their research problems undisturbed.

Coffee Reseach Committee

The Committee met on three occasions during the year and full reports of their deliberations and recommendations were published in the Coffee Board Bulletin. The Coffee Services is glad of the opportunity of thanking all members of the Committee for the valuable help they have given.

Acknowledgments

This report would be incomplete without reference to the co-operation and assistance given the Coffee Services by other officers of the Department. In particular we record our sincere thanks to the Senior Agricultural Chemist and his staff for help given in the preparations of the D. D. T. /paraffin spray, which proved a temporary control against the attending ant, *Pheidole piwctulata.* at a time when banding grease was unobtainable. Our thanks are also due to Mr. C. R. Devonshire, Liquorer to the Coffee Board, for the large number of samples he has reported on on our behalf. Finally, I personally wish to record my appreciation to all officers of the Coffee Services, both European and African, for their loyal work throughout the year.

STUART GILLETT,
Acting Senior Coffee Officer

ANNUAL REPORT OF THE ENTOMOLOGIST (COFFEE SERVICES), 1945

General

In the early pari of the year research was continued on the Coffee Thrips *(Diarthrothrips coffee* Williams). Important additions to our knowledge of this insect have been made in recent years and a practical control method has been developed which has so far proved to be very satisfactory. In view of this satisfactory thrips position, it was found possible to diveit attention to further studies on the mealy bug problem and a start has been made on an investigation of cases of local failure of the mealy bug parasites introduced from Uganda in 1938. The necessity for such an investigation has long been recognized because these local failures have been puzzling in view of the general spectacular success of the parasites elsewhere. A shortage of field staff has inevitably led to increased calls on the Entomologist's time for advisory services and the time available for research has been lessened accordingly. About 150 advisory visits to farms were made during the year in addition to extensive travelling in connexion with investigational work.

The Coffee Thrips

The section of the Entomologist's Annual Report for 1944 concerning the Coffee Thrips *(Diarthrothrips coffea* Williams!), which included most of the experimental results obtained in the 1944-45 thrips season, was published in detail in the Coffee Board Bulletin for June, 1945, and there is little to add to that report.

Bulk supplies of paris green for use in the paris green/molasses/lime spray did not arrive in the Colony in time for the 1944-45 outbreak season, but some planters were able to try out the new method on a plantation scale with the small stocks of this insecticide already in the country. Results were very promising. The 1944-45 outbreak season did not produce infestations of great severity, but it was possible to carty out a further series of field experiments and a full-scale field trial which enabled certain improvements in the method to be made. An increase in the quantity of hydrated lime from 1{ lb. to 3 lb. was found to make the risk of leaf scorch negligible without reducing the kill obtained to any important extent. The recommended formula now reads: water, 40 gallons; hydrated lime (fresh, finely ground, of high calcium oxide content), 3 lb.: paris green, 8 oz.: molasses, 10 pints. To be mixed in the order given.

Experience gained in the field trial indicated that spraying should commence earlier than had previously been considered necessary and that from September onwards close watch should be kept on those areas which had proved themselves in the past to be incipient outbreak centres. An article entitled "A Reminder on Spraying for Thrips" was published in the Coffee Board Bulletin for September, 1945, including the above-mentioned modifications, and giving planters the information they would require to deal with the next thrips outbreak. With a prolonged dry season accompanied by continued hot conditions, outbreaks occurring in the 1945-4(i season have been of extreme severity, the damage, in some plantations where no control measures have been taken, amounting to complete defoliation. Where the new spraying method has been effectively carried out a very satisfactory degree of protection has been afforded.

The Common Coffee Mealy Bug

While the biological control of the Common Coffee Mealy Bug *(Pseudococcus kenya* Le Pelley) by introduced parasites has in general been highly successful, isolated instances have occurred since the early days of the parasite introductions which seem to indicate a varying degree of failure on the part of the parasites.

Until recently there has been little opportunity to investigate such cases, but the need for such an investigation has long been recognized. Such local failures, even though in the great majority of cases they involve only small areas, have naturally produced a feeling of uncertainty in the mind of the planter, who, while admitting the general success of control by parasites, cannot be blamed for his apprehension lest the state of affairs indicated by such failures should become general. A preliminary account of the investigation into the causes of local failure of the introduced parasites was published in the Coffee Board Bulletin for October, 1945, and some further advance has been made since that account was published. Our present knowledge can be summarized as follows: — Of five species of parasites introduced only one has as yet shown itself to be capable of maintaining the mealy bug population at such a low density that it ceases to be a pest, namely *Anagyrus* sp. near *kivuensis* Comp. All four of the remaining species arc found breeding in the field and, although there has been no attempt as yet accurately to assess their effect, the impression gained is that none of them is capable of satisfactorily controlling *Pseudococcus kenya:* by itself. Recent investigation shows that local failure of *Anagyrus* sp. near *kivuensis* is causcd by the depressing effect of a hypcrparasite (as yet unnamed).

The normal course of parasitism by *A.* sp. nr. *kivuensis* can be regarded as following the sequence—climax of *P. kenya*•—climax of *A.* sp. nr. *kivuensis* —climax of hypcrparasite. In other words, the occurrence of the hyperparasite is of no consequence provided this sequence is followed. Under certain circumstances, however, the climax of the hyperparasite appears to occur prematurely. *A.* sp. nr. *kivuensis* does not reach a normal climax and there is only partial control of *P. kenya*-. As far as is known at present these circumstances are briefly as follows: —

(a) The hypcrparasite mentioned above is common to both *A.* sp. nr. *kivuensis* and a primary parasite (unnamed) of Green Scale *(Lecanium africanum* Newst. h Thus, when an infestation of Green Scale occurs in the same place as an infestation of mealy bug. it is possible for the hyperparasite to switch from one host to the other, mutually causing premature depression of the primary parasites and their resultant failure to control their hosts.

(b) The same hyperparasite, even when Green Scale is not noticeably present, appears to be able to cause premature depression of *A.* sp. nr. *kivuensis* and a resultant infestation, when mealy bug occurs on a particular type of growth. Young, vigorously growing suckers, coming from near the base of the tree, whether it be growing on the single or multiple stem systems, favour the development of mealy bug. The reasons for this type of parasite failure are not yet understood, but it is possible that when trees are allowed to produce suckers at the coldest time of the year the parasite *A.* sp. nr. *kivuensis* is temporarily at a disadvantage, relative to its host and to its hypcrparasite. This type of failure is by far the commonest and can lead to the most serious infestation of mealy bug, especially when single stem coffec is originally converted to the multiple system or when a new cycle of heads is brought up at one time.

The above should be regarded as oversimplified preliminary findings only. Although the hyperparasite referred to above appears to be the principal cause of parasite failure, there are others similarly involved, and further, other insects may be involved in the same manner as Green Scale.

In general, however, these two types probably cover practically all cases of parasite failure. A question which arises is as to whether the incidence of parasite failure is increasing or not, but this question is still impossible to answer. General observations and investigational work will have to continue for a longer period before an answer can be attempted. The following preliminary observations can. however, he made: —

(a) It was to be expected that a considerable period would have to elapse before what could be regarded as a normal equilibrium as between host and parasites could become established. It is as yet too early to make a statement on this question.

(b) Further studies on the reaction of primary parasi; es, hyperparasites and associated hosts such as Green Scale to varying climatic conditions from season to season are required.

(c) Following the virtual cessation of the almost universal greasebanding control method for mealy bug, certain other pests appear to be gradually returning to the state of balance they maintained before this method was adopted. Such a pest is Green Scale *(L. africanum*) which is rapidly devoured by Coccinellids following greasebanding. In view of what has been stated above of the connexion between mealy bug and Green Scale, this is obviously a factor which may have an important bearing on the activity of the parasite *A.* sp. nr. *kivuensis.*

(d) The recent conversion (for cultural reasons which need not be gone into here) of large areas of single stem coffee to the multiple system is another factor which must be considered, in view of what has been stated above of the connexion between sucker growth and a high degree of hyperparasitism. It is possible that the large areas in a susceptible state have resulted in more attacks of mealy bug which has given the impression that the position generally has deteriorated.

The need to answer this question became more pressing towards the end of 1945 and the beginning of 1946, when these local failures were more common and severe than in any previous season. As has been pointed out above, the position is still too difficult to assess, and further observation and research is obviously necessary. One point that emerges quite clearly from the evidence already in our possession, however, is the fact that when *A.* sp. nr. *kivuensis* fails there is no other parasite which can effectively take its place and the possibility, which has never been lost sight of, of introducing further parasites from Uganda, must now be considered. As regards immediate measures, the aim in the meantime must be to eliminate as far as possible conditions favourable to the hyperparasite.

A more serious view must obviously be taken of outbreaks of Green Scale in the future and control by spraying or banding carried out. Sucker growth on single stem coffee must be regularly removed and the trees not allowed to become too thick. In multiple stem coffee it has been found possible to protect new suckers by applying methylated spirit with a brush direct to mealy bug infesting them. If this is carried out as a monthly routine until such time as the growth becomes more mature, parasites can then be relied upon to effect control.

Selection of suckers should be carried out as early as possible and the unwanted ones removed. An uneven cycle is recommended in established multiple stem coffee, for, by adopting such a cycle, a continuous area of young suckers all of the same age is avoided. When carrying out the original conversion of single stem coffee, the area converted at any one time should be such that the methylated spirit treatment can be properly carried out.

When parasite failure occurs, the only course remaining is to revert to control by predators which involves grease-banding the trees to exclude the ant *Pheidole punitulata* Mayr.

The position during the recent period when parasite failures were more common was aggravated because stocks of banding grease in the Colony became exhausted. As an emergency measure, D. D. T. in kerosene at 3 per cent strength applied to the lower part of the stem of the tree with a sprayer was used successful as a substitute ant control. This application was found to be effective for about six weeks.

This method of ant control requires further testing from various aspects, including its effect on the trees and on parasites. The official recommendation for areas where parasite failure has occurred is still greasebanding. Good stocks of this material have now arrived.

In conclusion, it can be stated that, apart from the isolated localities where, for one reason or another, conditions have favoured the hyperparasite, the biological control of *P. kenya* by *A.* sp. nr. *kivuensis* is still highly successful, and that at the time of writing the majority of infestations induced by parasite failure have been satisfactorily controlled by predators.

Antestia

This pest caused trouble in certain areas during 1945 and large populations were sometimes recorded. In some areas the reason for this increase seemed to be a seasonal fluctuation; such areas are those in which *Antestia* is not always a pest.

In other areas, where *Antestia* always constitutes a menace, the increase was a cumulative effect following the use over a period of low grade pyrethrum powder, a material subsequently proved to be ineffectual against *Antestia.* Releases of high grade powder made it possible to restore efficient control. It is surprising how few planters carry out regular tests to ascertain the *Antestia* population, when the value of such a routine has been so conclusively proved.

Other Pests

Asterolecanium coffete Newst. was unusually prevalent and necessitated control by spraying pn many farms. Green Scale *(Lecanium africanum* Newst.) was also more common than usual.

Information on these pests was published in the Coffee Board Bulletin for October, 1945.

A. R. MELVILLE,
Entomologist (Coffee Services).

ANNUAL REPORT OF THE PLANT PHYSIOLOGIST AND PATHOLOGIST (COFFEE SERVICES), 1945

General

During the year under review considerable advances in the analysis of the results from the growth observations and from the experiments on the Upper Kiambu characteristic flavour have been made. These have largely been possible owing to the employment of an Italian co-operator, Paulo Vicinelli, formerly an agricultural economist in the Department of Agriculture in Abyssinia, who has made detailed statistical examinations of the data which had been accumulated over the last few years.

No new long-term investigations were commenced, but a fair amount of *ad hoc* work was performed in connexion with various physiological diseases mainly associated with the continued abnormally dry conditions. An article entitled "Leaf Scorch", which dealt with some of these diseases, was published in the Bulletin of the Coffee Board of Kenya in May.

Shedding of Cherry in the Mitubiri Area

A severe shedding of cherry in all stages of development was observed on Mongalia Estate. Mitubiri, during April. Cherry not shed, but reaching maturity, was found frequently to contain blackened beans from which no organism could be isolated: externally there were no lesions. The disease appeared to be physiological and similar to, but much more severe than, the shedding of very young cherry so common in the Makuyu district. Both this latter type of shedding and the production of black beans have been shown to be caused by lack of carbohydrates developing earlier than is the case when it causes overbearing die-back *(see* Annual Report. 1942). The trees were found to have a very poor development of superficial lateral roots and those present contained little starch reserve, and in addition there had been a vigorous development of vegetation at the time of the shedding. The consequent strain on the trees may have caused a lack of carbohydrates before the new growth could produce sufficient for its own consumption. The poor development of the superficial root system does not appear to be entirely due to mechanical cultivation and may be normal for the area.

A New Type of Physiological Die-back

This die-back, which occurred on Mchana Estate. Ruiru. commenced as a vein-crossing scorch in which eventually all the leaves of a branch became involved and the latter died back, such branches occurring almost anywhere on the tree, although mainly in the outer and upper regions. The affected trees were mainly in a large, elongated depression, whose centre was some 20 ft. below the lowest point on the periphery. Investigation of the root systems showed them to be very superficial in the main, few roots passing below 4 ft. depth, 'he region of which there was a marked tendency to take a horizontal course. Determinations of soluble salt content and pH led to the conclusion that the soil normally has a very impeded drainage, apparently due to an underlying bard murram layer. The water which collects in the depression appears to find its way out via a swallow hole at the centre and hence the area avoids becoming a swamp. During the dry conditions of recent years the drainage, however, has been adequate for the reduced rainfall, and in the dry season the soil probably dried out below the majority of the roots. New root growth being insufficient to follow the moisture down, the trees would have become highly droughted for a considerable period. This draughting, together with the associated lowering in inorganic nutrition, is thought to have been the cause of the die-back.

Constricted Growth and Wood Conductance

A peculiar drooping of the leaves on multiple stem coffee at Gethumbwini Estate, Thika, which was not due to willing, was associated with regions of very short internodes on the main stem. A short investigation was made to see if such regions were likely to cause a reduced transpiration stream to the affected leaves. The time taken for the passage of a fixed volume of a non-osmotic fluid, liquid paraffin, under constant pressure through sections of equal length of stem, including a node, was determined. It was found that the areas of cross-section of the nodes just before the "constricted" regions were actually slightly larger than might have been expected from the regression of area on distance from the stem apex. Those of the "constricted" nodes agreed closely with the expected. Further, a linear regression of rate of flow on cross-sectional area was found. Departures from expected in the "constricted" regions were always in the direction of faster flow. There is thus no evidence that the "constricted" growth causes any restriction of the transpiration stream in the field.

Invstigations of the comparative nutrient status as regards nitrates, phosphates or starch in affected and unaffected branches revealed no marked differences, although nitrates were low in both cases. Further observations showed that the "droop" was of fairly general occurrence on old. somewhat isolated, multiple stem heads and was absent when these were shaded from the afternoon sun. It is thought to be a peculiar growth form brought about by the abnormal exposure of such heads.

Root Systems

Advantage was taken of the presence of the Italian co-operator to send the African Laboratory Assistant into the field to collect further data on root systems. Five root systems were excavated at Mchana Estate, Ruiru, in connexion with the peculiar die-back discussed above. These were photographed in such a manner as to give as good a permanent record as a well-drawn diagram. Detailed notes were made and pH and soluble salt contents measured electrically. The surface system was also washed out to one foot depth and photographed from above. In this manner useful records for reference purposes have been made. Most of the work of washing out was performed by the African, each root requiring, on the average, only a day's visit for recording. I have to thank the Manager of Mchana Estate. Colonel Merrilt. for his permission to work on the estate and for labour and facilities which he very willingly provided.

When labour was no longer available owing to picking having commenced, attention was transferred to the new Experimental Station at Jacaranda Estate, where a further three root systems were examined. These will form a foundation on which a physiological understanding of the trees on the experimental station can be based. It was found that two distinct types of root systems were present. In the one. the superficial root mat is fairly well developed, although mainly at some depth, whereas the axial system is very poor, having suffered from repeated and serious die-back. In the other, the superficial system is poor, reaching its maximum development immediately under the bole of the tree, but the axial system is somewhat better than with the first type and die-back does not appear to have been so severe. In both cases cultivation damage to the superficial system has been severe and the trees appear to have been planted too shallow. The first type was found at the north-western end of the estate and its superficial system is probably capable of rapid improvement. On the other hand, the regeneration of the axial system is likely to prove difficult. The other type occurs at the south-eastern end. growing on shallower soil containing murrain deposits. In spite of its poor superficial mat, it may prove easier to regenerate its root system as a whole than with the first type, owing to its better axial system.

The Upper Kiambu Type of Liquor

The investigation of the relationship between the greenness of the silverskin and the type of liquor produced by the contained bean, was continued by the examination of the effect of this factor in the case of individual trees on the plot loaned to the Department by the Kenya Tea Company at Kentmere Estate. Upper Kiambu. The crop of twenty trees chosen at random in a block of fifty was collected at weekly intervals and fermented and dried separately. Each lot was examined for amount of greenness and a liquoring test was eventually performed by the Coffee Board's liquorer. Owing to the small amount of crop on many occasions, it was often necessary to bulk several pickings together in order to get sufficient coffee for the liquoring test.

From a mathematical investigation of the relationships between the numbers of beans of different degrees of greenness in a sample, it was found that the percentage which had green coloration on the back of the bean, a relatively easily determined characteristic, gave a good indication of the mean greenness of the beans in the sample (i. e. the proportion of the surface of the type of bean most frequently occurring which is coloured green). The mean greenness expressed in this form for the total crop of each tree was found to be correlated with the number of cherries in the total crop. The relation appeared to be nearly linear up to 2, 000 cherries, above which point further increase in crop led to no further change in greenness. In the case of two trees (numbers 11 and 45), the mean greenness was much less than would have been expected from their crop size. The liquors of both these were sour.

An examination. of the change in greenness with week of picking for individual trees shows that in all cases the first small pickings were very green. Later and larger pickings were much less so and were the least green of all. The final pickings showed a return to greenness, which, in some cases, was very marked and in others (heavy cropping trees) was only slight. Within each tree the mean greenness followed the amount of crop picked each week, but between trees the amount of greenness at any one picking was apparently controlled both by the amount of crop at that picking and also by the total crop of that tree.

The liquoring reports were examined in the first place to see if there was any relation between general quality and mean greenness. The liquoring classifications "good", "fair", etc., were allotted a scale of marks and the correlation between these and the figure for mean greenness was calculated. The correlation coefficient, r. was 0. 087, a value not even given by a one in ten chance. Next, the liquors were assessed for Upper Kiambu characteristics by means of the scoring system devised with the help of the Coffee Board's liquorer in 1943. The correlation was found to be highly significant and beyond the P = 0. 001 level, r 0. 503. The reason for the lack of correlation in the first case appears to be that the samples with low mean greenness have a poor type of liquor, often sour or sourish, but which is not of an Upper Kiambu type. An examination of these cases suggests that it is only when a sample of a non-Upper Kiambu type is of small size that sourness develops. A sample of high mean greenness, but of the same size, does not give a sourish but usually an Upper Kiambu type of liquor. It is thought that in this case the fundamentally Upper Kiambu type of bean counteracts the sourness factor, which may be due to a too small amount of coffee for proper fermentation. It is noteworthy that there were relatively few eases of marked Upper Kiambu liquors. This may have been due to the counteracting sourness factor. It is well known in coffee blending that sourness may be overcome by the addition of a full-bodied coffee.

The best liquors were produced in the present series by coffees of intermediate to fairly high greenness. It is thought that this may. in part, be due to 'he method of preparation. The metabolic balance which produces a good liquor

seems to be a rather delicate one in Upper Kiambu coffees. With low crop, the characteristic Upper Kiambu flavour is usually produced, whereas a high crop is associated with another type of liquor which also has a poor flavour, although not of the so-called Upper Kiambu type,

A very careful and detailed analysis of all the data on the relation of greenness to liquor, mainly based on the liquors obtained in the present experiment, was made and the results incorporated in a score table for assessing the development of the Upper Kiambu flavour in terms of mean greenness. Some of the conclusions which were reached during this examination are worthy of note. Thus, although liquors from coffees with a high mean greenness are characterized by having a light acidity, this is only so if, at the same time, it is accompanied by a full body. Thus light acidity, light or medium bodied liquors come from samples with low mean greenness. On the other hand, a liquor light in acidity, full in body but "common", also comes from this type of coffee, but if it is not "common" or is "tainted" to "strong" it is usually from rather green beans. Common coffee are all of low mean greenness, as are also "sour" or "fruity" coffees. "Tainted" coffees are usually intermediate, whereas "strong" ones are of high mean greenness. There is an interaction with the acidity-body description, however, and also with general quality of the liquor. In general, a liquor which is of poorer quality than another with exactly the same description otherwise tends to be of lower mean greenness. Similarly, a "tainted" coffee. for example, with medium acidity and medium body is usually of lower mean greenness than one of otherwise similar description but with a full body. The score table will be of considerable value in future for assessing the effect of experimental treatments on liquor.

Composite samples were also made of the same type as those normally used for assessing the liquor of a tree in selection work. The correlation of the scores of these liquors against mean greenness of the total crop of the tree gave a slightly higher value than that obtained from the individual samples, r — 0. 583, a highly significant figure. The correlation between crop size and liquor score was also calculated and found to be insignificant, r -0. 149, but this was in part due to curvilincaritv. A graph showed that any correlation was probably completely accounted for by the correlation between mean greenness and crop. The liquors of the trees 11 and 45. which diverged considerably from the expected values in this latter correlation, were found to follow the values for mean greenness and not for crop size.

An examination of the liquors produced by pickings from the same tree shows a fairly strict relation to mean greenness, apparently closer than that which occurs between samples from different trees. A tree whose crop as a whole is green will have a fairly high scoring liquor from a picking which was not very green. In other words, the score of any particular picking depends both on the greenness of the sample and on the greenness of the total crop.

The results support those of last year, when it was concluded that greenness was only a correlated character and not the actual one causing the development of the Upper Kiambu characteristic flavour. It would appear to be a better index to the type of metabolism which produced the liquor than the size of crop alone; there is no data to decide whether it is better than the leaf /crop ratio, though it has certain practical advantages over the latter, and as a means of picking out those beans or parts of the crop likely to give an Upper Kiambu liquor, it will prove a very useful tool in further experimental work. Its investigation has yielded much useful information on the relations of different types of liquor and has demonstrated a closer relation between the properties of the bean and the liquor it produces than had hitherto been thought to exist.

Since a laboratory method of removing the mucilage from the bean by mechanical means had been found to yield a less Upper Kiambu type of liquor than that prepared by the usual fermentation method (*see* Annual Report for 19441, it was decided to perform some comparative tests using the Raoeng pulper and a machine devised by Mr. A. Pratt when he was an Agricultural Officer in the Colony.' The Raoeng machine was very kindly loaned by Mr. E. G. Pittaway, and the Kenya Tea Company again co-operated by providing coffee cherry from their Kibubuti Estate. Samples of cherry were collected at four dates spread over the picking season and taken to Jacaranda Estate, where they were divided into three lots, which were processed by the two mechanical methods and by the normal "dry" fermentation method. The liquoring reports on the samples obtained are not yet complete. In conclusion I wish to thank the Coffee Boards liquorer. Mr. Devonshire, for his continued patience in examining the large number of samples which these investigations have entailed.

Observations and Growth, Fruiting and Flowering of a Block of Trees at the Scott Agricultural Laboratories

The rainfall in 1945, although being higher than in the two preceding years, tended to fall in isolated showers of some intensity and the long rains period was not well defined. Growth, in consequence, did not show marked maxima and minima and never became very rapid. This may also partially have been due to the very vigorous growth in the short rains of 1944. Following this, there was a marked slackening in growth during January and February, though it did not cease as is usually the case at this time, presumably owing to the heavy showers which fell. At the end of February fairly heavy rain fell on five consecutive days and growth became more rapid for a period, but had slowed down again towards the end of April, when a rainy period commenced. Growth during this period reached a maximum for the year, but never became very rapid. There was a minor increase again in August and September and then a decrease to almost nil at the end of October. The short rains were of fair intensity but of short duration and produced a sharp peak in the growth curve. The watered trees followed the same general course as the unwatered, but the greatest growth was in March-April. The growth of these trees had not been exceptionally marked during the previous short rains, no doubt owing to their heavy cropping, the unwatered trees having hardly any crop at this time.

A good flowering occurred on both watered and unwatered trees during March and April, which produced good crops towards the end of the year. As predicted from the exceptional growth in the short rains of 1944, the unwatered trees produced an extremely heavy flowering in the short rains. This flowering was in common with the majority of the East of the Rift coffee. As might have been expected, the watered trees, which did not produce exceptional growth in the short rains of 1944. had only a minor flowering in the short rains of 1945 and their greater growth in March-April of that year has been reflected by a strong flowering in March, 1946,

The correlations between growth in one year and flowering in the following have been calculated as well as those between growth in one season in one year and flowering in the same season the following year. The following values or the correlation coefficient were obtained, all being highly significant: —

Regression of growth in short rains on flowering in following short rains.	r = 0. 5988
Regression of growth in long rains on flowering in following long rains.	r = 0. 5921
Combination of the two above r e g r e s s i o n s . . . ,	r = 0. 6186
Regression of total growth in long rains, plus that of the following short rains on total flowering one year later respectively.	r = 0. 6485

Thus it would appear that the basic influence in the development of a flowering is the amount of growth in a period one year previous to its development. This has already been shown to be, on the average, the time at which the flower buds are initiated. There is some evidence that the amount of flowering developed is modified during the period of its determination (one to three months before flowering occurs), but the growth the previous year, at the time of its initiation, would appear to be the most important single factor.

As has been seen and as, in fact, is only too well known, the main influence determining the size of growth maxima is rainfall and its distribution. Crop size comes next in importance. The effects of other climatic factors are usually obscured by these two factors. The growth of the watered trees in 1943, however, presented an opportunity to assess the effect of temperature, radiation and evaporation. The growth curve ascended rapidly to a maximum in January of that year and descended rather evenly with minor peaks and troughs throughout the year as the crop developed on the trees. The general downward trend was considered to be mainly due to this developing crop. A comparison of the minor peaks and troughs with a graph for degree hours per week at 5°C. temperature intervals revealed some noteworthy resemblances. A number of attempts to analyse the results by means of the method of multiple regression were made. Finally, a multiple regression was calculated with one dependent variable, average growth in mm/week/branch/tree and eight independent variables: time (days from start of regression), radiation (weekly average minutes of sunshine/day), evaporation (Piche—mm / week), and the average weekly hours/day in which the temperature rose above 10", 15°, 20°, 25° and 30 C. Since, when calculated as multiple regressions, the regression of number of hours above any temperature level excludes the effect of the number of hours above all other temperature levels, it is equivalent to calculating the effect on growth of different temperature levels. This method of calculating avoids certain difficulties with the statistics. The following table gives the total correlation and multiple regression coefficients: —

Variable	*Total Correlation Coefficients*	*Multiple Regression Coefficients*
Temperatures above 10 * C . .	+0. 286*	0. 076
„ I5°C	+ 0. 294*	- 0 . 176
„ 20°C	+ 0, 279*	+0. 328
„ 25°C	+ 0. 297*	4 0. 316
.. 30°C	+ 0. 424**	- 0 . 330
Time	- 0 . 891**	- 0. 148**
Radiation	+ 0. 252*	+0. 006**
Evaporation	+ 0. 072	- 0. 011**

The constant of the multiple regression equation is + 6. 621. The significance of the coefficients is shown by one asterisk if significant, two if highly significant.

The multiple regression coefficients for temperatures above 20° and 25°C are just not significant. Although none of the individual regressions on temperature are significant, the total regression on temperature is naturally high significant. Further, the differences between those for the pairs 15" and 25'. 20° and 30°, and 25° and 30° are significant. In general, it would appear possible that there is an optimum temperature between 25° and 30°C and a minimum between 15° and 20°, hi future investigations it will be necessary to bear it) mind the possibility that night temperatures might produce a more rapid growth than similar day temperatures, since the lower temperatures only occurred at night in this investigation. This is a similar state of affairs to that reported since these results were obtained by F. W, Went *(Amer. J. Bot.,* vol. 31, p. 597, I944) for tomatoes.

The positive regression with radiation when its effects on temperature and evaporation are excluded is noteworthy and may be contrasted with Nutman's findings on the generally inverse relation between radiation and photosynthesis *(Annals of Botany N.S.,* vol i, p. 353 and p. 681, 1937). This investigation, however, only dealt with single leaves and one only of the processes which influence growth. The positive correlation with radiation found in the present work may, perhaps, be interpreted as being the difference that might be expected when average radiation of the whole bush is considered and not just that of the single leaf.

After accounting for the various climatic factors, there remains a rather higher growth rate than expected at points associated with rainy periods which preceded them by one to two weeks. Since the effects of rainfall on temperature, radiation, evaporation and soil moisture have been eliminated, it would seem that the rain may also act in some delayed and possibly indirect manner and not only via its effect on soil or climate. It is noteworthy that flowerings are always brought out bv showers of rain in spite of the daily watering of the trees from above.

Although the results of the statistical analyses must be used with caution, they form a basis on which future investigations can be made and afford an interim picture of the main lines of the physiological reactions of the coffee bush which will be of considerable use in dealing with *ad hoc* problems.

R. W. RAYNER,
Plant Pathologist and Physiologist,
Coffee Services.

ANNUAL REPORT FOR 1945 OF THE AGRICULTURAL OFFICER, PYRETHRUM SERVICES

Pyrethrum Experimental Station, Molo

As described in the Annual Report for 1944, a site for the main station was chosen at Molo and general development was carried out for this purpose. In September. 1945, the decision to have the main station at Molo was cancelled in favour of a fresh site on the Government farm at 01 Joro Orok. The experimental plots at Molo are to be carried on as a sub-station--the preliminary work put into the purely experimental side of the Molo station will not be lost.

Meteorological Records

Month	Rain Total	Dry Bulb Mean	Wot Bulb Mean	Max. Mean	Min. Mean	Soil Temperatures 4* Mean	6" Mean	8* Mean
	inn.	F.	F.	F.	F.	C.	C.	C.
Jan.	•47	57-30	51. 20	73-00	46. 90	19. 12	18-82	18. 64
Feb.	61	57. 60	50. 52	75. 75	41. 54	19. 41	19. 22	19. 43
Mar.	33	57. 92	50. 34	75. 54	40. 80	19. 58	19. 41	20. 05
Apr.	61	60. 72	52. 36	76. 57	42. 57	20. 39	20. 20	20. 50
May	4. 10	57. 14	53. 44	72. 95	44. 40	18. 40	18. 35	18. 76
June	7. 84	54. 73	63. 68	68. 04	47. 07	16. 03	16. 15	16. 56
July	7. 85	55. 22	51. 78	64. 71	45. 22	14. 72	14. 90	15. 35
Aug.	8. 80	55. 00	51. 60	'65. 49	44. 03	15. 49	15. 44	1. 69
Sep,	4. 82	57. 15	52. 70	67. 68	42. 26	15. 76	15. 95	16. 04
Oct.	1. 17	58. 61	53. 13	71. 09	41. 74	19. 31	19. 24	19. 28
Nov.	2. 94	56. 63	52. 63	71. 84	46. 16	17. 54	17. 54	17. 82
Dee.	1. 60	56. 63	50. 93		41. 90	18-21	18. 05	18. 29

Pyrethrum Experimental Plots

The experimental area comprised a total of 313 plots occupying an area of 4. 1 acres. Early in the year the various trials were pegged out and planting commenced on 25th May. Planting was completed by 15th June. Conditions were favourable and a good stand was obtained. Picking started in August and continued for the remainder of the year. As no drier was available, sun drying was carried out. In cloudy, wet weather, such as was experienced in August and November, sun drying was extremely difficult. Ten bags of dried flowers were picked during the year.

Experimental Plot for Deciduous Fruits

The site selected in 1944 was stumped, cultivated and fenced. Broad base terraces were constructed by tractor equipment. The fruit trees arrived but were not planted in the experimental plot this year.

Sub-stat ions

Ol Joro Orok.—A site for experimental plots was selected on the Government farm in April. The area was cultivated and the experiments pegged out in readiness for planting. Planting took place in July, under very favourable conditions. Owing to cold, cloudy weather and a severe hailstorm the young plants made slow progress in the early stages. By the end of the year, however, growth was more rapid and the plants began to flower. Picking commenced in the second half of December.

In September, when it was decided to move the main station to 01 Joro Orok, building sites were selected and a preliminary programme of development drawn up.

Kinangop.—The 5-acre site described in the 1944 report was tractor ploughed and cultivated. The area was fenced and huts for the labour constructed. Hand cultivation and terracing were carried out.

Three trials were planted in the short rains, but conditions were not favourable and some re-planting may be necessary in 1946.

Subukia.—Early in the year a site of 9 acres was selected for a sub-station on the farm of Mr. W. A. C. Allison, in Subukia.

Owing to various delays occasioned by a shortage of ploughing equipment the plot was not ready for planting in the long rains. By the end of the year, however, the land was clean and will be planted in the long rains. 1946.

Kitale.—A provisional site for a sub-station was selected on the new Government farm at Kitale, but no work was done on it during the year under review.

Experimental Work

B\ the end of the year the following trials had been planted: —

Experiment	*Molo*	*Ol Joro Orok*	*Kinangop*
Cutting back	1	1	—
Fertilizer	1	1	—
High Toxic Variety*	1	1	1
Interplanting	—	1	—
Regeneration of Plants	1	—	—
Repeated Trimming	1	1	—
Root Excavations*	1	—	—
Seedling vs. Splits	1	1	1
Spacing and Cultivation	1	1	1
Transplanting Skill	1	—	—

* Planted in 1944

The first 1945 plantings were done at Molo and the experimental results given below were obtained from these trials. As the trials have only been growing for six months, final conclusions are not yet available.

Effect of Phosphate.—The application of phosphate in the planting holes at rate of 200 lb. per acre gave an increased yield of 23 lb. per acre in the first six months from planting.

Effect of a Grass Mulch.—Under Molo conditions, mulching depressed the yield by 75 lb. per acre in the first six months from planting. Probably conditions at Molo were too wet and cold for a mulch to be beneficial: there is evidence that mulching under warmer and drier conditions increases the yield.

Effect of Lime.—Lime, applied at the rate of 1,000 lb. per acre, had no effect on yield in the first six months.

High Toxic Variety.—The High Toxic Variety, which yielded 52 lb. per acre less than the control in 1944/45 is doing better this season. Final figures are not available.

Regeneration of Plants,—This trial was designed to test the effect of cutting plants back to ground level, weeding them and allowing them to regenerate as compared with uprooting and planting splits. It was found that cutting back to ground level and weeding gets rid of most weeds but does not overcome sorrel *(Oxalis* sp.) which seeds heavily in old pyrethrum plants.

Seedlings vs. Splits.—Owing to the fact that seedlings take longer than splits to come into (lower, their yield in the early stages is much less. Splits yielded 330 lb. per acre in the first seven months, as compared with only 197 lb. per acre for the seedlings. !t was found that in wet weather planting the stand

obtained with seedlings was not so good as with splits. Under drier conditions, however, the stand of seedlings was as good as that of splits. The reason for this is thought to be that seedlings, being smaller, are more apt to be covered with silt during heavy rains.

Effect of Spacing.—Pyrethrum planted at a close spacing gives a markedly better yield in the early stages than pyrethrum planted at a wide spacing. For example, pyrethrum planted at a spacing of 3 ft. by 3 ft, gave a yield of only 292 lb. per acre in the first season, as compared with a yield of 508 lb. per acre from pyrethrum planted at 2 ft. by 1 ft.

Effect of Ridging 1½. —*A* better stand was obtained on ridged plots than on level plots. Ridging had no effect on yield in the early stages. It should be emphasized, however, that in this particular experiment it was not possible to contour ridge. Contour ridging, by its effects in holding up water, might have given very different results.

Transplanting Skill.—Marked differences occurred in the ability of an individual to plant seedlings in wet weather. There were no significant differences between individuals in their ability to plant splits in wet weather or seedlings in fairly dry weather. In this experiment the individuals concerned were allowed to take their time over the planting and were offered a cash reward for the individual who secured the best stand.

Blind Plants.—Preliminary trials showed that the coarse, dark green leaf associated with blind plants is not necessarily a permanent character of the plant. Typical flowering plants can go blind and there are indications that blind plants can change into flowering plants. Some experiments are being carried out, but it is too early as yet to report on them.

General

Travelling. —Miles travelled on duty, 9, 183: nights spent on safari, 59.

This does not include mileage undertaken in connexion with a visit to the Belgian Congo.

Visit to Belgian Congo— On November 6th the Agricultural Officer left Molo as a member of a deputation sent to study pyrethrum in the Belgian Congo. The party returned on November 26th having made valuable contacts with Research Workers and others and having gained much valuable information. The results of the investigations have been reported elsewhere.

Advisory Services.—Requests for advice were on an increased scale and 21 visits to farms were undertaken in this connexion. The number of visitors to the Molo station was 23.

Pests and Diseases.—An outbreak of Root Rot *(Sclerotica* minor) occurred on a farm in the Ol Joro Orok district, but the amount of damage caused was not great. Other cases occurred during the year but were not serious. In every case it appeared that the fungus attack was not the primary cause: it had only attacked plants weakened by some other factor.

Eelworm was observed on three occasions. In two cases it was causing an appreciable reduction in yield.

Experimental Drier. —In order to interpret the results of field experiments in terms of yield of pyrethrin per acre it is necessary to have a drier which will dry all samples under the same controlled conditions.

A small drier was designed for this purpose by Mr. R. O. Barnes, Soil Engineer, Heating is by steam circulating through a radiator. The draught is operated by a power-driven fan. The drier is mounted on a lorry chassis so that it can be towed to sub-stations if required. The construction of this drier was started in 1945, but was not completed.

Publications. —The following articles were published during the year for circulation to pyrethrum growers in Kenya: —

"Blind Plants in Kenya Pyrethrum."

"Pyrethrum Notes for Cultivators"—four issues.

"PARAC".—At the Delegates' Conference in June, 1945, it was decided to appoint a committee to advise on pyrethrum research. A committee was formed consisting of seven growers with the Agricultural Officer as secretary. This committee was named the Pyrethrum Agricultural Research Advisory Committee (PARAC) and met for the first time on July 7th.

The first duty of PARAC was to consider the siting of the main station. As a result of their deliberations the site of the main station was moved from Molo to 01 Joro Orok.

There were four full meetings of PARAC during the year and a wide variety of subjects were discussed.

Conclusion

As in 1944, difficulties have arisen owing to lack of equipment. For example, a calculating machine, ordered from overseas at the end of 1944. had still not arrived by the end of 1945. The picking of the trials at Molo nearly broke down at one time owing to the non-arrival of weighing machines.

Owing to war-time conditions, it was not possible to start work on the permanent buildings this year. Until these arc constructed facilities for research are inevitably rather primitive.

Much routine work bad to be carried out by the Agricultural Officer owing to the difficulty experienced in obtaining a trained assistant. An assistant was engaged at the end of the year and this should ease the position considerably in 1946.

There is still no chemist available for the work of interpreting the experimental results in terms of yields of pyrethrum. Consequently this aspect of the Work has had to be neglected for the time being.

In spite of these difficulties some progress has been made and experimental results are now beginning to be obtained. In 1946, when further sub-stations come into production, there should be a considerable increase in the volume of experimental evidence.

E. W, GADDUM.
Agricultural Officer.

ANNUAL REPORT OF THE SENIOR SOIL CONSERVATION OFFICER FOR 1945

Staff

European.—During the greater part of the year the staff consisted of Mr. A. C. Maher, Officer in Charge; Mr. R. O. Barnes, Soil Engineer, two Assistant Soil Conservation Officers and one Field Assistant, Not until the last quarter of the year was it possible to recruit additional staff, by the end of the year five additional officers were in training.

Italian Survey Party.—This party, consisting of Lieut. Fingo. Lieut. Zacconie and Cpl. Stumpo, worked at Rongai throughout the year. Lieut. Iraci was substituted for Lieut. Zaccome on 27th March.

African.—During the year African Civil Service terms were accepted by all Soil Conservation Service staff who were eligible, except for a small number of suspicious reactionaries. The work of the senior levellers continued to show a high degree of responsibility and reliability and attracted high praise from a number of farmers. A more contented tone was observable throughout the African staff, a matter which may be attributed in part to the promotion of five of the more senior men to Grade C. However, there were a number of resignations and a few disciplinary discharges, so that at the end of the year the number of levellers was only 26 compared with 30 at the end of 1944, despite the need for expansion in the post-war period. There are also eight learner-levellers.

Visits and Meetings

Mr. Maher, Officer in Charge, Soil Conservation Service, visited Machakos in company with Mr. R. O. Barnes from 25th to 29th January. Estimates were subsequently prepared referring to staff machinery and materials required for conservation work in both the arable and pastoral areas of the Ukamba (Machakos) Reserve.

Visits were made by Mr. Maher to the Kitosh and Maragoli locations on 26th and 27th February, together with the Agricultural Officer, Kakamega.

From 19th April to 3rd May Mr. Maher visited the Buganda and Eastern Provinces of Uganda to study matters relating to soil conservation. A report of this visit was made and circulated. Later, from 14th to 16th June, Mr, Barnes accompanied Mr, Maher on a further visit to examine erosion conditions on the excessively steep slopes which are cultivated in the Bugishu district.

A meeting of local farmers in the Ol Doroto area was attended by Mr. Maher on 5th August and the Ol Momoi Forest Concession area, Subukia. was visited with the Agricultural Officer, Njoro on the 6th. 7th and 8th August.

A talk on "Soil Conservation in the Modern World" was given to the Turbo-Kipkarren Farmers Association on the 13th October, while small meetings were addressed at Fort Ternan, Koru and Songhor on the 7th. 8th and 9th October.

A tour of the Aberdares district was made with Mr. T. Y. Watson, Senior Agricultural Officer. Rumuruti, from 12th to 20th December.

Mr. Barnes visited Moiben with Mr. Maher, to discuss dam sites, from 14th to 16th June. Later in the month he visited Uplands regarding pyrethrum driers and Karatina and Kerugoya concerning factory alterations and irrigation work. He also visited Solai to advise on irrigation by waste water from a sisal factory and on waste disposal Dam sites were investigated at Kampi-ya-Moto.

The Soil Engineer gave a talk to the East African Women's League at Nakuru on 4th July and attended a meeting of the Pyrethrum Board at Nairobi

on the 16th and 17th. From 10th to 24th September he was at Karatina and Kerugoya in order to advise on the introduction of new processes for sulphiting and steaming the vegetables at the Dried Vegetable Factories. On 5th September he attended a meeting of the Rongai Valley Farmers Association. On 27th and 28th September he visited Machakos and later attended a Secretariat meeting regarding future conservation policy in the Reserve.

Visits were made by Mr. Barnes to consult with the Officer in Charge, Soil Conservation Service, from 13th to 22nd March, 1st to 7th June, and 6th to 7th September.

Terracing and Associated Works

The following table summarizes work carried out during the year in the European areas of the Colony: —

DISTRICT	BROAD BASK			NARROW BASE			SQUATTER SHAMBAS	
	Acres	Miles	No. of Farms	Acres	Miles	No. of Farms	Acres	Miles
Nakuru Uasin (Jisliu Trans Nzoia Athi-River.. Honghor	4638-1 557 3 1809. 0 660. 0 71. 6	361. 5 60. 6 206. 4 35. 9 7-2	27 12 32 1 1	814. 3 65. 8 41. 9	133. 1 9. 0 16. 4	21 4 4	139. 3	36. 6
Total	7736. 0	671. 6	73	922. 0	158. 5	29	139. 3	36-6

MISCELLANEOUS WORK

District	Handwork cu. ft. excavated	Length of Outlet drains constructed *yd.*	Length of citoff drains constructed *yd.*	Length of roads constructed	Acreage Bench Terraced Acres	Length of road repaired *yd.*
Nakuru **Uasin Gishu** **Trans Nzoia** Athi River Songhor	50, 817 119, 204 242, 443 1, 648	18, 500 8, 752 19, 934	11, 290 7, 200 13, 633	23, 103 1, 000 12, 160	– 1 10	– 1, 930 9. 361
Total	414, 112	47, 192	32, 129	30, 203	11	11. 297

During the year only the two D6 tractors and the paraffin Caterpillar were available for work.

The D6 Caterpillar Diesel stationed at Njoro was out of action for 56 days during the year and the D6 at Kitale for 32 days. The Caterpillar 28 in the Uasin Gishu suffered many breakdowns and on 5th March was sent to the reduction Board Workshops at Njoro for alteration. It had not been returned by the end of the year.

Under Mr. Newton's energetic and enthusiastic direction particularly good progress was made in the Nakuru area, where the soils and slopes often facilitate rapid completion of terracing work while farm tractors or Production Board tractors are occasionally available.

Staff was supplied from the Kitale headquarters for work in the Uasin Gishu district while, for the first time since a small scale and abortive start in 1941, work was done in Nyanza Province. It is hoped that an officer may be posted at Lumbwa during the year to ensure the maintenance and continuance of this work.

During the year approximately 322 acres (31 miles of terrace) were terraced in the Kitosh Reserve by Soil Conservation Service staff working under the Agricultural Officer, Kakamega. During the first quarter the work was carried on with a Martin ditcher (which has no moving parts) while the Hummer graders were removed for repair of axles and bearings which should have been greased regularly and had not been, and ground down external ratchets which should not have been greased and had been. All six bearings and axles were again ruined within a few weeks of the beginning of the 1945-46 terracing season. While the work done was fairly good in quality—with the exception of some mistakes—design of layouts it is evident that even the simplest machinery will not be kept in order (greased, nuts kept tight, etc.) in the absence of close supervision (European) which is not present in this instance.

Owing to lack of co-operation from the North Kitosh people, including the people at the Lugulu Mission and Kimilili, machinery and staff were moved to South Kitosh at the beginning of November. The Agricultural Officer, Kakamega, observed: "Unfortunately the Kitosh have an idea firmly fixed in their heads that Government will provide everything—implements, staff and labour—and that their sole responsibility is to grant permission for the work to be done".

While it is evident that work in this area cannot proceed favourably till a European officer is posted to the district, in this, as in other native districts, it is not worth posting an officer unless he can be utilized in the implementation of a comprehensive plan of improved husbandry and soil conservation with a permanent and satisfactory economic and social system, including a land tenure system which ensures proper land use and the conservation of soil fertility and water supplies.

Contour Planting of Sisal

Two sisal plantations in the Uasin Gishu-Trans Nzoia area carried out contour planting. 750 acres of land were set out for this purpose at Hoey's Bridge.

Drainage Schemes

During the year the survey and plotting of the Rongai Valley Drainage Scheme was completed except for a little plotting and tracing to be done early in 1946. During ten months, in two of which there was only one surveyor, the party covered 86 square miles of farm surveys, including 160 miles of drainage lines which were cross-sectioned by the Soil Conservation Service levellers; together with the areas which had the drainage lines demarcated but not surveyed, approximately 100 square miles were covered during the year.

Following discussions and agreements between the groups of farmers concerned. orders were issued to farmers to close drainage lines under the Rules of the Land and Water Preservation Ordinance. Some delay and difficulty was

caused by disturbance or removal of pegs demarcating the lines. It is proposed to obtain legislation which will include penalties for removal or disturbance of marks or beacons.

Blue prints have been issued to farmers in the area showing the topography of their farms and the position of permanent drainage lines, etc.

Work was begun with a hired tractor and angledozer and No. 2 Caterpillar Terracer on the main drain of the 300 acres of black clay land to be drained in the Holmboe (Endebess) Drainage Scheme which had been surveyed by the Italian Survey Party at the end of 1944. However, the onset of heavy rains towards the end of May rendered the soil too sticky for work to be continued. The area concerned was waterlogged with water lying on it from 2 in. to 3 in. up to 18 in. deep for the best part of four months up to the beginning of September. A yield of under one bag per acre of maize was obtained over the area. It is hoped to complete this scheme early in 1946.

A Soil Conservation Service labour gang completed the sloping to 1: 1 of the sides of open ditches on a few acres of heavy land on the North Kinangop. While ditches with I: 1 side slopes are often dug by farmers it is doubtful whether even 1: 1 slopes will afford sufficient stability to avoid slumping. There is a good deal of experimental work awaiting attention in this area with regard to the removal of surplus water by the use of open ditches or mole drains.

A good deal of interest was shown in several districts during the year with regard to the possibility of draining swampy land, heavy clay soils and vleis. It is hoped that the Soil Conservation Service will be able to render service in the coming years in securing increased productivity through drainage on many areas in both European and native areas. A fund of experience is being built up which it is hoped will become most valuable to the Colony when more men and machines are available to undertake this work.

Water Supplies

A large number of requests were received during the year for the investigation of water supply schemes, particularly in regard to dams. Owing to lack of tractors and other machinery it was impossible to comply with the many requests to construct farm dams. However, one dam was contructed at Karuna, Moiben, by Soil Conservation Service labourers working with farm drivers and oxen under the supervision of a Soil Conservation Service leveller. This dam involved an earth fill of about 7,000 cubic yards and about another 1,000 cubic yards of excavation. When full the dam will have a surface area of 16.3 acres, and a capacity of about 100 acre feet or approximately 27,000,000 gallons. The upstream bank of the dam is protected against wave action by a layer of rough rock, while the crests of the two spillways (with a combined maximum capacity of 1,100 cusecs) are similarly protected.

In connexion with the construction of a dam in the South-west Trans Nzoia a small stream with a dry season flow of 1/40 cusecs and a flood flow estimated at 800 cusecs. a diversion ditch to carry up to 400 cusecs was constructed with a hired RD4 Caterpillar Diesel and terracer. This dam is to be completed early in 1946 with a hired D6 tractor and angledozer as the development of seeps in the valley bed with the onset of the rains prevented further work. The fill will be about 3,000 cubic yards.

Courses

A course, including field demonstration and theoretical lectures was held at Kitale for Land Bank inspectors and farmers from 5th to 11th February. This

course was attended by nine inspectors and up to 40 persons attended the demonstrations. It was considered that this course was very successful and appeared to be enjoyed by those attending it.

A refresher course for levellers, learner-levellers and senior English-speaking terrace-operators was held at Kitale from 16th July to 8th August. It was evident that such refresher courses are very necessary in that many men showed a tendency to forget fundamental principles of their training.

The New Nairobi-Nakuru Road: Kijabe Hill Section

Drawings were submitted to the Director of Public Works by the Soil Engineer in February giving details of various works needed to protect the new trunk road to Nakuru from flood water from Kijabe Hill and from the K. U. R. & H. culverts. It was desired, also, to prevent the main gully—formerly the main road—from cutting back into the hill. The works, which were estimated as likely to cost £4, 000, were pegged out on the site by the Construction Engineer, P. W. D., and the proposals were discussed by the Soil Engineer with this officer and with the Divisional Engineer, K. U. R, &. H. It is understood that the P. W. D. and the K. U. R. & H. have agreed to carry out the works jointly. This section of the new main road runs below a highly erodible hillside and the works are required to protect the road against such run-off as occurred in 1940, when both road and railway embankments were badly damaged.

River Scouts

Good reports were received of the work of river scouts in European areas during the year. There was a somewhat ominous lack of comment upon their work in the native reserves, where they often have to contend with an unhelpful native administration as well as an antagonistic population.

Transport

The Soil Conservation Service gained one Ford Six lorry during the year, which was employed at Songhor, and one old Dodge van used by the Assistant Soil Conservation Officer at Kitale. Fortunately, several officers who joined the Soil Conservation Service at the end of the year had or obtained their own cars, otherwise the position would have been very difficult.

S. C. S. District Headquarters

During the year the needs of the Soil Conservation Service for district headquarters, as described in the 1944 Report, were clarified and some progress was made towards achieving these ends.

160 acres of land were set aside in Kitale Township for buildings, including offices, stores and African staff quarters, recreation grounds, etc. A further 280 acres of Crown land were set aside as grazing land and arable land on which to grow foodstuffs for rations and to try out soil conservation techniques.

A brick house, including sitting room-kitchen, two bedrooms, store and bathroom, was completed for the Storekeeper. A set of "flats" for 13 men, three of the men with families, was begun. While there are 10 large and 3 small bedrooms there will be four shower baths, a communal dining and sitting room, eight kitchens and a laundry room. It is hoped that by sharing of certain facilities the cost per family may be considerably reduced without impairing seriously the privacy and comfort of individuals.

A general plan for the camp has been made and new offices are to be built in 1946.

Work continued on the Soil Conservation camp at the Plant Breeding Station, Njoro, but a site for the headquarters in Nyanza Province (Lumbwa), Uasin Gishu district and Nakuru district (since the Plant Breeding Station does not have sufficient spacel were not settled by the end of the year, although sites had been provisionally allocated in Thomson's Falls for the Aberdares district headquarters.

S. C. S. Training School and Headquarters

The farm at Thika which had been purchased for a Soil Conservation Service Training School and Headquarters was surveyed by the italian Survey Party in September. When an accurate topographical map was available it was found that inadequate land was available for buildings, recreation grounds and experimental areas. The better portion of the farm has been excised and was later sold away from the original area. The remaining portion consisted of a narrow ridge, a precipitous gorge 260 ft. down to the Chania river: a large swamp—which might be drained—and a smaller circular depression which could not be drained. Subsequent to making the survey the Soil Engineer and two of the three Italians contracted malaria.

in view of the unsuitable nature of the ground on the remaining portion of the farm, its apparent unhealthiness and the difficulty regarding the water supplv. it was decided not to continue with this site and to look for an alternative elsewhere. It was found possible to dispose of the land without loss to Government.

Health

The health of the Soil Conservation Service African staff continued to be good with comparative freedom from malaria and dvsentery. Arrangements were made to supply water to the Kitale camp from the filtered town supply. The supply at Njoro in the dry season from the dwindling and dirty Njoro river is not very satisfactory.

It is planned to increase the supply of vegetables to African staff during 1946.

General

While the area terraced during 1945 was greater than in anv previous year, it still fell far short of the amount which is required to keep pace with erosion damage.

The palliative measures of strip-cropping were tried in some districts such as Turbo and Kipkarren without giving anv impressive success.

An experiment was carried out with terrace construction bv ploughing instead of by the use of a terracer and the conclusion was reached that while terraces of satisfactory specifications could be made on gently rolling land the cost is greater than that of terraces made with a special machine: nor does this means of construction obviate the difficulty of shortage of tractor Power available on farms for work additional to normal farm activities.

Some advance could be noticed in good husbandry in that most of the better farmers now either harrow down and plough in their crop residues or they remove them to make boma manure or compost. Nevertheless there is still a minority of farmers who. from apathy, ignorance, a reactionary attitude or missguided desire to show their independence of thought, continue to burn all the organic materials which might help to maintain the moisture content and crumb structure of the soil.

Similarly, there are a number of farmers, including some well-known members of the farming community, who decline to cultivate and plant on the contour on terraced land, alleging insuperable inconvenience while giving lip service to the need for soil conservation and preaching doctrines of compulsion for the African and for the farmer over the way. It is impossible to allow these reactionaries to follow their old methods if these mean the destruction of soil conservation works in defiance of the Land and Water Preservation Ordinance, and the wastage of Government funds expended on work to defend national resources, which is virtually subsidized by the taxpayer to the extent of at least 33 per cent, and often much more.

The development of ley farming, earnestly desired as an essential to the preservation of soil fertility, has shown little advance beyond the experimental or seed bulking stage owing to shortage of seed and difficulty of obtaining fencing materials.

Only a relatively small number of the better farmers have made a substantial attempt to produce more compost or boma manure. The shortage and indifferent quality of the African labourer may be one reason for this and a reason which might be overcome in part by a greater effort to mechanize farm activities. It is realized, however, that the latter development entails a greater investment of capital in their farms by farmers whose financial condition is, despite war-time prices, not yet stable.

On many farms the crop yields arc deplorable, This is due to erosion, loss of soil fertility and general bad husbandry. By following normal good practices over 17 bags of maize per acre were obtained on the Agricultural Experimental Station at Kitale, and 17. 6 bags per acre at the Soil Conservation Service camp. The acreages were small, it is true, only 30 or 40 in each case, but similar methods of production could be used on most farms on a much larger scale with corresponding benefits: yet yields of 2, 3 or 4 bags per acre are common on many farms in the district, while half the farmers average under 8 bags per acre.

The improvement of farming practice needs far more than the introduction of anti-erosion measures. On many farms a technical and economic examination of the farming system is required and the formulation of a farm plan for at least five years ahead by the farmer assisted b> experienced technical Government officers.

It is only by personal contacts and by advice given on individual farms that the average farmer can be persuaded to alter his mode of farming.

It cannot be considered that much will be accomplished by the terracing of individual fields if the soil conservation measures have not been included merely as part of a co-ordinated farm plan. Unfortunately, the calls upon the time of experienced agricultural officers are many while their numbers are too few. and there is little likelihood that it will be possible to obtain any number of trained agriculturalists in the immediate post-war period. It would appear necessary that those officers employed in technical duties in the construction of anti-erosion works should receive as much training as possible also in the agronomic side of soil conservation. They must endeavour to obtain a sound practical knowledge of general farming that, within the limits of their competence they may, in time, consult with farmers on means of carrying out on the farm and field scale the farming policy which the Department of Agricul-ture ture has decided as desirable for the district.

Little work was done by the Soil Conservation Service in the native reserves during 1945. with the exception of the somewhat unsatisfactory and certainly expensive work carried out in the Kitosh district. Some Soil Conservation Service staff was maintained in the Machakos Reserve at Matungulu, while a leveller was stationed at Karatina (later transferred to Fort Hall) and at Olenguruone Settlement. There is a definite tendency for the work of the Soil Conservation Service staff in the reserves, without frequent technical supervision of European officers of the Soil Conservation Service, to deteriorate both in quality and quantity compared with the work done by the same employees while working in the European areas.

During the year detailed plans were not only prepared for conservation work in the Ukamba (Machakos) Reserve, but also for work in other reserves. Such planning must inevitably be based on approximate estimations in default of accurate data on topography, soil fertility, vegetation and other biological and sociological data. Ideally an ecological, economic and social survey should precede the preparation of such plans; on a small scale a detailed land use and social survey of the areas concerned immediately before action begins.

Under present conditions deterioration of soil and vegetation is continuing, together with a degradation of the standards of nutrition and therefore of health and physique. As I have stressed in every annual report for several years, there is no possibility of achieving prosperity in the native reserves nor yet conservation of those resources of soil and water upon which unborn generations must depend without a change or modernization of methods of agriculture, including both the husbandry of crops and animals; and there must be. as an inevitable accompaniment, a complete change in the social and land tenure customs of the people; to this change are opposed the formidable forces of ignorance, apathy, laziness and reaction. Nevertheless, it is impossible to contemplate as a rational undertaking the use of numbers of European officers and costly machinery in the native reserves except to initiate the development of the reserves as prosperous areas in which agriculture as an *industry* has an economic purpose —to provide food for the community generally and good living for the farmer—and is not merely pursued as a means of barely sustaining life for an ever-increasing multitude of ignorant, ill-nourished subsistence peasants whose misdirected and intermittent energies leave havoc behind them. No dust screen thrown up by pounding Diesels or by hurrying cars of platoons of **European** officers, no mist of spurious prosperity emanating from an orgy of **Government** spending on African salaries in the reserves would hide for long the lurking skeletons of poverty and want in African reserves, where populations increase and soil fertility dissipates, where ignorance and reaction dominate and science is afraid to show its head.

COLIN MAHER,
Officer in Charge.

ANNUAL REPORT OF THE SENIOR AGRICULTURAL CHEMIST, 1945

Administration and General

Staff.—The stall position in the Chemical Section during the year has been difficult. There have been several changes. Mrs. Notley resigned as from the 29th April, 1945, and Mrs. Selby Hall as from the 15th October, 1945. Miss Donald resigned on the occasion of her marriage, but has returned in a temporary capacity. The Soil Chemist was also absent on overseas leave. Mr. S, B. Knowlden was released from the Army and resumed duties as from the 5th January, 1945. An Italian co-operator. Lieutenant Scota, was employed on the 27th January, 1945.

These changes put a strain on the other members of the staff; new, and even returning officers, require some time to find their feet. I would, therefore, record my appreciation of the very loyal work of the staff of the Chemical Section.

Work Done.—There has been practically no change in the number of samples examined during the year. A detailed statement of the character and number of samples received and examined is given below:—

Nature of Sample	Outstanding at 31. 12. 44	Reed.	Refused Exam.		Outstanding at 31. 12. 45
Pyrethrum—-					
Control	33	376	–	387	22
Investigation	27	53	1		
Insecticides	–	15	–	15	–
Soils..	–	323	–	323	
Manures	–	62	1	60	1
Waters	–	20	–	20	–
Dried Vegetables	–	132	–	132	–
Paprika	1	52	–	53	–
Feeds	–	6	–	6	–
Maize..		74	–	74	–
Miscellaneous		88	–	84	4
	81	1201	1	1233	27

Pyrethrum

Control.—The number of control samples received during the year referred to the export of over 7. 500 tons.

The production of pyrethrum was good in the first two months of the year, but the pyrethrin content showed a tendency to drop. Production was fair in March and very low in the period April to July, but at the end of March the pyrethrin content showed a tendency to increase. It reached a maximum in September. For the last five months of the year the pyrethrin content of all export samples was uniformly high—on an average higher than that for the previous year.

There was a severe recrudescence of the controversy over methods of pyrethrum analysis exacerbated by the fact that recent investigation of the mercury reduction method for Pyrethrin I had revealed that the previous factor of 4. 4 m. gms. pyrethrin I per millilitre of 0. 01 M K10., was incorrect and that this factor should be 5. 7. Obviously, using this new factor there would be a marked increase in the Pyrethrin I content recorded. As buyers were buying

upon the total pyrethrin content they would now have to pay more. Interested parties overseas insisted that the Seil method of analysis should be employed in respect of export samples. Even were I not prejudiced against the Seil method, it is not possible to make the change since the laboratory does not carry sufficient suitable apparatus to permit of the number of samples needed being analysed daily.

My objection to the Seil method lies in the fact that it gives incorrect results. Several workers in the subject have shown that during the steam distillation of the Pyrethrin I acid. Chrysanthemum Monocarboxylic acid decomposition occurs and that, therefore, the results for Pyrethrin I are on the low side. This decomposition also occurs when the pure acid is employed. The method which is employed at the Scott Agricultural Laboratories is the method which has been accepted as the official method in the United States. It depends upon the fact that the monocarboxylic acid reacts in a specific manner with a mercury sulphate reagent. Decomposition does not occur. This method gives a better picture even with the old factor of the relative proportions of Pyrethrin I and Pyrethrin II in a sample of pyrethrum flowers than does any method in which the determination of Pyrethrin I is based upon steam distillation.

The controversy reached such a pitch that a letter was addressed to the Research Secretary of the Colonial Office requesting him to arrange, if possible, for a critical survey of methods of pyrethrum analysis. A special committee was set up in Great Britain and while the report has not yet been published, it may be stated that the method employed is the mercury reduction method and the newly ascertained factor of 5. 7 will be employed.

Investigation, —Many of the investigational samples were received in connexion with the study of driers. As a result of a good deal of study, one is forced to the conclusion that the Ainabkoi type of drier is as efficient as it is possible for a natural draught drier to be. Alterations merely complicate matters. Greater economy and efficiency in drying can only be secured by mechanical recirculation of the greater part of the drying air. That drying has not been bad is shown by the high pyrethrin content of the export samples. There are other factors that have not yet been disentangled which must account for the lower pyrethrin contents in some years.

Complaints have often been made that the strain of pyrethrin in Kenya is "worked out". If this were the case one would have expected the pyrethrin content to have dropped concurrently with yield. Analytical results showed that this strain is as good as ever. Questioning those making the complaints always leads to the statement that the proportion of "blind" plants has increased and 'hat, therefore, there must be a depreciation. Granted, this conclusion is correct, but what is the cause of it?

In the Belgian Congo, as the writer saw when he accompanied the party sent by the Pyrethrum Board to study pyrethrum growing there, yields per acre have increased while the pyrethrin content has remained high. This is not due to special breeding but to mass selection in the field of suitable parent Plants from which to gather seed. Propagation is practically always by seed and not vegetatively. That such mass selection can have a very marked effect is shown by the experience at these laboratories. When we first planted pyrethrum here in 1928 only 20 per cent of the plants flowered. To-day over 80 per cent flower regularly and freely; even many of the "blind" plants flower if the season be propitious. The practice here has almost always been propagation of the seedlings.

In Kenya practically all the propagation has been vegetatively, that is to say. plants have been split up and the individual splits planted. Such propagation is very suitable for maintaining a good strain, provided that a modicum of selection is effected. I fear that to-day far too many pyrethrum growers simply buy a batch of pyrethrum plants from the field of a neighbour, split up every individual and plant all the splits. "Blind" plants, not suffering the strain of flower production, develop into huge plants which are capable of giving very many more splits than do flowering plants. A very reasonable estimate would be that for every flowering plant giving, say, ten splits, the "blind" plant would give twenty. Suppose there was 5 per cent of "blind" plants in the population split up. The first replanting would have an increased proportion of "blind" plants, now amounting to 9½ per cent. The second replanting, done in the same way, would contain 17½ per cent of "blind" plants. It is not surprising, therefore, that tire proportion of "blind" plants has increased.

If one does wish to propagate vegetatively then at least some care in selecting the parent plants should be taken. I am convinced that if good, large, free flowering, erect plants were selected in sufficient quantity, the yields would be increased without any danger of depreciation in the pyrethrin content. I. too. am of the opinion that it would be worth while occasionally propagating bv seed, again using selection in the field for the parent plants.

Before leaving the subject of pyrethrum, I should like to express my gratitude to the Pyrethrum Board for permitting me to accompany their official visit to the Belgian Congo. What was seen there was very illuminating and should be of value to the pyrethrum growers in Kenya. One of the most interesting points was that the high yielding, high content pyrethrum was grown in soils derived from recent volcanic rocks. These soils, combined with the good, well distributed rainfall, have contributed a very great deal to the heavy yields and good pyrethrin content.

Insecticides

The figure quoted for insecticides does not truly reflect the amount of work that has been done on the subject of the new synthetic insecticides. D. D. T. and 666. The medical side of the Army needed a great deal of help in connexion with their work on the use of D. D. T for anti-mosquito larval spray, and although in most cases the work itself was undertaken by their officers in the chemical laboratories, the preliminary instruction work and so forth occupied a fair amount of time. Nevertheless, time that has been well expended since chemical staff is now very familiar with the properties of both insecticides and the methods of determination. In connexion with this latter, a fair amount of work has been done on methods of estimation involving quantities smaller than those suggested in the recommended methods. Unfortunately, we arc not yet in possession of apparatus which will enable us to determine very small quantities.

D. D. T. has suffered from over publicization. A valuable and potent weapon, it has appealed to the imagination of the journalists, especially those who are responsible for the short, snappy articles that appear in the so popular Digests—a misnomer because so often the material is undigested! The public in Kenya appear to be enthusiastic subscribers to these journals and the subject of D. D. T. has caused a good deal of unnecessary correspondence.

666, or more correctly Gammexane. has not been so widely publicized. Both D. D. T. and Gammexane are potent and valuable weapons in the war against insects, but both are lasting, D. D. T. more so than Gammexane. This lasting effect renders them rather dangerous. They may be likened to tommy guns with faulty trigger mechanism. It is easy to get them to start, but difficult to stop them. Harmless lookers-on get caught. Both these insecticides are efficacious

against a very large number of insects, but the danger lies in the fact that beneficial insects may also be destroyed long after the pests have been killed. Very great care is therefore needed in their application and until much more is known of their effect on the general insect population of an area neither should be used indiscriminately.

Both these insecticides are fairly volatile and can be employed in the form of smokes. Cartridges in which D. D. T. and Gammexane were separately mixed were tried against termites. The mixture was rather on the rapid side since, instead of a long continued smoke, a semi-explosion occured. The termite nest treated with Gammexane smoke in a very short time became inactive and the holes filled up. There has been no activity in that nest for almost a year. In the nest that was treated with D. D. T. it appeared that there was little or no effect; the holes remained open and clean and during the first rain after application the biggest swarm of flying termites that I have ever seen came out. However, almost a year later it is evident that this colony has been destroyed. Later experiments with Gammexane have not proved quite so successful. Two colonies in my own garden are quite inactive; one shows a little activity. This latter was a very large widespread colony. A very large colony in the laboratory grounds, although it has been treated twice, still shows a good deal of activity. While it appears that both these insecticides may be of value for the destruction of termite colonies, a good deal of research work will be required to study the modes of application before recommendations can be offered. Gammexane is a fairly lasting but somewhat volatile insecticide. Experiments have been made by I. C. I, in Britain in its use as a soil insecticide against wireworm. One of these experiments was seen by the writer at Jealotts Hill. Although the crop had been reaped, the appearance of the stubble was sufficient to show how efficacious the material had been against wireworm. Plans have been made for experiments to be conducted with Gammexane against Cockchafer grub in Kenya.

There was a possibility that as these insecticides were so toxic to insects they might also be deleterious to the micro flora and fauna of the soil. Preliminary experiments in the laboratory indicate that at even the heaviest dressings that would be employed there has been no ill-effects whatsoever. It even appears that with medium dressings the effect has been beneficial to the bacterial flora.

Dehydrated Vegetables

Complaints regarding the quality of the produce of the Dried Vegetable **Factories** were very **frequent** in the early part of the year. In some cases these **complaints** were based on deterioration caused by damage to the cans **in transit** to Detail Issue Depots. Often these damaged cans lay in the Depots for some months before issue and the contents picked up moisture, with the lesult **that** deterioration was most marked. Suggestions were, therefore made that all the seams of the can be painted with elastic bituminous paint which would tend **to** seal up any cracks in the seams caused by mishandling.

Some complaints, especially as regards potatoes, did have a basis. The material was definitely well below standard. This, however, was not ascribable J° bad factory practice but to the fact that the fresh potatoes sent to the factory were of very poor quality indeed. The authorities concerned allocated the best quality potatoes, including those from the neighbourhood of the factories, •or immediate consumption and the poor quality stuff for dehydration. Dehydration does not improve quality—it merely preserves material in the form in which it is received. Good quality dehydrated vegetables can only be obtained from good quality raw material.

The War Office was impressed with the poorness of samples sent to them and contemplated refusing to accept any further produce from the two dehydrated vegetable factories. Meanwhile, representations made locally sccured supplies of good quality potatoes for the factory and the writer was sent home on a flying visit, together with samples, to demonstrate that excellent quality material could be produced. As a result of discussions with the War Office, the. Colonial Office and the Ministry of Food, it was agreed that a further 1,000 tons of dehydrated vegetables would be acccptcd from the Kenya factories during the period from 1st April to the 31st December, 1946. Dehydrated vegetables were to consist mainly of potatoes. It was also agreed that there should be no interference with the supply of first class potatoes to the dehydration factories.

The result of the supply of first class material to the factories has been that the products have consistently been of excellent quality. Dehydrated potatoes, in particular, are better than English dehydrated potatoes.

During my (lying visit contacts were made with the Ministry of Food, the Chief C hemist of the Supplies Branch of the War Office, and with authorities at the Low Temperature Research Station, Cambridge. A visit was also paid to a large dehydrated factory in the neighbourhood of London. It can be stated that in no way did it appear that the methods employed in Britain—with the exception of nitrogen packing—were any better than those of the Kenya factories.

Paprika

The quality of the paprika produced has, on the whole, remained good. There is no doubt that it would be highly acceptable on overseas markets. It is much to be doubted, however, if the price charged to the Army would be secured in the world's greatest market, the United States. It is difficult to understand why it has not been possible to produce paprika more cheaply since, if the land be well manured, very large yields of the fresh material are obtainable. It would be worth while investigating more closely the growing of paprika by the African.

Soils and Manures

This subject has been dealt with in detail by the Soil Chemist.

Feeds

Analyses of several types of feeding stuffs have been made during the year, but only one merits discussion, namely, fishmeal produced locally. The samples of fishmeal that were received here all contained an excessive amount of common salt. While cattle might be able to stand these large quantities of common salt, pigs certainly would be badly affected.

The method of drying fish on the inland waters of East Africa can only be described as extraordinarily primitive. The fish are gutted and split and then packed in salt overnight or even for twenty-four hours. During this time the flesh of the fish absorbs very large quantities of salt. The salted fish are then sun dried. The final product, in some cases, contains as much as 25 per cent sodium chloridc—"common salt".

There is no doubt that at certain times of the year there is a big surplus ol fish produced on the lakes of East Africa, a surplus greater than can be absorbed in the form of dried fish for African consumption. Unless some modification is made in the method of drying fish, this surplus cannot be absorbed as a feeding stuff. A system of drying whereby the fish are first subjected to boiling water and then dried would probably meet the needs of this trade.

Maize

All the samples of maize analysed were submitted by the Maize Conditioning Plant for moisture determination. This work was undertaken as it was impossible, at the time, for the staff of the Plant to make moisture determinations for themselves. The normal method employed in grading and reconditioning plants is the Brown Duval, an empirical method which requires standardization for each type of grain and for each altitude. This standardization would involve a very good deal of work and as another method has now become standard in Great Britain apparatus for this test has been ordered by the Chemical Section on behalf of the Maize Conditioning Plant.

This method has been very carefully studied in the Chemical Section and has been found to be perfectly applicable to conditions at Nairobi.

Rural Industries

The Senior Agricultural Chemist, for the second year, was in charge of the development of Rural Industries. The term "Rural Industries" as applied to the activities of those associated with the Senior Agricultural Chemist, is probably a misnomer; more correctly, "Rural Arts and Crafts" describes the work. At first only spinning and weaving were considered by the organization. The spinning of wool has been keenly taken up by the people of many parts of the African reserves. Weaving has not been so widely undertaken, although in some reserves many blankets have been produced in the form of strips. Some go-ahead Africans have been producing tweeds of pleasing designs, their own. and of good workmanship. Unfortunately, many of these weavers look upon their activities too much from a commercial aspect. Instead of utilizing the materials they have produced for their own use, they have sold them. However, in the reserves away from the big towns the African is tending to look upon the art of spinning and. to a less extent weaving, as something to occupy himself at night.

This year, owing primarily to the activities of the District Commissioner, Embu, a fair amount of interest has been taken in the home tanning of skins. The Veterinary Laboratories, too, have been of great assistance in training Africans in the science of tanning.

One of the difficulties of tanning is the provision of suitable tanks for the bath. Iron is completely unsuitable since it causes very severe discoloration. Very few Africans, especially in the further reserves, can afford to erect concrete tanks, and often, even if they could, the procuring of suitable sand is very difficult. Many are now using an ox hide suspended from a framework of rough timber in the form of a basin. These "basins" work well as tan baths. At the same time the hide itself is being gradually tanned and, at the end of six months or so, a piece of heavy, very well tanned leather has been produced.

Tanning has, in many cases, met a very great need. There has been a shortage of leather, some of which has been disgracefully prepared. On top of this the prices charged have often been exorbitant. In the Embu Reserve, for example, a native is charged Sh. 2 for the tanning of a goat skin, a charge which is very reasonable and which the natives are only too willing to pay. During the year about ten small home tanneries have been established in different Part of Kenya Highlands. Other crafts have not been so enthusiastically taken up. The plaiting of straw hats is easy, but for some unknown reason natives have not taken it up. The art is easily learnt, there is little hard labour, and attractive hats are easily made, but, nevertheless, they have shown great unwillingness to learn and when they have learnt they immediately forget the work. Simple

pottery, too, has been and is still being attempted in different parts with varying, success, one of the difficulties being, of course, the production of glazed earthenware, Unglazed earthenware is somewhat porous.

Brickmaking has spread very rapidly in many of the reserves during the year. Although instruction has not been carried out directly under the Rural Industries organization, much of the instruction has, however, been financed from the vote. This work probably should be regarded as a true rural industry and should be of immense value in the reserves, especially where easily cut stone does not exist.

The writer undertook the control of the Rural Industries organization as an experiment to ascertain whether there is any demand for such training. It has definitely been proved that there is a demand. However, properly to foster the work, a good deal of follow-up is required. This takes time—far more time than the writer can spare from bis proper duties. A request has, therefore, been made for the appointment of a full-time officer to undertake the control of Rural Industries.

V. A, BECKLEY.
Senior Agricultural Chemist-

ANNUAL REPORT OF THE SOIL CHEMIST, 1945

The Soil Chemist was absent on vacation leave in the United Kingdom from the end of January to the end of June, and on his return was seconded to the Investgation Team of the African Settlement Board. This Annual Report, therefore, refers to the work done during seven months of the year only.

The total number of samples dealt with during this period amounted to 237 as compared with 510 for the previous full year. There was a total of 215 soil samples, 89 of which were taken and analysed in connexion with survey work, and 126 were submitted to these laboratories for examination and advice. Of the latter number, 53 were received from officers of the Department and other public bodies and 73 were received direct from farmers. The number of fertilizers and manures analysed amounted to 19. During my absence, 86 samples of soils and 43 of manures were examined and reported upon by the Senior Agricultural Chemist. Much of the routine work involved has been carried out by the African Agricultural Laboratory Assistant,

Whenever possible farmers are again advised to bring representative soil samples to these laboratories so that the Soil Chemist can discuss their problems with them and give advice accordingly. When this is not possible, then separate, representative composite soil samples of any particular soil conditions should be submitted together with information about the depth of sampling, the nature of the soil profile, or at least of the immediate sub-soil, the drainage conditions, history of crop performance, past manuring and whether any particular information is required.

Investigations

Coffee.—No specific work with coffee has been done, but two general investigations which have been continued have an important bearing on coffee culture. These are developments of suitable phosphatic fertilizers from local sources of supply of manufacture and work on the relationship between soil structure and moisture conservation.

Cereals.—Co-operative field experiments to measure the response of cereals grown on different main soil types to various forms of phosphatic fertilizers have been continued. These have been carried out by Agricultural Officers on European farms in the Kitale, Eldoret, Njoro and Thomson's Fall districts. It was possible to make an improvement in the layout of this year's field trials. In the past, yields were recorded from six sub-plots measured out within elongated main plots of the same treatment. This year there were five field trials, based upon a randomized block layout involving four or five treatments and five to eight replications. Some silicophosphate, prepared in the pilot plant of the Industrial Research Board, was included in all trials as well as super-rock phosphate, Uganda rock phosphate and, in one instance, Seychelles phosphate as well.

On a fertile, dark brown, volcanic ash soil at Njoro, under excellent growing conditions, 177A wheat made very good growth on all plots, including the controls, and gave mean yields ranging from 8.3 to 10.0 bags per acre. There were six replications of five treatments in the form of 1/40th acre randomized blocks. The wheat on the silicophosphate plots, closely followed by that on the super-rock phospate plots, soon grew ahead and that on the Seychelles phosphate plots came next in vigour and earliness, whilst the Uganda rock phosphate and control plots were similar and most backward. After flowering, the different Plots started to go down in direct proportion to the vigour of growth. At harvest time only the control series was still standing, whereas all the other plots had lodged, the silicophosphate plots being completely flat. This lodging vitiated the results of this particular field trial, as factors making for heavier growth also caused more lodging.

A similar field experiment with rye was laid out on a reddish loam at Kitale. This involved five treatments and four replications in the form of randomized blocks. The actual mean yields obtained varied from about five to ten bags per acre, being 5.2 and 5.4 for the two sets of control plots, 7.7 for the super-rock phosphate, 8.1 for the Uganda rock phosphate, and 9.9 for the silicophosphate treatment, but owing to marked differences of the yields of different plots due to variations in soil fertility, the statistical treatment of yield data only shows that the silicophosphate treatment give a significantly higher yield than either of the controls.

The third co-operative field trial with Sabanero wheat was carried out on the Plateau cinnamon-brown loam of fairly low fertility. This was in the form of a 5 x 5 Latin Square arrangement of 1/40th acre blocks with duplicate control treatments. This trial was largely spoilt by damage caused by rabbits. The actual harvested mean yields were of the low order of one and a third to two and three-quarter bags per acre, the lowest yields being those of the control plots and the highest being the silicophosphate treated plots. However, under the conditions of the experiment a statistical analysis of the results showed that there were no significant differences between any of the treatments.

A fourth similar trial was carried out with 117A wheat on a red loam of fairly low fertility near Thomson's Talis. This was in the form of l/40th acre randomized blocks, involving four treatments and eight replications. Throughout growth the silicophosphate plots were obviously the best, followed by the super-rock mixture plots, with no marked differences between the more backward Uganda rock phosphate treated and control plots at any stage of growth. The mean yields were as follows: —

	Mean Yield in Bags per Acre
Silicophosphate (185 lb. per acre)	6.74
Super-rock Phosphate (190 lb. per acre)	5.06
Uganda Rock Phosphate (285 lb. per acre)	3.78
Control	3.62
Significant Difference (P = 05), .	0.71

In this trial silicophosphate gave highly significantly better yields than any other treatment. The mean yield was 6.74 bags against a mean control yield of 3.62 bags, the significant difference being 0.71 bags per acre. The super-rock phosphate treatment was significantly better than the Uganda rock phosphate and control treatments and there was no significant difference between the latter two treatments under the particular conditions of this experiment.

The fifth similar field trial, carried out at Molo, was spoilt by the severe lodging of the crop.

These field trials have shown the suitability of a non-water-soluble, but highly citric-soluble phosphatic fertilizer for local soils that are deficient in this nutrient and confirm the very promising results, as shown by high phosphate intake, obtained with the previous pot culture work. There is now sufficient evidence to warrant the replacing of imported superphosphate by locally prepared silico-phospate for use in the Kenya Highlands. These experiments also confirm the pot culture work which had shown that finely ground Uganda rock phosphate was not sufficiently "early available" to be used by itself for annual crops. There is need to add a proportion of a very readily available phosphate.

The Soil Chemist has attended meetings of the Fertilizer Sub-committee of the Agricultural Production and Settlement Board and has prepared another pamphlet giving recommendations on the phosphatic manuring of cereals.

Soil Structure and Moisture Conservation.—Little reference has been made during past years to the breakdown of favourable soil crumb structure under continued cultivation and the natural building up of compound granular soil particles by resting the land, more especially under a grass cover, but particular attention has always been given to the structural state of soils when judging their fertility level and in advising on cultural practices. With certain soil types of about similar nutrient status, the degree of soil aggregation often exerts a profound influence on their cropping capacity, more especially during adverse growing seasons, and it was not fully understood why a disintegrated soil structure often limited yields to such an extent. A start has been made to study the relationship between soil structure and water conservation. It has been found that soils with a poor structure hold a greater amount of water per unit depth of soil than corresponding similar, but more aggregated, soils. In warm sunny weather at the Scott Agricultural Laboratories, the loss of moisture by evaporation from a freshly moistened soil amounts to about a quarter of an inch per day. The extra amount of water held in the uppermost layers of a disintegrated soil is soon lost by surface and sub-surface evaporation, whereas if this water had penetrated deeper, as it does in the case of more open soil with a good structure, it is more protected against such evaporation. This shows that a soil with a better structure has the great advantage that more water is conserved in the sub-soil to support plant growth during drought periods. These findings arc only applicable to soils of similar organic matter contents. In regions of limited rainfall and subjected to periods of drought and a downward desiccation of the soil, the aim should be to get surplus water down into the protected sub-soil rather than to increase the water-holding capacity of the surface soil.

In January a simple trial was started to note the effect of different cultural treatments on soil structure. Some partly worn-out Kikuyu red loam, of a known degree of water-stable aggregation, was placed into four bitumen-lined boxes and subjected to four treatments which will be continued for a number of years. These are as follows: planted to Kikuyu grass and clover which was kept short: continuously cropped with cereals with thorough and frequent cultivation: cropping with cereals with a minimum amount of sub-surface cultivation: and, lastly, continuous clean cultivation. After ten months, when the cropped soils had given two crops of cereals, the four soils were examined by the wet sieving method. Even this early first test showed a better water-stable crumb structure developing under grass sod, but otherwise there were no measurable differences. Under the grass cover the proportion of soil held on a 1 m.m. sieve had increased from I per cent to 4 per cent, and that held on a 0.5 m.m. sieve from 12 per cent to 13 per cent

Soil ***Survey.***—While carrying out land utilization surveys in the semi-arid areas for the African Settlement Board, the opportunity was taken to study the classification and distribution of natural soil types. On the basis of field observations of the topography, soil parent material and mode of formation, natural drainage and profile characteristics, coupled with numerous laboratory analyses, some naturally occurring soil types noted in the reconnaissance soil utilization survey over about 1,000 square miles have been classified into named Soil Series. In fact, this latter field technique, with additional information about present moisture conditions and inherent fertility, was the means used to carry out the land utilization survey. Natural soil types were grouped together or sub-divided according to their fertility status and their estimated agronomic Value for development, with or without irrigation. The widespread occurrence of badly drained brackish soils with a high ground water level in the vicinity of Lake Jipe make it possible to study some typical flocculated Solonshak or white alkali and some very impervious, heavy Solonetz or "black alkali" soils.

These extend over about 8,000 acres of land on the flood plain of the Lumi River. The saline soils contain up to 2.5 per cent soluble salts and the "black alkali" soils have pH values up to 11.0 and 0.25 per cent of "black alkali". Many highly saline soils are free from "alkali", whereas the "black alkali" soils contain varying amounts of other salts.

In the extensive areas of volcanic and metamorphic rocks, eight new soil series were identified. The dominant soil (Serengeti Series) is a deep, well-drained, slightly acid, reddish, sandy loam to loam derived from the deep weathering of gneiss. On locally more elevated sites there are shallower, leached, more acid, slightly cinnamon brown, loamy coarse sands to sandy loams with laterite or "murram" occurring within two to three feet from the surface (Mbuyuni Series). At the bottom of gentle slopes, the reddish loam passes into a reassorted, neutral, dark khaki brown, sandy clayloam that is subjected to seasonal impeded drainage conditions (Bura Series). The basalts and volcanic tuffs under the same climatic conditions have given rise to deep, slightly calcareous, naturally well-drained, chocolate-brown loams to clayloams with a good structure (Ziwani Series).

Land Utilization Survey.—The main task carried out during the year as a member of the Investigational Team of the African Settlement Board, was a land utilization survey in the Taveta region. A reconnaissance survey was made over an area of about 1,000 square miles and a detailed irrigation survey over about 35,000 acres. The irrigation survey involved the sampling and appropriate analyses of a total of 57 representative soil profiles. Commanded lands have been classified and delineated as "very suitable", "suitable", "less suitable", "unsuitable" and "very unsuitable" for irrigation. On the right bank of the Lumi River it is possible to select about 9,600 acres of land that is "very suitable" and "suitable", and similarly about 5,500 acres on the left bank of the river. At Taveta, water and land resources offer great possibilities for the development of intensive cultivation under irrigation, as a large and suitable permanent spring water supply of 200 cusecs becomes available in close proximity to large areas of potential fertile soils. Soils which are unsuitable for irrigation comprise some very impervious, highly alkaline sodium clays containing large amounts of "black alkali" and other soils with high amounts of "white alkali" throughout the profile. A soil utilization map on a scale of 1:25,000 (about 0.4 mile to the inch) has been prepared showing the classification and approximate delineation of main parcels of land according to their estimated value under irrigation.

A survey of the Upper Tsavo region showed that there are no suitable sites and soils where the combined water of the Upper Tsavo could be used to irrigate a large block of land. In this district the most suitable soils occur on the gently sloping, deep, naturally well-drained, chocolate-brown, sandy clayloams of good, inherent fertility and structure that occur in the upper reaches of the river. These lands are commanded by the Njoro, Sainte and Motoinye tributaries. Some of these waters are already being utilized at Ziwani and the extension of irrigation here offers the greatest promise of development in the Upper Tsavo region.

G. H. GETHIN JONES.
Soil Chemist.

ANNUAL REPORT FOR 1945 OF THE SENIOR PLANT PATHOLOGIST

The collection of yeast cultures has been maintained. Yeasts for baking, wine and vinegar-making have been supplied to industrial concerns and to individuals as required. Cultures of food-yeast, *Torulopsis utilis* and *T. utilis* var. major were received from the Lister Institute for issue as required to the East African Industrial Research Board in connexion with a food yeast project. Cultures were also distributed to officers in the adjoining territories. One of the wild yeasts isolated proved suitable for domestic wine and vinegar making. It appeared to be at least equal in alcohol formation to the special *Ellipsoideus* yeasts imported from Berkeley, California.

A culture of *Penicillum notation* (Fleming No. 277) was supplied by the Lister Institute. The fungus was used in experimental work to facilitate the isolation of certain fungi free from bacterial contamination. Cultures of this strain of the fungus were supplied to the Military Authorities and to Medical Officers and others in the neighbouring territories.

Cultures of acetic acid bacteria isolated from various vinegar fermentations have been sent to the Lister Institute. These have been studied by Dr. T. K. Walker of the School of Technology, Manchester. Four species have been determined by Dr. Walker as new. Two, so far, have been named by Dr. Walker, one as *Acetobacter transcapsulatum* N. C. T. C. No. 7029 and the other *A. polyoxydans* N. C. T. C. No. 7030. Dr. Walker states (in lit.) that *A. transcapsulatum* shows a peculiar kind of capsule formation in that only a part of the cell is enclosed by the capsular material. *A. polyoxydans* oxidises a wider range of sugars and alcohols than any well-known *acetobacter* species. Since importations of vinegar have been resumed further work on acetic fermentations is not likely to be required.

The isolation, preparation and distribution of legume nodule bacteria have been resumed following an increased demand. Tests are being made of the infectivity of the bacteria from the indigenous *Glycine javanica* on the cultivated Soya Bean.

Samples of various foodstuffs were reported on for the presence of poisonous weed seeds, moulds, etc., on behalf of the Military Authorities.

Further study has been made of the pyrethrum wilt and crown rot material which has been received at the laboratory from time to time. The view, previously expressed, that much of the trouble is due to drought, over-cropping, or faulty cultivation of the crop is maintained. In many instances it appears that the disease starts from a snag of dead wood left on the split. Other factors inducive of crown rot are water logging, bad planting, damage by implements and localized unsuitable areas of soil.

The fungi associated with the crown rot are *Fusaria* (two constantly recurring types), *Sclerotina minor* and less frequently *S. sclerotiorum.*

In view of the predominance of *S. minor* in pyrethrum crown rot and wilt, a study was made of its parasitism.

Abundant sclerotia were obtained by growing the fungus on sterile maize grains. Surface sterilized pyrethrum seed was grown in a mixture of sterile soil and sclerotial material from a pure culture of the fungus and then covered with [a] thin layer of soil. After four months none of the plants was affected and the sclerotia showed no signs of having produced mycelium or apothecia. A parellel trial with splits instead of seed produced a similar negative result.

A further trial using as inoculum a lettuce leaf infected with the fungus and placed at the base of pyrethrum seedlings, 12.15 cm. in height, resulted in rapid infection after the plants had been covered with a bell jar for two days. Aerial fans of mycelium spread over the surface of the soil. The apical leaves of the inoculated plants were killed in from two to three days. Two months later some of the infected plants had put out fresh shoots while others did not recover. A partial recovery from crown rot has been seen in the field. Apart from the young apical leaves which were directly destroyed, wilting and death of the older leaves did not take place until the crown tissue was invaded. On the dead plant remains and on the surrounding soil numbers of sclerotia were formed.

Young seedlings were readily infected by placing small pieces of a ten-day agar culture in the leaf axials, Control plants were similarly treated with sterile agar. As in the previous trial, some of the inoculated plants withstood infection. No infection took place in any of the above trials when the inoculum was more than a few centimetres from the plant.

The following plants in order of susceptibility have been infected by inoculation: lettuce, lemon fruits, carrot and beetroot plants. No infection followed wounding and inoculation of sweet potato, castor oil, kweme nut. *datura* and tomato.

The size of the sclerotia varied more according to the substrata than to temperature and ranged from being barely visible on wheat straw to up to 1 cm, in diameter on lemon fruit. It seems possible, therefore, that some of the forms, with large sclerotia in the field on pyrethrum attributed to 5. ***sclerotiorum*** maybe ***S. minor.***

A serious canker disease of Cupressus, first reported by the Research Officer of the Kenya Forest Department in 1944. has been studied further. The disease is caused by the fungus ***Monochaetia unicornis*** (Cke. and Ell.) Sacc., the pathogenicity of which has been demonstrated by inoculation. ***Pestalotia funerea*** Desm. almost invariably accompanies the ***Monochaetia*** and ***Pestalotla*** fructifications are frequently more in evidence on cankered material than those of the primary parasite. Inoculations with cultures of the ***Pestalotla*** gave negative results, the wound being quickly isolated by wound cork tissue.

The general appearance of the disease is scarcely distinguishable from that described by W.W. Wagener on ***Cupresses macrocarpa*** in California. Material has been exchanged with Dr. Wagener. The Research Officer of the Forest Department is carrying out an extensive survey of the forest areas in Kenya, it appears, from the result of this survey, that the disease is widespread throughout the Kenya Highlands. Vigorously growing trees in good soil are affected as readily as those under less favourable conditions. Typical material collected during the survey has been sent to the Scott Laboratories for confirmation.

Experimental work has been directed mainly to investigating methods of infection. Infection readily followed inoculating into wounds using the usual technique. Two or three year old trees were girdled with canker three to four months after inoculation. With stem inoculations, the inoculation was infected bark, agar culture and cotton wool soaked with a spore suspension in water. Young trees sprayed with a spore suspension and kept under a bell-jar were not infected, but infection followed in the case of trees similarly treated but. in addition, abraded with carborundum powder.

Although the majority of cankers seen appear to have a dead twig more or less in the centre, suggesting that the fungus may have first entered at some point

on the twig and travelled down to the main stem, evidence that this readily happens is absent. A tree two feet high was inoculated at a basal twig about one inch from the main stem. Infection occurred normally on the twig and the fungus passed downwards eventually reaching the main stem, but a canker not forming there until eleven months later. It seems unlikely that cankers on the main stems are formed in this way with any frequency.

A study of the pathogen has revealed the occurrence of a second strain of *Monochaetia* which differs considerably in cultural characters and length of setae.

The first outbreak of tomato canker, *Corynebacterium michiganense,* recorded in Kenya occurred near Nairobi, where the crop was almost completely destroyed. The identification of the bacteria was confirmed by Dr. W. J. Dowson, to whom isolations from the original outbreak were sent. Investigation showed that the disease was already widespread.

Phoma lingam not previously reported from Kenya, caused considerable loss among *Brassicas* being grown under the Government seed production scheme.

A crown rot of lucerne was caused by a fungus which, from the character of the mycelium in culture, was very similar to *Roseilinia necatrx.* No *Dematophora,* however, was formed either in culture or on the natural substratum.

A canker disease of tea bushes, involving large areas of the main branch system, occurred in several blocks on a large tea estate. Associated with the cankers were a species of *Pestalotia* (not *P. theue,* Saw.) and *Phomopsis.* both of which were isolated from marginal tissue. Inoculations with cultures of both these fungi gave negative results. The fungi apparently entered through pruning wounds. Heavy pruning during what should normally be cloudy weather, followed by severe sun scorch, is thought to be the primary contributory factor. The heaping up of the prunings on to the bushes to provide protection from the sun prevented damage to subsequently pruned blocks.

Potato blight, *Phytophthora infestans,* first recorded in Kenya in 1941, is now permanently established in East Africa. The disease has occurred throughout the Colony during each season since the original outbreak. It was noted during the first year of attack that two native varieties showed considerable resistance to the disease. Recommendations were made to multiply the stocks of these two for distribution as seed as the best means of ensuring the continuation of potato production. Another variety received from Uganda, now known to be Skerry Blue, also showed resistance as well as superior cropping qualities. Tubers of this variety have been multiplied and distributed.

In 1943, Dr. S. P. Wiltshire, Director of the Imperial Mycological Institute, suggested to Professor D. Reddick, of Cornell University, U. S. A., that his blight immune potatoes might be of value in Kenya. In the first place, true seed of *Solanium demission* was received from Professor Reddick, from which plants were raised for testing with the local biotypes of *P. infestans.* Tubers of s.*demission* from this seed were sent to Uganda and the Belgian Congo as well as to distant parts of Kenya. No reports of any blight infection were received. Tests in the laboratory also proved immunity. Later, a large collection of immune *F. l demission x tuberosum* hybrids was received. It was pointed out by Professor Reddick that these would need further back crossing with local varieties before being of any value commercially. It was apparently assumed in America and elsewhere that the so-called long day type of potato grown at 40 N in the States would he unlikely to succeed at the Equator and that the production of a Kenya blight immune potato must be made with local material. These Reddick

hybrids were used to some extent as the male parent in the breeding work. Subsequently, one of these and the progeny of a cross made with it became attacked by blight when tested. It was learned later from Professor Reddick that the F1 hybrid had, in America, proved susceptible and that its hybrids should be discarded. It has long been obvious to everyone in Kenya that the ordinary potato varieties grown in England, notwithstanding the short tropical day, crop well in the Highlands and have been grown there at least as long as there has been white settlement. These facts were communicated to Professor Reddick and also the fact that Sebago, which is grown extensively in New York, behaved as well as any other variety in Kenya, Professor Reddick, in a later communication, states that Sebago and some of his blight immune potatoes which have already reached commercial quality were grown as far south as Florida and produced a "fine crop" in the short days there. This fact has prompted Professor Reddick to send a collection of later hybrids which have reached commercial quality, including the new variety "Empire", which it is expected will be made available to the public in the United States during 1946. In view, therefore, of the acceptance of the fact by American workers that the tropical potato need not necessarily be produced in the tropics, further work on the original F.1 *demissam* hybrids has been discontinued in favour of the latter consignment.

The original collection of *Solarium andigenum* from the Empire Potato Collection received in 1943, is not being maintained after 1945. It is considered proved, as far as Kenya is concerned *(vide supra)* that potato breeding need not be based on a short day potato such as the *S. andigenum* varieties. The potatoes had been procured from the Imperial Bureau of Plant Breeding by the Economic Advisor to the East African Governors' Conference and handed over to me. It was not anticipated, nor found, that these possessed any immunity from blight, for which quality it is assumed they were first procured. As these potatoes might have other useful characters, it was considered that the best use that could be made of them was as a material for crossing with the established domestic varieties in Kenya. It was, of course, appreciated that no material was likely to be available here which was not at the disposal of the fully equipped plant breeding stations in England and elsewhere and the chances of achieving anything of real value, in view of lack of staff facilities and equipment, were extremely remote. Accordingly, a number of crosses were made with the *Andigenum* potatoes as the male parent and the few *tuberosum* potatoes which produced flowers at Nairobi. All the South American potatoes have been severely affected by virus diseases, of which virus Y is probably the chief one. From these seedlings some 450 plants were planted out from tubers early in the year. A number of these have already been discarded on account of susceptibility to blight, undesirable shape and other qualities. Further back crossing seemed impossible as all the Fl hybrids were pollen sterile as were the original *tuberosum* parents. A few Fl hybrids produced late in the year form pollen. With these, back crossing may be possible. The female parents in these crosses were Skerry Blue, Up-to-Date. Craig's Defiance and two native varieties. The flavour of these *Andigenum x tuberosum* hybrids seemed to excel that of the domestic potatoes.

The work of selection and further crossing will, for the time being, be continued as far as circumstances permit until it can be taken over by the plant breeders. The contention, however, that the infusion of the short day blood is a prerequisite to successful potato production in Kenya does not bear examination.

Other species and varieties of South American potatoes received for trial include some frost-resistant varieties of *Solatium andigenum* from high altitudes in the Andes and varieties of *S. phureja*. The latter has been grown at Nairobi

and in hot low country under irrigation at Taveta. In view of the threat to sweet potato cultivation from the virus disease reported from Uganda, it was thought that ***S. phureja*** might prove of value as a food crop at lower altitudes.

In 1943 a lot of three blight immune varieties, bred by Dr. Black at the Corstophine Plant Breeding Station, was received through the Imperial Bureau of Genetics. Of these, two, Nos. 655 and 653, have been maintained. So far they have shown no susceptibility to blight.

A further consignment of Dr. Black's Blight Resisters Nos. 834a (43), 833a (77), 835a (3), 855 (15). 931b (7), 914a (91) and 759b (5) were received in 1944. These have been grown on at the Scott Laboratories and at Limuru, Thomson's Falls and Kisii. All but 759b (5) appear to be resistant to blight. After the first crop was raised, a few tubers of each kind were sent to the three territories, to the Belgian Congo and Southern Rhodesia. No. 914 in Kenya and elsewhere showed considerable promise and seems well suited to East African conditions. Adverse growing conditions have prevented any considerable increase in the stocks. In view of the possible extinction of the stocks owing to the failure of the rains, Dr. Black, later in the year, kindly supplied further stocks of 914, 834 and 931, as well as six new seedlings.

During the year, through the oflices of the Agricultural Adviser to the Secretary of State, I was supplied by Dr. R. N. Salaman with a few tubers each of a series of blight resistant potatoes. Three of these were the result of further crossing by Mr. John Clarke in Northern Ireland. A Dutch variety. Robyjin, also supplied by Dr. Salaman. showed promise as a good yielder. Provided, as is anticipated, that this large and comprehensive collection of blight resistant potatoes from England and America is not unduly handicapped by the short day and that no new blight biotype becomes evolved in East Africa, any further breeding here for blight resistance is, under present conditions, not justified.

The recorded fact that blight was not present in Kenya before 1941 has been received with incredulity. It has been suggested that the fungus was already present but that until 1941 the weather did not favour the epiphytotic or that some new and virulent biotype must brave arisen. The first supposition can be discounted. In order to substantiate the second i was asked by the Imperial Bureau of Plant Breeding to send material and cultures of ***Phytophtora*** to Dr. Dickinson of the School of Agriculture. Cambridge, Attempts have been made during the year to do this. There seems to be no indication, so far, that The blight biotypes are other than those already recognized in the United Kingdom. It would, indeed, seem that two only of these are present as the blight resisters from Corstophine are susceptible to a third biotype.

With regard to direct measures of control, trials have been made with A. R. P. bucket pump fitted with the jet in place of the usual spray nozzle. It was demonstrated that by utilizing the deposit of dew as a wetting agent is was Possible to obtain a cover equal to that given by the nozzle delivering a mist with, at the same time, considerably less movement through the crop being necessary.

Arrangements were made with the Agricultural Officer, Taveta. for a trial **to** be made of a selection of potato varieties to observe the behaviour of them **under** irrigation at high temperatures. The plot was defoliated at about flowering **time** by locusts. It was, however, shown that the first early Arran Pilot yielded as well as main crop potatoes.

In view of the confusion with regard to the identity of the so-called native Potatoes, a collection has been sent to the Imperial Bureau of Plant Breeding, the potatoes are now awaiting identification by the Potato Synonym Committee.

So far, the potato from Uganda has been identified as Skerry Blue and the varieties known as Kinongo and Kerai as Northern Star. Others cannot be identified. It seems likely that a few are old Continental varieties.

Some experimental work has been done on methods of healing cut potato, tubers and general treatment of seed, including the preparation of "eyes" and rose ends. An illustrated article on the cutting and treatment of potato seed has been published in the East African Agricultural Journal.

A study of the virus diseases of the potato in Kenya has been continued. Tubers of plants showing the more severe types of virus symptoms were sent from the potato virus collection to Mr. F. C. Bawden, at Rothamsted, who has identified the types of virus present. No virus not known in the United Kingdom was found. All the main symptoms are various manifestations of Leaf Roll, X and Y and their combinations. Virus Y is, as far as can be seen from the present survey, to be responsible for most of the severe virus symptoms encountered in Kenya. There is, however, no question of general degeneration of stocks, although these have been in cultivation in some instances for many years. It might be expected that all stocks of long standing would be infected with some form or other of virus X. However, some of the native varieties show no obvious virus symptoms. Individual plants of the Kinongo variety have been selected from native shambas which, on being tested, have proved to be free from any of the usual virus infections. This finding was confirmed by Mr. F. C. Bawden. Clones have now been raised from some of these virus-free plants, the stock from which these potatoes had undoubtedly been grown for many years. The plants are not carriers of X as all three strains, at Rothamsted produced systemic infection of these plants (F. C. Bawden, *in lilt.)*. This freedom from virus infection is not thought to be due to the circumstances to which Van de Plank attributes the freedom from virus disease of potatoes in Basutoland. It is unlikely that the original importations were free from virus infection. The plants, although generally grown in a mixed culture, are often in small pure stands and thus have ample opportunity to make mechanical contact. The reason may possibly be due to the setting of true seed from time to time and the consequent influx of virus-free seedlings which do not differ essentially from the variety.

The bacterial wilt disease of the potato and tomato, which was previously referred to as a new bacterial disease, is a strain of *Xanthomonas solanacearum.* Dr. W. J. Dowson, who has studied cultures of the organism, reports that it is an atypical strain which does not cause staining of the vascular tissue in either stem or tuber. It is not pathogenic to tobacco. The disease is widespread and has caused much loss to growers of tomatoes and potatoes.

In view of the increase of the incident of the Fusarium wilt disease of the Pigeon Pea reported from the Central Province, samples of wilt resistant Pigeon Pea seed from India has been obtained through the courtesy of the Imperial Economic Botanist and are now being tested.

The routine work of rust determination and testing of wheat hybrids for the Senior Plant Breeder has been continued.

The Woodiness disease of passion fruit is still a menace to the industry in the Sotik area. A survey has been made during the year and plans put in hand to resume the previous study of the Trans Nzoia woodiness virus.

The seed testing service has been maintained during the year.

R. M. NATTRASS.
Senior Plant Pathologist.

ANNUAL REPORT OF THE SENIOR ENTOMOLOGIST FOR 1945

Staff

Mr. H. Wilkinson, Senior Entomologist, was on duty until September, when, owing to a reappearance of former illness, he was admitted to hospital, whence he proceeded on sick leave and subsequently on leave pending retirement. Mr. Wilkinson first joined the Department in 1920. During the year he made a journey to South Africa in connexion with the Eucalyptus beetle and was absent from the Colony on this duty from the 22nd February till the 8th April.

Dr. R. Le Pelley was Acting Senior Entomologist from the 1st October till the end of the year, but was almost entirely occupied with locust work throughout the year.

Mr. C. F. Fox was on duty throughout the year and carried on the work of the Section during the absences of the Senior Entomologist. Great credit is due to him for carrying on the work of the section for long periods alone.

Plant Protection

The only new legislation under the Plant Protection Ordinance during the year was the Plant Protection (Amendment) Rules, 1945 (Government Notice No. 171 of 1945), which amended the Plant Protection Rules, 1939 (Government Notice No. 551 of 1939). These Rules were concerned with locusts and they amended and added to the rules previously in force.

The work of administering the Plant Protection Ordinance and of dealing with the many problems connected with it continued to increase and has become almost a full-time job for one officer. An endeavour was made during the year to tighten up on the inspection service in order to close loopholes through which pests or diseases might enter the Colony. This brought to light some grave weaknesses in the existing machinery and the value of the Ordinance for preventing the introduction of pests and diseases will be nullified if these weaknesses are not removed. At the end of the year administrative measures to remove these weaknesses were under consideration.

Inspection Service

Exports.—Seventy-nine packages for export were examined and certificates issued, the contents amounting to 5,272 items.

Imports.—Seven hundred and sixty-two packages from overseas were examined in Nairobi; of these 476 contained fruit trees and 5,310 trees were involved.

Though a small proportion of these imports were interceptions of unauthorized imports made at the G.P.O., Nairobi, the majority were legitimate imports under permit through normal channels. A notable exception to this was a consignment of 300 cases of South African apples brought into Kenya from Tanganyika Territory by road and rail. A fortunate train of circumstances and prompt action brought about the interception of this fruit before it was marketed, and it was found to be heavily infested with Codling Moth. The whole consignment had to be destroyed. An interesting point in connexion with this consignment and one which might have made a repetition of this method of importation likely was the fact that the importers were able to offer the fruit for sale in Nairobi two or three days before fruit reached Nairobi from the same ship, but entering Kenya through the port of Mombasa. The problem of control of these inter-territorial movements by rail of imported plant material was receiving attention

at the end of the year. The problem of how to ensure the interception of all plant material arriving by air was also receiving attention.

The important work of the Chief Grader and Inspector in inspecting plant material entering the Colony at Mombasa, and his helpful co-operation with this section in connexion with matters arising under the Plant Protection Ordinance is acknowledged.

Insects Intercepted.—Many species of insects were intercepted on imported plant products. Most of them were well-known pests, among them being the sisal weevil, *Scyphophorus acupunctatus* Gyll., from Tanganyika, and the Codling Moth, *Cydia pomonella* L., from South Africa. A few others were new interceptions and have not yet been identified.

General Advisory Work

One hundred and seventy-five items, either insect pests or infested plant material, were sent to the laboratory for examination and report. This represents an important side of the advisory work. Advisory visits, in addition, were made to a number of farms and plantations and a large number of visitors seeking advice visited the laboratory.

Maize Stalk Borer

During the year reports came in of damage by Maize Stalk borer in the Trans Nzoia and Uasin Gishu districts. The insect concerned was *Busseola fusca* Fuller, which has not, in the past, been a serious pest in those districts. At the end of the year plans were in hand for an investigation of the position early in 1946.

Eucalyptus Beetle

Late in 1944 a beetle previously unknown in the country was found damaging Eucalyptus over a wide area at Kericho and elsewhere. In February, 1945, confirmation was received from the Imperial Institute of Entomology that this was *Gonipterus scutellatus* Gyll., the well-known Australian insect which had been introduced in the early years of the century to South Africa, where it is known as the Eucalyptus Snout Beetle, and where it did very serious damage to several species of Eucalyptus.

The Senior Entomologist immediately made arrangements to visit South Africa with the object of introducing the egg parasite, *Anaphoidea nitens,* Gir. As a result, parasites were received in Kenya and liberated in March, only a few weeks after identification of the beetle. The speed with which biological control was applied to this pest, which probably constitutes a record, is due to the very prompt action by Mr. Wilkinson.

Large numbers of parasites were reared in the laboratory for liberation and by the end of the year the parasite had become established in nearly all infested areas. A survey made in October showed that in some places the parasite had spread up to six miles from its original liberation site. The early results can be considered very promising, and the value of the parasite in the control of this beetle seems assured.

In conclusion, I should like once again to acknowledge the help of the Imperial Institute of Entomology to this section, particularly in connexion with the identification of insects.

R. H. LE PELLEY,
Acling Senior Entomologist.

ANUUAL REPORT OF THE SENIOR PLANT BREEDER, 1945

Wheat—General

The rains were exceptionally late in commencing, but once started carried' on throughout the growing season and excellent crops have been reaped over the whole Colony. Owing to the late sowing the harvest in some areas was interrupted by the advent of the short rains, and some damage to the crop resulted. Lodging of the crop was somewhat general, especially in the weaker strawed varieties, but the grain for the most part filled well.

Rust and other Diseases

Stem rust was only present to a slight extent and was responsible for very little damage to the crop. Physiologic forms K. l, K. 2 and K. 5 were, however, recorded as being present in the field. These three forms were also isolated at Mbulumbulu in the Northern Province, Tanganyika Territory, together with form **K**. 7, which had not previously been found in the field.

Fusarium infection, both in the seedling and more mature stages, accounted for loss of crop in a few cases and this disease, together with Glume Blotch, *Septoria,* was prevalent to a greater extent than usual.

Take-all was again present, in one case as low as the 7, 000 feet level.

The work of the Senior Plant Pathologist in carrying out routine seedling inoculation tests, maintaining the ditferent rust forms, identifying rust specimens collected and creating artificial rust epidemics in the breeding cages has again **to be** recorded with thanks.

Review of the Main Varieties Grown

No. 117A. and Sabanero were again the two principal wheats grown. Both these wheats yielded well, but their lack of straw strength was accentuated this season and it is anticipated that they will be replaced, particularly on the richer **soils,** by some of the new stronger strawed hybrids now under increase. They have, however, served the country well during the war years and have suffered no damage by stem rust, although slight stem rust infections have sometimes been found on the variety Sabanero,

Equator, the variety usually grown at the top altitudes in view of its yellow rust resistance, again escaped stem rust.

Kenya Governor, grown in those areas requiring an early maturing variety, showed some rust infection, but for the most part was not affected appreciably.

Similarly. NB. 230, Burbank and Reward, all carried a little rust without any marked loss of crops.

Pedigree Seed

The following stocks of pure seed were produced this year: —1I7A. —7 bags We re harvested at the Plant Breeding Station, Njoro. Equator—Approximately 150 bags were harvested in the Molo, Mau Summit area. Sabanero—10 bags of a Rhodesian selection were harvested at Njoro.

Wheat Breeding at the Plant Breeding Station, Njoro

New wheat now under trial and multiplication comprise the following bosses: — 291, 261, 294. 184. 318 and 321.

Cross 291 (*Australian* 26. A. *x* 58. F. (L. 1.). —Over 1. 000 bags of the one strain kept, 291. J. I. 1. 1., were reaped in 1944 and most of this seed was sown in 1945.

Results have generally been good and this wheat has stood well when adjacent fields of 1I7A. and Sabanero have been laid. Yields, too, have been high and bushel weights up to 64| lb. have been recorded by growers. It has been entirely free from stem rust and its medium early maturity is of value. Its disadvantages are susceptibility to leaf rust, which has affected the crop in a few areas, susceptibility to yellow rust at the higher altitudes and a very moderate baking quality.

A number of single plant selections were grown as differences in maturity and bushel weights were found to exist in the parent strain.

Cross 261 (68. E. 12. A. x *Reliance).*—Only one strain, No. 26I. R 7. C. I B.. was issued to growers and 150 bags of seed have been harvested. This is an early maturing wheat like Kenya Governor and has yielded well to date. Seedling inoculations show it to possess some, but not full, susceptibility to form K. 7 of stem rust and it is susceptible to leaf rust. Its baking quality is good and it should be a useful acquisition to the mills. It is a bearded wheat and grown on the slopes of Mount Kilimanjaro and exposed to high winds, shattering occurred due to the awns and often the glumes with them breaking off, thus exposing the grain which subsequently fell. Elsewhere, however, no shedding occurred even when the wheat was overripe and it would seem safe to continue with this variety provided it is not grown in windswept areas.

One further strain. No. 261. S. 10. C. 2. D., which has not yielded as well here as in Tanganyika Territory, will not be continued with in the yield trial this coming season.

Cross 294 *(Australian* 26. A. *x* 117. A. K—Two strains. Nos. 294. M. 7. C. 6. A. and 294. B. 2. A. 3., were issued to growers. 294. M. 7. C. 6. A. is medium maturing like Sabanero, has grown and yielded well and possesses very fair straw. It, together with 294. M. 7. C. 6. C.. which is very similar, will be carried on and are of distinct promise.

294. B. 2. A. 3., while not so quick as Kenya Governor, is an earlyish maturing wheat which has possibilities and is being continued with. It did. however, show more susceptibility to glume blotch than did most varieties this season. Ten acres were sown at Kilima Kiu in the short rains in October and though the crop received no further rain shortly after it was up. it withstood the drought conditions very well and 71 bags were harvested.

One further strain, 294. H. 2. A. I., which has performed well in the yield trial is also being issued to a grower.

In addition, two strains, 294. M. 7. C. 1. C. and 294. AN. 5. B. 3., which are not yet in the bulk stage, will be included in the yield trial, the former for the first time and the latter for a final test.

All the above strains are likely to be suitable for altitudes up to 8, 000 feet. Baking reports show that they are not of the high quality of Cross No. 261. but approach more the filler class. They should prove of value and the General Manager of Messrs. Unga Limited considers that they might, with advantage, replace some of the present varieties.

Cross No. 184 *(Reliance x* 73. D. 2. I. 1.).—One early strain, 184. P. 2. A. I. F., was issued, but grown on good land and seeded rather heavily it lodged badly. At Njoro it came top in the yield trial on the Station. The straw, unfortunately, is both tall and weak, and whilst a further trial is being made on poorer soil this season, it is likely that this wheat, which is not only a good yielder and resistant to all forms of stem rust but of really excellent baking quality equal to No. 1 Manitoba. may have to be discarded. It has, however, been used as a parent in crosses.

A second strain, 184. P. 2. A. I. A., which is a week later maturing, was increased on the Station here, but this strain, which also yielded very well, likewise suffers from weak and tall straw.

Cross No. 318 *(Rust resistant selection oat of D. C. x Ceres* 721 *x* 112. E. 8. I.. 5.) —Two strains were included in the yield trial and increase plots. No. 318. A J. 4. A. 1. yielded and stood well and is resistant to all forms of stem rust in seedling tests.

No. 318. 0. 3. B. 2. yielded only moderately at Njoro but very well at ol Joro Orok. It possesses a border-line reaction to form K. 2 but resistance to the remaining forms of stem rust and resistance to yellow rust at the higher, hut possibly not the very top, altitudes.

Both these strains are being continued with and have been issued to growers for further trial and multiplication.

Yield figures taken from the yield trials relating to all the above wheals arc given below. Acknowledgments are made to the Senior Agricultural Officer, Rumuruti. who carried out the Ol Joro Orok trial, and to the Agricultural Officer in Charge, Northern Province Wheat Scheme Arusha. who was responsible for the Tanganyika Territory trials. The differences required for significance are not given as the Statistician has yet to analyse the Kenya results for 1945. but it will be seen that the new hybrids have generally outyielded the control varieties such as II7. A.. Sabanero and Kenya Governor.

YIELD FIGURES IN BAGS OF 200 LB. PER ACRE OF SOME OF THE NEW HYBRIDS EXTRACTED FROM THE YIELD TRIALS LAID DOWN IN 1944 & 1945

VARIETY	KENYA COLONY			TANGANYIKA TERRITORY		
	NJORO 7. 100 1 ft. 1944	NJORO 7, 100 ft. 1945	OLJORO OROK 7. 800 ft. IMS	ARDAI 4, 500 fl. 1945	NOARE 5, 200 ft. 1945	MBULU-MBULU 5, 800 ft, 1945
29I. J . 1. 1. 1.	9. 7	10. 3				7. 0
294. M. 7. C. 6. A . . .	11. 0	10. 0	–	–	–	–
294. M. 7. C. 6. C . . .	11. 0	112	12-7	–	–	
294. B. 2. A. 3.	9-7	10. 2	10. 9	li-4	–	
294. H. 2. A. 1.	9. 9	10. 9	–	–		
294. NN. 5. B. 3 . . .	8. 3	9. 2	11. 8	5. 2	10. 9	12. 1
281. R. 7. C. 1. B . . .	10. 6	10. 0	–	7. 4	9. 3	
201. S. 10. c. 2. D . . .	7-4	–	–	7. 3	11. 0	13. 5
318. O. S. B. 2.	–	8. 9	13. 2		–	
31S. AJ. 4. A. I . . .	–	10. 6	–			
184. P. 2. A. I. F . . .		11. 5	–	–		
REGENT 975. 6 . . .	8. 5	9. 1	13. 3	–		–
117. A	9. 4	9. 2	10. 4	–		
Sabannero	8-2	(i-4	8. 1	–		–
Kenya Governor	–			4. 4	6. 4	10. 2

Crosses 337, 344 *and* 350

These three crosses, which are in the F4 generation from the cross, were grown in the breeding cage. A number of pure lines were harvested which will he increased in the small multiplication plots in 1946.

Cross No. 337 (223. F. 1. A. 3. *x* 291. J. 1. B. 1.)—15 strains were selected at harvest as being pure and suitable for increase. These are mostly medium early to medium maturing with very fair straw strength and with a capacity to yield well.

Pelshenke figures indicate that they possess useful baking quality and the grain, which is attractive in appearance, mostly bushelled between 63-64} lb.

These strains have shown very little or no stem rust infection and a varying amount of leaf rust infection. Some of them are likely to be suitable to the higher altitudes up to 8, 000 feet.

Cross No. 344 (279. I. 5. F. 2. *x* 291. J. I. B. I.). —Eleven strains have been harvested. On the whole this cross has not shown so much resistance to stem rust and there has been a certain amount of stem and ear coloration which, accentuated under adverse conditions, has not given the plants too healthy an appearance.

In the high altitude cage at Molo this coloration and unhealthy appearance has been more marked and the grain, apart from slight yellow rust damage, has been affected. At Njoro, however, the grain was good, bushelling between 63 and 64 lb. The straw strength generally is good.

Cross No. 350 (223. F. 1. A. 5. *x* 294. M. 7. C. 8.). —Thirteen strains have been harvested. Some of these strains, as in Cross 344, have shown traces of stem rust this and/or last year. The amount of infection has been very slight and as other wheats in the cage have rusted badly these wheats are likely to be resistant. However, this fact is recorded as in other families no trace of rust at all has been observed. The straw is mostly shortish and strong and the appearance of the grain, which has bushelled up to 65 lb., is good.

One or two strains out of cross 340 (UX. 9. M. 1. A. 9. D. 2. x Regent 935. 6), cross 341 (279. 1. 5. F. 2. x Eureka G. 2503), cross 342 (279. I. 5. F. 2. x 210. E. 1. C. 1.), and cross 351 (I17. A. x Regent 975. 6) which are also in the F4 generation have bulked and will be grown on. but they are not so promising as the above three crosses.

F2 Cage Material

This material resulted from the crosses made by Dr. Becker in 1944, the F, generation being grown at the Scott Agricultural Laboratories over the short rains.

Some very promising plants have been obtained from the following of these crosses.

Cross 357—(184. P. 2. A. 1. E. x 294. AN. 4. A. I.).

Cross 359—(184. P. 2. A. 1. E. x 291. J. I. L).

The aim here is to combine the quality and yield of the 184 parent with the strength of straw of the second parent.

In cross 359 both parents are resistant to all forms of stem rust, though in crosses 357 the 294 parent is not resistant to all forms.

Strong strawed plants of the desired type have been harvested and the appearance of the grain in both these crosses is most attractive.

Cross No. 353 *(Warigo x* 291. J. 1. 1. 1.). —Both these wheats stand well and it is hoped to incorporate the leaf rust resistance of Warigo with the stem rust resistance of the 291 parent. Warigo is classed as a medium strong wheat in Australia and should therefore improve the baking quality of 291. A large number of plants have been harvested, though little leaf rust selection was able to be made this season.

Selections were also made in the following crosses, but the amount of material kept was comparatively small.

Cross No. 352—Warigo x 117. A.
„ No. 355—117. A. x 291. J. 1. I. 1.
„ No. 356—184. P. 2. A. 1. E. x 192. Q. 2. A. (L).
„ No. 358—184. P. 2. A. I. E. x 294. B. 2. A. 3.
., No. 361—294. N. 7. C. C. C. x 117. A.

The F, generation of cross 360 (Equator x I17. A.) was grown in the Njoro cage.

Dr. Becker made a further small series of crosses with the object of producing early maturing varieties possessing resistance to stem and leaf rust. These crosses were harvested too late in the season to enable the F, generation to be grown in the short rains. They are:

Cross No. 363—Warigo x 261. S. 10. C. 2. D.
„ No. 364—Warigo x 261. S. 10. C. 1. A.
„ No. 365—Warigo x 261. R. 7. C. LB.
„ No. 366—Warigo x 294. B. 2. A. 3.
„ No. 367—Warigo x 184. P. 2. A. 1. F.

Importations

Three new American wheats were grown.

Newthatch C. I. 12318 was resistant to stem and leaf rust, though susceptible to yellow rust.

Two durum wheats, Carleton C. l. 12064 and Stewart C. I. 12066. were resistant to leaf rust but susceptible to stem and yellow rust.

The Australian variety, Warigo, was resistant to stem and leaf rust this season, though it has previously shown some stem rust infection and seedling inoculations show it to be susceptible to three out of the seven K. forms.

Regent 935. 6

This Canadian wheat grown on Mount Elgon and the Plateau was promising **and** remained free of stem and leaf rust, though it again showed some stem rust infection in the breeding cage at the Scott Agricultural Laboratories. Seedling inoculations show it to be susceptible to forms K. 6 and K. 7 of stem rust, **and** whilst extended trials will be carried out next season growers have been advised that its stem rust resistance is not complete under Kenya conditions.

Wheat Breeding at (he Scott Agricultural Laboratories and the Molo Sub-station

Seven F, strains of cross No. 338 (192. Q. 2. A. (L) x Australian 27/2. 2. 1. 5) will be carried on. These strains have mostly shown resistance to leaf rust, though their stem rust resistance is not so marked.

All the pure line material was sown at both these stations, which serve **as** additional testing grounds for stem rust and, in the case of Molo. for yellow rust also.

The assistance of Mr. Gillett, the Senior Agricultural Officer and Experimentalist, in sowing the wheat at the Scott Agricultural Laboratories, and of Mr. Halcrow, Agricultural Officer, in harvesting the multiplication plots is gratefully acknowledged.

Pelshenke Wholemeal Fermentation Tests

Dr. Becker carried out these tests which serve as a general guide to the quality of new hybrids.

Through the courtesy of Mr. Holden, the General Manager of Messrs. Unga Limited, samples of the more advanced hybrids were sent to Dr. Kent Jones, in England, for reports on their baking quality.

Northern Province Wheat Scheme, Tanganyika Territory

Mr. R. N. Fuggles-Couehman, the Agricultural Officer in charge, again laid down trials with some of the new Kenya hybrids. These trials arc of value to this country in as much as they provide additional information as to the behaviour of these wheats and a fair acreage of several strains will be planted in 1946 in the Northern Province area.

Stem rust was particularly severe in the Mbulumbulu district. Form K. 2 was first identified on the variety Simpsons L. 3, the whole crop of which was lost due to rust damage. Subsequently Kenya Governor was badly attacked by form K. l, but the crop was too far advanced for much damage to be caused. This was followed by a varying amount of infection on the multiplication plots of the new hybrids. Rust collected from six of these hybrids was identified in each case as being form K. 5. As the hybrids in question have all shown resistance to form K. 5 in the seedling stage it is difficult to explain the present infection. Seedling inoculation tests with Form K. 5 arc being repeated and the seedlings will be grown on so that their mature resistance also can be tested.

The varying amount of infection is shown by the following rust records taken by the Agricultural Officer in charge.

Severity of Infection.	*Variety*
Very heavy	Sabanero.
Heavy.	294. A. N. 4. A. I.
Moderate	Regent 117. A.
Rattier moderate.	294. H. 2. A. 3.
Scattered.	294. AN. 5. B. 3. 261. S. 10. C. 2. D.
Very light.	294. H. 2. A. 3.
None seen.	261. R. 7. C. 1. B. 294. M. 7. C. 6. A. 294. M. 7. C. 6. C. 291.. J. I. I. I.

The rust records for 117. A. and Sabanero refer to field records. These two varieties were not grown in the multiplication plots.

At a later date a sample of rust was collected from a field of 117. A. and identified as form K. 7, which had, to date, only been isolated in the breeding cages at Njoro and Scott Agricultural l. aboratories. I17. A. is resistant to form K. 7 in the seedling stage, though Sabanero shows some susceptibility. A field of 66 acres of 291. J. L. L. L. remained entirely free of rust.

It will be seen that the strains in the multiplication plots which showed a nil or slight infection only are those which are under increase in Kenya.

Form K. 5 was first recorded in Kenya in 1937 and has since been isolated in 1945, 1944. 1942 and 1941 so it is likely always to have been present in recent years. There has, however, been no record of damage to either Sabanero or I 17. A-. though these two varieties have both been grown annually on a large scale in this Colony and it may be that the rust which attacked Sabanero was the same form, K. 7, as attacked 117. A. The hybrids which carried the K. 5 rust are like 117. A., but not Sabanero. resistant to form K. 7 in the seedling stage.

A visit to the Northern Province Wheat Scheme areas was made in July when harvesting was starting in the earlier districts, but the Mbulumbulu rust infection on the hybrids plots developed later.

Barley

The barley yield trial was sown too early for the conditions pertaining this season and the constant rains throughout the growing period resulted in too rank a growth and heavy lodging and the experiment could not be harvested. The trial was repeated late in the season, but growth was poor and too uneven to make the results of value. All the varieties grown were affected by leaf blotch.

New varieties under trial were the Danish variety Kenia. Glacier C. I. 6976 from America, Camton from England and the Canadian variety Mariout.

Glacier stood very well considering the season and showed resistance to leaf blotch and is distinctly promising as a feed barley.

Kenia will also be carried on. though its straw strength was not so good.

Camton possessed very strong straw, but was very badly attacked by leaf blotch.

Mariout was only sown late in the season but showed promise.

Other varieties under trial include the Australian variety Research and an unnamed, two-row. broad-eared German barley possessing tall but good straw.

The Australian variety Prior may still be taken as the standard where a quick maturing malting barley is required. The Breweries prefer it to Maltworthy as possessing a plumper berry, but in other respects there is little to choose between the two varieties.

A six-row Abyssinian barley which had yielded well in the past proved disappointing in the hands of growers this season.

Oats

Stem rust was less prevalent than usual. At Njoro the Canadian variety Ajax rusted badly, Lampton showed some infection, as did two new varieties. Cedar from America and Achilles from New Zealand, though none of these varieties were as susceptible as Ajax.

A bag of seed of Achilles was issued to a grower and a very good sample has been reaped with a bushel weight of over 43 lb., which is high for this country. The grain, however, is awned and will only be of value for feed purposes. The variety Cedar should suit the mills, provided a sufficiently plump sample can be obtained.

R. J. LATHBURY.
Senior Plant Breeder.

ANNUAL REPORT OF THE SENIOR AGRICULTURAL OFFICER (PASTURE RESEARCH), 1945

Work on three main lines of investigation was continued. These lines are: —

(a) Survey of the vegetation and regional classification into the main types.
(b) Management studies of the chief natural grassland types.
(c) Experiments with individual pasture species under cultivation and crops for fodder storage.

Much time has been devoted during the year to the application of results obtained from past work in the third of the above sections: in that seed production of certain grasses was undertaken on a considerable scale, in order to meet the demand which has arisen from the necessity to return to grass a proportion of the land ploughed for war-time cereal production. Work on the other two lines has necessarily been curtailed. The wider implications of these sections must, in any case, await the provision of trained European staff and the establishment of regional research stations.

Survey

No major survey was found possible. In September and October a brief reconnaissance was carried out in the Taveta region, in connexion with the work of a group of officers engaged in investigating the possibilities of obtaining additional land for native settlement. A coloured vegetation map, setting forth information collected during survey work in Kenya and Somalia was prepared with the generous co-operation of the local Military Authorities. A description to accompany this map is in course of preparation.

Natural Grassland Types

In addition to the maintenance of work in the two types accessible from Kabete, i. e. Kikuyu grass and *Acacia—Themedu* dominant grassland, previously reported—attention has been given to management experiments in certain Highland regions where, under present farming conditions, the advance of a useless coarse-grass phase of the vegetation constitutes a serious problem. The dominant of this phase is *Pennisetum schimperi,* a large, strongly-tufted grass, and it is now recognized that the problem with which this species is associated presents one of the major difficulties of pasture management over a very wide and important area of the Highlands. We already have a considerable amount of definite information upon the ecological relationships of this grass, and it only remains to prove, in properly controlled experiments, the possibility of applying this information. Some of the evidence upon which the future management of this productive region of the country must be based is given in three papers published in the Empire Journal of Experimental Agriculture from 1935-1942. As the result of a growing realization of the seriousness of the problem and of constant enquiries, it was decided in 1943 to set up a co-operative experiment on a farm in the Thomson's Falls district, in order to test some of the information obtained on the reactions of *P. schimperi* herbage, rather than to await the provision of facilities for more comprehensive work. The main feature of this trial is the application of controlled grass-burning as a means of suppressing *P. schimperi* in favour of the associated and desirable *Themedu triandra,* which was formerly dominant in the area. Although the experiment has suffered some of the usual misfortunes common to such co-operative undertakings, results obtained during the year indicate that some of the treatments applied are distinctly successful in producing the desired change in the herbage.

Study of Individual Pasture Plants

The primary aim of the work in this section is the discovery of pasture plants which may be used as temporary leys in rotation with arable crops, as a means of maintaining the fertility of arable land. Observations in the course of this and associated work on fodder crop cultivation over a number of years have emphasized the fact that the physical condition of the soil, as influenced by the roots of a grass cover, is of outstanding importance in fertility. The factor.

one which has been insufficiently recognized, which makes this point conspicuous under local climatic conditions is the capacity of the soil to absorb and retain moisture. This capacity is reduced to a marked degree with the breaking-down of the surface layer to a fine, flour-like condition under clean-cultivated crops and restored, with regained crumb structure, by a period of years under a close cover of vegetation such as grass. The variation in the degree to which the soil can absorb and retain moisture is frequently of critical importance to the crop, as has been very evident over the recent series of dry growing seasons. The means to control this critical factor lie in the correct use of grass as a resting-cover in the arable rotation of crops.

From the evidence available it appears that, unlike the case in temperate regions where lack of water is seldom, if ever, the main controlling influence, under the conditions of much more meagre moisture which obtain in Kenya, soil water and not chemical fertility is of first and immediate importance in crop production. It has been observed that where continuous crop cultivation has been practiced over a considerable number of years, normal yields can yet be obtained in periods of plentiful rainfall, but that crops on such land become markedly more susceptible to drought.

Observations on the Effect of Soil Structure

In 1939, when the November rains were very deficient, plants only about 8 in. high were produced on plots at Kabete then under their tenth crop of fodder maize following grass. These plants eventually withered and no significant yield was obtained. On a nearby area which had been ploughed from grass a few months previously, maize plants about four feet in height were produced, these retained their green colour and a reasonable yield of fodder was obtained. The first impression was that partially exhausted chemical fertility was responsible for the failure of the crop on the old plots, but this impression was corrected when, in the following season of plentiful rain, 19. 84 tons per acre were harvested from these plots, a yield little below the maximum ever obtained in the experiment and approximately equal to that of the adjoining new area in this season. It became evident that moisture and not chemical fertility was the controlling factor in yield. As long as there was ample rain the performance of the new and the old plots was much the same, but when only a limited amount of water was available, as in 1939, the yield was chiefly determined by the varying ability of the two soils to absorb and retain moisture for the use of the plants. Examination of the soils showed an obvious difference; that of the new area was granular in appearance, while on the old maize plots the soil was in a much finer and more powdery condition. Even in walking over the two areas the difference could be detected, in that on the old plots a distinct drag from the fine soil was felt. It appeared then from these observations, that the degree to which the soil had broken down under clean cultivation in a relatively short period (three years) was an all-important factor in controlling soil moisture.

In order to test this conclusion, a 1/10 acre plot close to the old maize plots (two plots of 1/20 acre each) was dug from grass, and over a number of growing seasons the performance of this plot was compared with that of the old maize plots. Rough measurements of the soil structure were carried out by the Soil Chemist in order to confirm the observations as to soil condition, and if possible to connect these with the differences of yield obtained. The soils of the new and old plots were of the same type (Kikuyu red loam) and from both general appearance and chemical analysis, closely similar. The conditions of planting and harvesting were the same for both areas, sowing being carried out on the same day throughout all plots.

The yields given in Table I arc based upon two 1/40 acre quadrats in each of the two areas (new and old) and the material weighed consists of whole maize plants, including roots. The soil samples examined in 1944 were taken at four points in each quadrat and to the approximate depth of a *jembe* (hoe) stroke, i. e. 6—9 inches.

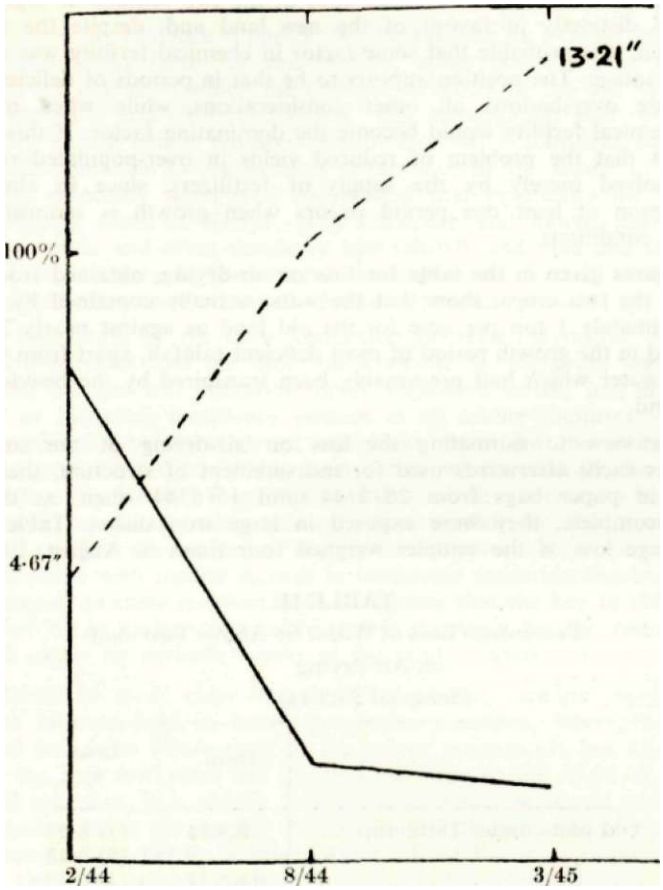
TABLE I

Comparison of Maize Plots with Different Soil Structure

	Green Weight per acre (lb.)	Loss on Air-drying %	Plants Established %	Rainfall During growth inches	Soil Aggregates (Water-stable) 1. mm %	Total Nitrogen %
Old Plots, 26.2.44 Under 18th. crop	**(1) 4340** **(2) 3690**	**57.58**	(1) 91.26 (2) 91.92	4-67	(1) 18 (2) 16	**(1) 362** **(2) 357**
New Plot, 26. 2.44 Under 4th crop	**(1) 7246** **(2) 7290**	**75-00**	**(1) 86.04** **(2) 86.23**	4.67	**(1) 29** **(2) 32**	(1) 387 (2) 340
Old Plots 9.8. 44 Under 19th crop	**(1) 16330** **(2) 16520**	**71-25**	**(1) 84. 68** **(2) 85.70**	10.15		–
New Plot, 9. 8.44 Under 5th crop	**(1) 17800** **(2) 20000**	**71 25**	**(1) 83.64** **(2) 81.79**	10.15		–
Old Plots, 8. 3.45 Under 20th crop	**(1) 16630** **(2) 16550**	73 33	**(1) 76.22** **(2) 76.60**	13.21	–	–
New Plot, 8. 3.45 Under 6th crop	**(1) 18200** **(2) 20530**	76.25	(1) 86.88 (2) 86.69	13.21		

FIGURE I

Proportionate Increase of Total Yield on New Area Over Old compared with Rainfall during Growth



Percentage increase in yield:

Rainfall during growth:

The conditions required to test the above conclusion were a growing season when the rainfall was much too low together with a season of ample rainfall. Unfortunately, a scries of drought years occurred, and although results for very Low rainfall were available, during 1944-45 there was no season of ample rain which could possibly result in a maximum crop of Maize (even in the long rains of 1944, the rainfall during growth was 50 per cent below average). Nevertheless, the table clearly shows that under the drought conditions experienced by the crop harvested in February, 1944, there is a much greater proportionate difference in yield between the two sections of the experiment than in the case of the two following crops when the rainfall, though still inadequate, was much higher. These differences are more clearly shown by the graph. Fig. I. It will be seen that the differences of yield appear to follow the measurements of soil structure, as indicated by the percentages of water—stable aggregates retained by a 1 mm. sieve. Further, the percentages of total nitrogen in the soil samples, given in

the last column of the table, suggest that there is no significant difference in chemical fertility between the new and the old areas, even when the latter had produced the 18th crop of maize. It should be mentioned, however, that measurements of the yield of immature maize cobs in the two seasons of higher rainfall gave results distinctly in favour of the new land and, despite the figures for total nitrogen, it is probable that some factor in chemical fertility was responsible for this advantage. The position appears to be that in periods of deficient rainfall, soil structure overshadows all other considerations, while when moisture is plentiful chemical fertility would become the dominating factor. If this is correct, it is evident that the problem of reduced yields in over-populated regions can never be solved merely by the supply of fertilizers, since in almost every growing season at least one period occurs when growth is seriously checked by drought conditions.

The figures given in the table for loss on air-drying, obtained from samples taken from the two crops, show that the water actually contained by the maize was approximately 1 ton per acre for the old land as against nearly 2½ tons on the new land in the growth period of most deficient rainfall, apart from the greater amount of water which had presumably been transpired by the heavier crop on the new land.

With a view to estimating the loss on air-drying of the soil samples (2 kilograms each) afterwards used for measurement of structure, these samples were kept in paper bags from 28/2/44 until 15/8/44 when, as drying was evidently incomplete, they were exposed in large iron dishes. Table II shows the percentage loss of the samples weighed four times in August, 1944.

TABLE II

Percentage loss of Water by Above Two Soils on Air-drying

(Sampled 28.2.44)

	Date	Low %
Old plots under 18th crop..	9.8.44	(1) 6.23
		(2) 5.43
	18.8.44	(1) 0.40
		(2) 5.58
	23.8.44	(1) 6.50
		(2) 5.73
	23.8.44	(1) 6.43
		(2) 5.03
New plot under 4th crop	9.8.44	(1) 4.55
		(2) 4.70
	18.8.44	(1) 4.05
		(2) 4.78
	23.8.44	(1) 4.80
		(2) 4.93
	28.8.44	(1) 4.08
		(2) 4.80

A greater loss of moisture was expected from the soil of better structure on the new plot, indicating the presence of a greater amount of water in this soil, but the table shows the reverse. The obvious explanation is that the soil with superior structure dries out less readily. Further, it will be seen that both

soils actually gained in weight at the last weighing on 28/8/44, the soil of better structure gaining slightly more than that from the old plots. The general increase in weight was due to absorption of moisture from the atmosphere in dull, humid weather.

The foregoing evidence supports the observations in 1939-40 which suggested that the controlling factor in soil fertility, under conditions of relatively low rainfall, is the degree to which the physical structure of the soil has deteriorated through exposure and clean cultivation. The investigation was necessarily of a preliminary nature and it requires confirmation on a statistical basis, but there can be little doubt as to the extreme importance of the aspect of soil moisture considered; especially when it is appreciated that practically the whole of the crop producing areas of Kenya, both European and native, are more or less subject to erratic and often decidedly low rainfall, and also that the amount of degeneration, as shown by the structure measurements, is small in the experiment compared with the condition usually found in practice.

The realization of the close connexion between the degree of aggregation of the soil particles and the moisture available to the crop, and also of the dependence of this soil condition upon vegetative cover, has emphasized the necessity of including temporary pasture in all arable rotations and has given a new importance to the study of individual plants for the artificial establishment of pasture. Moisture is the main factor which controls the possibility of crop rotation in Kenya. Even that portion of the country which is capable of producing crops is under relatively low rainfall for the tropics and it is subject to marked dry seasons. Further, the effectiveness of the rainfall is not to be compared with similar records in temperate countries where evaporation is less important. In these circumstances, it appears that the key to the maintenance of soil fertility in arable crop cultivation is provision for the restoration of the crumb structure by periodic return of the land to grass.

It should be made clear that this view of "ley farming" does not coincide with that hitherto held in humid temperate countries, where the system was developed and from where most of the recent propaganda has arisen. Although work in the past few years has directed attention to the effect of a grass cover upon soil structure, it is chiefly Russian work under semi-arid conditions which is informative as to the readily observable soil changes under local conditions. In the temperate countries a much wider use of the ley (temporary pasture) is possible than in the dry tropics. It is, in fact, advocated as a substitute for permanent pasture throughout a great part of Britain, The position in Kenya is entirely different, there is no suggestion that natural grassland should be ploughed and put under a ley rotation; this would be neither desirable nor practicable. The grass leys must be regarded as an essential instrument for the maintenance of fertility in the limited areas available for crop cultivation. The care of the vast natural grasslands, and the preservation in them of a balance between utilization and deterioration, will always remain a first concern of the country.

Grasses for Temporary Pasture

Work over a considerable number of years has been concentrated mainly upon investigation of the indigenous flora, and this work has tended increasingly to indicate that the most fruitful field for study lies in an investigation of the numerous ecotypes or geographical strains of the widely distributed species, which are induced by sharply contrasted climatic conditions resulting from the unusual topography of the country.

Persistence under intensive management and good seed production are two of the qualities which have been sought in the promising grasses which have been obtained and tested. It has not been easy to find species possessing both

these qualities, but the work has now reached the stage of practical application in the cases of certain grasses, although an extensive field for research of course remains. Two types, the Nzoia strain of *Chloris gayana* (Rhodes Grass) and *Melinis minutiflora* (Molasses Grass) cover the requirements of the main portion of the agricultural areas, while *Bromus marginatus*. an exotic species, is in use in the high altitude areas. Induced by the necessity of returning excess arable land to pasture, which has resulted from war-time production of cereals, a considerable demand for the seed of these grasses has recently developed. Large-scale seed production organized through selected growers to meet this demand has met with considerable difficulty, chiefly owing to lack of appropriate information on mechanical methods of harvesting.

Mention should be made of two further indigenous grasses which have more recently come to notice in the work. Although they have not yet been proved by critical see "The Nzoia Type of Rhodes Grass for Temporary Leys". East African Agricultural Journal, Vol. IX. pp. 62-68, October. 1943), these two are likely to play an important part in future ley farming development. The one is the Alego Ecotype of Rhodes grass, obtained from the district of that name in the Kavirondo region. This grass is persistent and a good seed producer, with a habit which tends to a closer sward than that produced by the Nzoia Ecotype. The other is *Eragrostis curvula*. grass which was obtained from near the Ngorongoro Crater on the Kenya-Tanganyika border some 18 years ago by an American botanical expedition. Tests of material received from the U. S. A. were made during the year. The grass is deep-rooted and evidently drought-resistant to a marked degree. These qualities, coupled with the facts that it belongs to a group of pioneer grasses and that in the U. S. A. it has been shown to resist successfully a considerable degree of frost, suggest that it might be of value in solving the particularly difficult problem of regrassing arable land in limited areas of Kenya, such as the higher Naro Moru district, where, at high altitudes, the rainfall is unexpectedly low and erratic, frost occurs and desiccating winds prevail. Arable cultivation should, of course, be reduced to the minimum required for stock farming under such conditions, but unfortunately production of cereals for war purposes has extended in recent years.

Advance has been made in ley establishment in a direction which bears upon the importance of soil moisture discussed above. It has been observed that, in recent dry years, better establishment of grass seedlings has taken place under a heavy cover of weeds than on bare soil.' This appears to be due to the fact that the shade provided conserves moisture at the soil surface. The idea was applied to the establishment of Nzoia Rhodes grass by mixing the grass seed with that of Kavirondo Perennial Sorghum. The latter germinates and develops much more quickly than the Rhodes grass, and if sown thickly, provides a dense shade of seedlings a few inches high. Under this shade a remarkably successful establishment of the grass was obtained. Had the Sorghum been permitted to grow uncontrolled it would have completely suppressed the grass, and it is therefore necessary either to graze or to cut the herbage repeatedly at 4 in. to 6 in. high. By this means a sward in which Rhodes grass was strongly dominant was obtained in November from an April sowing, and the Sorghum is rapidly disappearing completely.

This rather different application of the "nurse crop" method from that usually understood in moist temperate countries, appears to afford the possibility of safer Iey establishment in areas where rainfall is unreliable, and at the same time to provide grazing more rapidly through the quick-growing Sorghum constituent of the mixture.

* Observation by A. R. Melville, Department of Agriculture, in course of examining grass seed production areas.

Oops for Fodder Storage

The storage of fodder as hay and silage for use in the dry seasons is an indispensable supplement of the intensive management of grassland in all parts of the country. Experiments in the comparison of crops for this purpose were continued. Further selection of four distinct types of the indigenous Kavirondo Perennial Sorghum were carried out *(see* East African Agricultural Journal. Vol. VI. pp. 183-186, April, 1941), and an experiment designed to compare the types was established. Increase of an outstanding type. R2342, bred from the above, was undertaken in collaboration with the Scott Agricultural Laboratories.

Identification of **Pasture Plants**

In the course of the year, determinations were made of 122 pasture plants received from officers of the Department and private individuals.

It is hoped that, with the end of the war, facilities to refer collections of plants to the herbarium of the Royal Botanic Gardens, Kew, will be re-established. Considerable difficulty has been experienced in this connexion, particularly in regard to the material resulting from survey work, although valuable assistance has been obtained both from the Agricultural Research Institute, Amani, and the Coryndon Memorial Museum, Nairobi.

Plant Exchange

As indicated in previous reports, war conditions have much reduced the possibility of exchanging pasture and fodder plants for trial with countries abroad. Planting material was supplied during the year, however, in response to requests from the following countries:—Nigeria, U. S. A., Tanganyika, Belgian Congo, Cameroons. Abyssinia, Palestine. Puerto Rico, Seychelles, Southern Rhodesia, Sierra Leone, Basutoland and Jamaica. Material was received from Abyssinia, Union of South Africa. Belgian Congo and Nigeria.

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Senior Agricultural Officer (Pasture Research).

GRADING, INSPECTION AND COOL STORES, SERVICES: ANNUAL REPORT OF THE CHIEF GRADER AND INSPECTOR, 1945

Plant Import Inspections

Export.—Only one Phytopathological Certificate was issued in respect of 152 bags of garlic, grown in Uganda and consigned to Ceylon.

During the previous year a number of certificates were issued in respect of coffee to Egypt. This coffee was triage, which, on account its low quality, becomes subject to the Egyptian Foods and Drugs Regulations, and must be covered by a certificate. Coffee has been exported to Egypt in normal quantities, but not triage, which accounts for the great reduction in the number of phyto-pathological certificates issued during 1945,

Imports.—The following table shows the number of parcels of seeds and plant material and products, with their declared values, inspected at Mombasa.

Plant Imports

Class of Import	Imported		Refused entry	
	No. of parcels	Declared value	No. of parcels	Declared value
		Sh. ***cts.***		*Sh.* cts.
Seeds	664	198, 784 33		
Tea seed				
Fruit, Apples	7, 558	280, 007 00	901	29, 879 00
Fruit, other	41, 022	347, 002 00	253	6, 756 00
Plants	15	150 00		
Bulbs.	1	30 00		
Fruit Trees	580	17, 470 16		
Foods and Spices. .	30, 932	3, 455, 446 40		
	89, 772	3, 298, 869 89	1, 154	36, 635 00

191 packages, valued at Sh. 17, 608/72 were passed on behalf of Uganda, seven parcels valued at Sh. 2. 500 on behalf of Tanganyika Territory.

The number of seed parcels is almost twice that of the previous year, while the value is more than doubled. The majority of these parcels have come from South Africa. The only tea seed received was either for Uganda or Tanganyika. Apples again showed an increase, but the percentage rejected was much higher. Foods and spices showed a great decrease on the preceding two years, due to reduction in bulk food shipments. Very symptomatic of the cessation of hostilities is the almost three-fold increase in the importation of fruit trees.

Grading

Maize.—The export season started very late, due to the policy of the Produce Control to see that internal needs would be satisfied before making any anticipated surplus available for export. As the maize was not primarily intended for export, little incentive was given the farmers to study quality, which accounts for the preponderance of the lower grades. Due to the late start of the season, which resulted in much of the maize being stored for a considerable period, it is not surprising that 66 per cent of that received at the coast was slightly weevily or weevily.

The following tables show the quantities and grades from the different sources: —

INSPECTED DIRECT (Hags of 200 lb. not.)

	Ex Reserve Stores	European grown	Native grown	Native Direct to M. C. P.	TOTAL
K 2	230	11, 251			11, 481
K2 SW	618	118			736
K 3	6, 688	66, 817	25, 073		98, 078
K3 SW	46, 085	84, 214	39, 036		169, 935
K3 C	10, 790				10, 790
K8 W	280	5, 825	1, 622		7, 727
K8 W S W . .		36, 849	1. 037		38, 486
K8 C W				3, 594	3. 594
K8 Y SW		4, 521			4, 521
Total Graded	04, 691	209, 095	67, 968	3, 594	345, 348
Wet	22	2, 000	860		3, 482
MY		35			35
WL	65, 231	27, 005	4, 372		96, 608
RJ	1, 793	10, 309	3, 516		15, 018
Total Rejected	67, 046	39, 949	8, 748		115, 743
Total Received	131, 737	249, 044	76, 716	3, 594	461, 091

The greater part of this maize was received between March and the end of June, by which time the quality was so poor that other types of maize for export had to be found in order to complete contracts. This accounts for the slightly weevily Yellow Undergrade (K8 Y SW). As well as this, South Africa was prepared to accept CUSOO maize on sample, of which 17, 313 bags were inspected direct and passed, and 2, 425 bags were reinspected after treatment at the Maize Conditioning Plant.

Maize Shipments

(1) *Shipments under Certificates*

Shipments were only made to South Africa and Mauritius.

The following table shows the number of certificates covering the numbers of bags shipped to these destinations in the various grades: —

	SOUTH AFRICA		MAURITIUS		TOTAL	
	No, of Certs.	No. of Bags	No. of Certs.	No. of Bags	No. of Certs.	No. of Bags
K 2	4	11, 251	1	230	5	11, 481
K 2 SW	1	118	1	618	2	730
K 3	8	89, 559	1	9, 923	9	99, 482
K 3 SW	9	92, 431	2	03, 208	11	155, 039
K 3 C	3	0, 593	2	38, 021	5	44, 614
K 8 W	1	1, 352	-	-	1	1, 352
K 8 WSW	2	8, 330	1	16, 333	3	24, 003
K 8 CW	4	3, 021	1	109	5	3, 730
K 8 YSW	2	4, 521	—	-	2	4, 521
Total	34	217, 770	9	128, 442	43	340, 218

In addition to the above, 19, 738 bags of CUSOO were shipped to South Africa covered by sixteen certificates:

(2) *Under Ride* 25

Arabia	17. 248 bags
Aden	915 ..
Dar es Salaam	67, 810 ..
Seychelles	10. 677 ,,
Socotra	1, 520
Somalia	13, 988 ,,
Tanga	103. 715 ..
Total	215. 873 bags

Beans

(a) Commercial

(1) *Grading.—As* there is a very distinct hiatus between the 1944-45 and the 1945-46 crops these are shown separately: —

Variety	January-May			September		December	TOTAL Bags
	K2	K3	K5	K2	K3	K5	
Canadian Wonder..		219	675			189	1, 063
Rose Coco		2. 427	544			299	3, 270
White Haricot	197	3, 407	822	580	277	4, 924	10, 207
Soya		9, 047	103			29	9, 178
Madagascar Butter..	263	205					528
Mixed	–		13, 250			667	13, 917
Totals:	460	15, 364	15, 394	580	270	6, 108	38, 183

The main point to be made here is that although the 1945-46 season opened in September it did not really amount to much till the latter half of November and two-thirds of the total received Arrived in December, by which time beetle damage had assumed such proportions that it was impossible to place the beans in any grade but undergrade (K5).

(2) *Shipments* under *Certificate.* —As occurred in 1944. shipment lagged considerably behind arrival at the coast. There was a noticeable lack of shipping space to South Africa during the latter half of December, which partly accounts for no shipments being made during that month.

	FEBRUARY-JUNI						septe	mber-NOVEr	MBER			
	K2		K3		K5		K2		K5		TOTAL	
Number of	Cert.	hags	Cert.	bags	Cert.	bags	Cert.	bags	Cert.	bags	Cert.	bags
Canadian Wonder			1	219	1	446			1	189	3	854
Rose Coco			9	1, 592	2	468					11	2, 060
White Haricot			3	610			4	580	3	775	14	3. 592
Soya			4	7, 188	4	1, 027					4	7, 188
Madagase Butter		263	2	103							3	420
Mixed					12	9, 068					12	9, 008
Totals	1	203	19	9, 772	19	11, 809	4	580	4	904	47	23. 188

(3) *Under Rule* 15—115 bags to Bahrein, 560 bags to Pangani,

(b) Seed Beans

(1) *Grading.*—The decline noted last year was to some extent restored in quantity, but there has been a sad decline in quality. The varieties "Victory" (alias "Yellow Prince" and "Long Tom" (alias "The Prince") in particular showed very marked discolouration, leading to degrading, which did not meet with the approval of the producers. The compulsory grading of seed beans was discontinued at the request of the Director of Agriculture, Tanganyika Territory. The following table shows the quantities and grades received:—

	K1	K2	K3	K5	Total
January-May	2,484	1		.,	2,485
September-December..	2,908	1,003	303	223	4,437
Total ..	5,392	1, 004	303	223	6,922

(2) ***Shipments.***—The following table shows the quantities, grades and destinations of the various shipments:—

	JANUARY MAY:				SEMPTEMBER-DECEMBER					
	U. Kitigdom		S. Africa		Ki igdom		S. A rica		To-TAL	
No. of	Cert,.	Bags.	Cert.	Bags.	Cert.	BAGS.	Cert.	BAGS.	Cert,	Bags.
K 1	13	1,986	25	1, 591	27	811	36	1, 931	101	6, 319
K 2					7	263	19	654	26	917
K 3							2	125	2	125
K 5							3	148	3	148
TOTAL	13	1, 986	25	1, 591	34	1, 074	60	2, 858	132	**7, 509**

Whereas the 1944/45 crop was shipped in almost equal quantities to the United Kingdom and South Africa, so far the 1945/46 crop has been shipped in considerably larger quantities to South Africa. This is not directly connected with shipping facilities, as the produce is railed to the coast to fulfil orders and in the vast majority of cases its destination is determined on the farm prior to railing and grading, which is significant.

Potatoes

Grading.—Unlike the last few years, there were only two months, namely May and June, during which no potatoes were received for grading,

77, 450 cwt. were received and graded during the period July to December; this amount is greater than the total amount of potatoes received for grading from 1942 until then. The annual total of 126, 583 cwt. is the highest since 1939. The potato export trade, never a popular one with the Port Authorities, had, during the war years, when it was not very active, lost many of the facilities it used to enjoy, chief of which was the potato shed, which was commandeered by the Navy. After some trouble with the record November shipments, when more than half of the potatoes received were rejected as wet (over 200 tons), the Port Authorities made J shed at the Magadi Soda Installation available for potatoes, and temporarily most of the floor space of the extension to the main sheds for shade-drying potatoes. The first shipments to Bombay and Colombo suffered very great losses, due generally to mismanagement. The potatoes arrived

at the coast wet, were stacked in the open under tarpaulins at a time when the coast was enjoying some very heavy instability showers (attempts were made to sun-dry the potatoes, which did not improve their keeping qualities), and finally they were stowed far too closely in the hatches without sufficient air spaces. Later shipments, after shed accommodation was made available, were very much more successful.

The trade has complained that potatoes grown between Njoro and Londiani do not keep as well as those grown in the Karatina Sagana area. This may be so, but the fact that these shipments were almost entirely from the former area and were successful enough for repeat orders to be placed shows at least that their keeping quality cannot be too bad.

The following table shows the quantities in hundredweight exported to various ports. All were graded K2 and shipped in bags: —

Aden	2, 707 cwt.
Bombay	27, 719
Colombo	20, 450
Dar es Salaam	17, 615
Durban	6, 391
Lourenco Marques	800
Mauritius	5, 770
Mogadishu	1, 076
Pagani	24
Seychelles	2, 716
Tanga	2, 084
Zanzibar	7, 468
Total	94, 820 cwt.

A total of 31, 680 cwt. were rejected during the year, which constitutes a record; of these, however, 13, 180 cwt. were dried and passed on resubmission for grading.

In addition to the above exports, 8, 035 bags (equivalent to 12, 942 cwt.) were exported as ships' stores.

Wheat

(1) ***Grading.*** —For the first time since 1936 there was a surplus of wheat for export. The wheat started to arrive in June and ended in October,

The appended table shows the varieties and grades.

The best wheat was undoubtedly Equator, the majority of which came from Molo and Mau Summit, as under: —

K1, 31, 661; K2, 3, 666; K3, 310; Kl SW, 1, 111; K2 SW. 311; K3 SW, —; total received: 36, 129.

The majority of the slightly Weevily and weevily wheat was, as might be expected, the softer wheats from the lower altitudes; Kitale was typical of this, railing more slightly weevily and wcevily than clean wheat, which was a pity, as the crop appears to have been good. For example, out of 11, 000 bags of Kenya Governor railed from Kitale, only 3, 000 bags were K1, 5. 000 were Kl SW, and over 2, 000 were weevily.

There was also an export of wheat from the Northern Province of Tanganyika Territory, This consisted of Kl wheat, selected by Unga Ltd. This shipment consisted of 1, 150 tons. On arrival nearly 80 tons were either slightly

weevily or weevily. These were treated at the conditioning plant, and when resubmitted for grading were graded first grade. The remarkable point about this wheat was its very high quality. The average bushel weight was 64. 72 lb., the highest being 66. 9 lb. and the lowest 63. 1 lb.

(2) *Shipments.* —Apart from the 1, 150 tons shipped from Tanganyika Territory mentioned above, which was shipped to Southern Rhodesia, via Beira. the remainder was shipped to South Africa. A total of 50 certificates was issued.

Conditioning

The conditioning plant worked a total of 4, 111 hours during the year, made up as follows: —

	Part days	*12-hour shifts*	*24-hour shifts*
No. 1 Plant	7	96	
No. 2 Plant	10	71	

The following produce was treated: —

Maize	175, 375 bags
Beans	39, 134 ,,
Mtama	1, 182 ,,
Wheat	1, 735 ,,
Rice	6, 179 ,,
Moong	1, 855 ,,
Total.	225, 460 bags

VARIETY	K1	K2	K3	K1 SW	K2 SW	K3 SW	Total Graded	R. J	WET	WL	Total Reject	Total Reed.
Equator	45, 018	4, 892	310	1. 842	311	—	52, 373	-	...			52, 373
KTI	2, 624	1. 299	220	402	-	-	4, 005	310	—	279	589	5, 194
117 A	14, 431	2, 006	-	2, 731	-	311	19, 479	160	-	1, 030	1, 700	21, 209
Sabenero..	9, 748	2, 564	288	1, 281	1, 078	—	14, 959	1	-	930	931	15. 890
Kenya Governor..	6, 287	-	-	5, 580	889	—	1 2, 750	1	-	2. 339	2, 340	15, 090
B 230	3. 575	1. 079		495	-	-	5, 149	-	—	21	21	5, 170
Burbank	545	-	-	03	-	-	608	-	7	-	7	615
Ceres	144	-	-	83	-	-	227	-	-	930	930	1, 157
Australia..	284	-	-	14	-	-	298			-	-	298
Reward	—	-	-	115	-	-	115	-	—	-	-	115
193	150	1, 120	-	-	280	-	1, 550	-	-	-	-	1, 550
Golden Ball	-		112	-	-	-	112	-	-	-	-	112
TOTALS	82, 800		930	12, 000	2, 558	311	112, 231	472	7	6, 129	0, 008	118, 839

230, 776 bags were treated by heat for the destruction of storage pests. That this figure is higher than that of the number of bags of grain treated at the plant is accounted for by the fact that some of the maize treated was in 160 lb. bags and is shown above converted into the equivalent number of 200 lb. bags, and that some of the rice was received in double bags.

Since August the plant has not been idle for more than two or three days at a time, not long enough to carry out any major overhauls **or** repairs, not that that was really practicable owing to the shortage of European staff, due to leave movements. However, there were no major breakdowns, and the time lost due to mechanical faults **was** almost negligible, though both plants were mainly employed in the destruction **of** storage pests and were **running** at their highest possible rate of feed,

The bean polishing machine, ordered for the Nairobi Grain Conditioning Plant, diverted to the Kilindini Conditioning Plant, arrived during the year, but was not installed for the following reasons: the expense of the alterations to the existing plant required, The time the plant would have been out of action while alterations were carried out. and the temporary shortage of European staff to supervise the alterations.

Nairobi Grain Conditioning Plant

The Nairobi Grain Conditioning Plant started operating on 13th August, 1945, and after working a total of 583 hours closed down on 13th October. During this period 26, 806 bags of maize and 3, 604 bags of wheat were treated. Out of this total 5. 960 bags of maize were used for experimental purposes. After some minor troubles, which were experienced in the running-in stage, the plant worked satisfactorily and the maker's specifications of an output of five tons per hour was obtained. Some difficulty was experienced from weevils migrating into the "clean" side of the plant, and the whole plant and stores were fumigated on 27th October, but with not entirely satisfactory results.

Fumigation

7, 576 bags of seed beans were treated in 60 operations. 528 bags of commercial beans in four operations, and 4. 023 bags of miscellaneous grain in 31 operations, making a total of 12, 127 bags treated in 95 operations, as compared with 6, 217 bags in 42 operations in 1944.

Carbon bisulphide was used until May. when the supply was exhausted. Since then Carbon Tetrachloride Ethylene Dichloride has been used. This fumigant has proved quite successful, but as far larger quantities are required to create a lethal mixture of gas. and as apparently it evaporates no faster than carbon bisulphide, it is much slower in building up a sufficient concentration of gas to be effective, and therefore lacks one of the desiderata of the ideal fumigant.

Oil Testing

Three oil tests were carried out during the year.

Cool Stores

The following table shows the total quantities and the revenue earned from the various commodities in the store during the years: —

Commodity	*Deposit* v	*Revenue*
		Sh.
Mutton	100, 643 lb.	5, 508. 21
Beef	372, 655..	25, 947. 75
Pork	308, 016	21. 475. 55
OffaL	80. 151,.	4, 907, 11
Bacon	180, 885.,	9. 082. 49
Cheese	11, 324,,	585. 75
Game	–	10. 00
Fruit	65, 933	5, 552. 41
Papain	— V	393. 12
Miscellaneous	924,	55. 07
Poultry	2, 190,.	290. 50
Eggs	63,.	5. 00
Local Butter	1, 550 c/s	3, 220. 89
Butter Store	18. 596 „	20. 110. 00
	1. 042. 5 tons	97, 143. 76

As was to be anticipated, there was a general fall in the deposits of meat as **a** result of the opening of the Naval cool store; the actual decrease was 31 per cent on the 1944 Figure. Local butter fell 60 per cent, partly due to the cessation of Naval deposits, partly to the diminishing Military requirements due to reduction in complement after the cessation of hostilities. In spite of this the total number of cases of butter is only 3 per cent less than the figure for 1944. These decreases were compensated to some extent by increases in cheese and fruit, so that the total decrease is 17. 6 per cent. As more space was available, produce tended to remain in store longer, with the result that the figure for average space occupied has risen from 66 per cent to 72 per cent, and the revenue has only fallen by 5. 7 per cent. About the same use has been made of the butter store; slightly more butter has been stored, but in the aggregate for shorter periods.

The plant has been running satisfactorily during the whole year without any major breakdowns. Routine overhauls have been carried out satisfactorily. The whole installation has been run by the original Peter Brotherhood Compressors. one at a time, and it has not been necessary to use the Hall Compressor to assist with the butter store. The efficiency of these compressors is a tribute to their builders and to the careful maintenance they have received.

P. V. M. QUJGGIN,
Acting *Chief Grader and Inspector.*

* Includes rent of butter store.

ANNUAL REPORT FOR 1945 OF EGERTON SCHOOL OF AGRICULTURE

Closing of Secondary School

The first two terms of the year were completed. The school was closed at the end of the second term, in August, in order to allow for a full programme of agricultural training to be undertaken. Pupils were transferred to the Prince of Wales School, Staff posted for the running of the Secondary School, viz. two Education Officers, one Matron, Grade 1. and one Assistant Matron were transferred from the School in August. All equipment used in the Secondary School, which represented all equipment on the whole station with the exception of equipment for the farm, for staff quarters and for twelve persons in boarding block C (the old "hostel") was removed at the same time.

Preparation of Accommodation Required for the Full Agricultural Training Scheme

After the removal of the Secondary School, all buildings became available for agricultural training, but many alterations and additions were necessary and an almost complete new set of equipment had to be obtained. This was difficult so soon after the end of the war. The rebuilding was commenced in October, the programme being as under: —

(a) Enlargement of the dining-room block.
(b) Partitioning of dormitories in blocks A and **B.**
(c) Erection of a new boarding block "D" (pre-fabricated).
(d) Erection of a new class IV staff house,
(e) Erection of quarters for a veterinary officer.
(f) Enlargement of two staff flats.
(g) Minor works, including erection of firewood stores and installation of water-borne sanitation.

Between October and the end of 1945 work progressed on items *(a), (b)* and (f). above, the enlargement of one staff flat having been completed earlier in the year.

Orders were placed with the P. W. D., the trade and through the Military for a complete set of boarding equipment. Equipment ordered was beginning to arrive by the end of the year.

Preparation for Agricultural Tuition

In addition to farm equipment, certain orders have been placed for material needed for tuition. Apparatus and reagents for fitting and stocking a laboratory were ordered, a lecture-room having been converted for use as a laboratory. Machinery was ordered for a workshop where heavy repairs could be undertaken and plans for the building were prepared. Periodicals, pamphlets, bulletins and text books were ordered. The preparation of a series of tutorial synopses was commenced, A search was begun for additional staff.

Land Development

A further 100 acres were cleared, stumped, ploughed, broad-based terraced and brought into cultivation and work was commenced on the development of a further 60 acres.

Water Supply

Although the sinking of the bore-hole was completed in July. 1944, the equipment and plant were not available in 1945 to put the bore-hole in operation. This has hindered the proper working of the new and main part of the farm.

Electric Light Supply

The station has been supplied by the East African Power and Lighting Company. Ltd., since July, 1945.

European Staff

Principal.—J. E. P. Booth was on leave and duty in the United Kingdom and South Africa from 18th January to 24th August. H. Gledhil! acted as principal during that period.

Farm Manager.—B. H. Robson was in residence during the year.

Warden and Engineer.—K. B. Bindloss was appointed on 1st September, 1945.

Technical Instructor.—J. Scanlon went on leave in May and was not reposted to the School. The post of Mechanical Instructor at the School ceases to exist.

Secretary.—Mrs. J. M, Robson was in residence for the whole year.

Secondary School Staff.—Withdrawn in August, *see* above.

New Staff.—Five posts of Instructor, one of Veterinary Officer, one of Housekeeper, one of Assistant Housekeeper, have been allowed on the establishment of the School and had to be filled at the end of the year.

Agricultural Training in 1945

One student completed the Agricultural Certificate Course for civilians. He took the final examination just after the end of the year and was granted the School certificate with credit.

The first of a series of short courses for Services personnel were conducted in November and December. The first course of this series provided initial training in farming, in the United Kingdom, the syllabus used being a modification of a War Office syllabus. Seventeen personnel attended this course.

Farm

Cropping

The Arable Rotation.—The rotation, all the courses of which have not yet been completed, is an eight-course rotation, with four years in temporary ley. it is designed for the maintenance of a dairy herd, of fattening pigs and for the production of certain crops for consumption as human food on the farm and for sale. During the non-grass courses, cereals, maize, oat hay, vetch hay, flax or linseed and potatoes are taken. The choice of first and last crops in these courses will not be finally decided until trials of methods of establishing temporary leys under these conditions have been carried further. The manurial treatment is based on:—

(i) concentrated grazing of leys;
(ii) application of dung to leys:
(iii) application of slow-acting phosphatic fertilizers to leys:
(iv) application of top-dressings of artificials to cereal and maize course:
(v) ploughing in of nitrogen-fixing vetch aftermath;
fvi) direct application of dung to potatoes.

In addition, the advisability of adding nitrogen to ploughed-in heavy straw and maize crop residues is under consideration. The dung is mainly made from cereal straws put through yards, pens, styes, etc. The advantage of applying it mainly to the ley courses is that losses of nitrification are reduced, labour difficulties in application are minimized and conditions for an optimum increase of soil fertility under ley treatment are approached for the benefit of subsequent crops.

Pyrethrum Rotation.—Pyrethrum is grown in a separate rotation and will be alternated with temporary ley, the ley being followed by one cereal crop before pyrethrum is planted again. Fuel will in time be produced on the farm. ***See*** below.

Non-rotational Crops.—*Lucerne,* under irrigation (not yet applied); trees for shelter, shade and fuel; permanent grassland.

Approximate present allocation of acreage:—

Arable (some still under natural grass)	480 acres
Pyrethrum rotation	30 „
Lucerne (not yet fully developed)	10 „
Permanent grass land (subject to future reduction)	50 „
School land	50 „
Undeveloped, uncultivable, camps, yards, roads, etc.	80
	800 acres

Products Sold

The products sold are whole milk, butter fat and butter (maize, oats, hay, silage and lucerne being grown for feed), bacon pigs (maize, barley and lucerne being grown for feed, eggs, wheat and pyrethrum, ogether with small quantities of potatoes, vegetables and flax. In the future linseed will be grown as a feed instead of flax. Maize is grown as food for humans and live stock, not for sale.

Cropping in 1945

Including the 100 acres of newly developed land *(see* above), 335 acres were under arable cultivation, as under:—

Field	L	30 acres.	Barley undersown with Nzoia Rhodes grass.
	2.	30	Nzoia Rhodes grass ley.
	3.	30 „	Part Naivasha star grass and part Nzoia Rhodes grass ley.
	4.	28	Oats for hay and silage, 15 acres: potatoes, 2 acres; vetches for hay and aftermather and manurial value, 11 acres.
	5.	30 „	Grain maize.
	6.	30	Grain maize.
	7.	30	Grain maize, 15 acres: silage maize, 15 acres.
	8.	30 „	Grain oats. 5 acres; hay oats, 10 acres; wheat, 15 acres.
	10.	30	Flax. 8 acres: rye for thatching, 10 acres; wheat, 12 acres.
	9.	10	Wheat.
	11.	30 „	Wheat.
	15.	27 „	Pyrethrum.

Production of Crops

Wheat: 304 bags.
Barley: 292 bags.
Oats: 109 bags.
Maize: 450 bags (ruined by hail).
Oat and vetch hay: 115 tons.
Oat and maize silage: 100 tons.

The Dairy Herd

The number of milch cows increased from 37 to 53 during the year. There were 25 heifers not yet calved and 12 heifer calves at the end of the year. There are two herds of grade cows, Ayrshire and Friesian. A fairly good pedigree bull is possessed for the Friesians. The pedigree Ayrshire bull became infertile. A young pedigree Ayrshire bull was generously presented in its place by Mr, Millington, of Turi, but this bull cannot be proved for some time to come, so the possibility of the use of artificial insemination by proven sires for the Ayrshire herd is now being investigated. Heifers of our own breeding were beginning to come into milk at the end of the year. The herds are now due for culling. The average lactation (under twelve months) for both herds is now over 500 gallons, an average daily production of only just under two gallons per head per day having been maintained in the dry season at the end of the year.

Production of Milk Products

Whole milk: 23, 554 gallons.

From this. 5, 082 lb. of first-grade butter fat was sold and 1, 103 lb. of butter was made, the remainder being sold as whole milk.

Pigs

Some excellent pedigree breeding sows are now in use. By improvement of rations, increase of warmth in the sties and insurance of access to sunlight by alteration to sty design, baconers were taken regularly to 220 lb. live weight within six months from birth and sold with firm setting qualities. A boar of our own breeding is about to be progeny tested. Enquiries from farmers for the purchase of our breeding stock are increasing. One hundred and fifteen baconers were sold during the year.

Poultry

Bleeding stock of Rhode Island Reds and White Leghorns was increased. Progeny testing of cocks, with trap nesting, is about to be introduced. Sales of eggs were maintained.

Sheep

A small flock of Romney Marsh sheep is kept for instruction purposes and for their value as followers on the grassland.

Farm Buildings

New stone hull-houses were built.

The old calf-pens were pulled down and calves housed in movable pens on grass.

Ceilings and sunyards were added to the piggeries.

A pyrethrum drier was built.

A farm office was built.

The main requirements in the immediate future are for a new milking shed and dairy and for an extension to the wagon and implement shed.

Labour

The supply was small and of poor quality. A nucleus of good, skilled men is being built up. Rations were improved and include issues of maize meal, meat, fat, legumes, vegetables and salt. A start was made on the building of a new, permanent camp, mainly in stone. Four stone houses and two stone kitchens were ready by the end of the year and others were being built. A system of bonuses for good work and general record was introduced.

Fencing of and Water Supply to Paddocks

Fencing is being put in as each unit in turn becomes due to be grassed. Water supply is held up until the bore-hole is in operation. Shade and shelter belts are being planted annually in advance of the grassing down of units.

Records Kept

Dairy Herd Records.—Daily milk record, daily milk products record, calf record, service record, herd book, litter weight record, field unit record, farm diary.

***Accounts Records.*—**Stores in and out ledger, cost accounts, power allocation records.

Revenue

Gross earnings from the farm in 1945 were within a few pounds of four thousand pounds. It is regretted that it was not possible to keep cost accounts during 1945, but this will he rectified in 1946.

J. E. P. BOOTH,
Principal,

DRIED VEGETABLE FACTORIES, KARATINA AND KERUGOYA— ANNUAL REPORT OF THE OFFICER IN CHARGE, 1945

Staff

Europeans 29, Asians 54, Africans 3,485.

Field Production

Analysie *Short* *Rains* *Crop* 1944 1945

KARATINA DIVISION

(Cabbage

Sub-Division	Total Regd Growers	Total Suppli-ers	Acres	Total Yield lb.	Total Yield Per acre Tons	Average per Suppli-er lb.
Karatina	2. 428	575	56	404.665	3 2	704
Gichutheini	3, 0 8 7	752	42	968, 508	102	1, 228
Gaikuyu	1,684	733	105	910, 835	3.9	1, 243
Chehe	456	219	32	57, 036	0 8	
	7, 605	2, 279	235	2, 341, 044	4.4	874

Carrot

Karatina	2, 428	1, 091	280	40, 169	0.6	368
Gichutheini	8, 0 8 7	994	200	986, 492	2.2	993
Gaikuyu	1, 684	1, 380	307	153, 008, 7	2.2	1,091
Chehe	45ft	285	53	1 1 0, 2 1 8	0.9	387
	7, 605	3, 750	840	3, 028, 276	1.61	714

KERUGOYA DIVISION

Cabbage

Kerugoya	1, 584	540	85	147, 118	0.77	273
Kagumo	1, 710	228	60	118,850	0.88	521
Gichugu Rains	2, 010	437	36	689, 888	0.86	159
Gichugu Irrigation	658					
	5, 962	1, 205	181	335, 306	0.8	238

Carrot

Kerugoya	1, 584	1, 006	200	1, 169, 902	2.1	1,163
KAGUMO	1, 7 1 0	415	300	278, 464	0.23	444
Gichugu Rains	2, 0 1 0	699	235	278, 479	0.50	400
Gichugu Irriagtion	658	324	2 6 6	1, 619, 059	2.7	4,997
	5, 962	2, 444	1, 0 6 0	3,251,904	1-4	1, 748

Analysis Long Rains Crop, 1945

KARATINA DIVISION

Cabbage

Karatina	2, 419	064	82	1, 593, 938	8. 0	2, 400
Gaikuyu	1, 679	874	177	1, 835, 203	4. 6	2, 099
Chehe	403	162	11	102, 950	41	035
Totals and Averages	4, 561	1. 700	270	3, 532, 151	5. 76	1, 711

Carrot

Karatina	2, 419	1, 083	260	2, 158, 027	37	1, 983
Gaikuyu	1. 0679	1. 325	452	3, 200, 380	3. 2	2, 469
Chehe	403	380	70	1, 038, 374	6. 1	2, 090
Totals and Averages	4, 501	2. 797	78S	6, 463, 381	4. 3	2, 380

Analysis Planting Period, August to December, 1945 (Field).

	Karatina Division Acres	Kerugoya Division Acres	Total Acres
Cabbage	167	114	281
Carrot	312	268	580
Beans	1	—	1
Potatoes	12	—	12

Remarks.—A decision having been reached in September that the Kerugoya Factory would close on the 31st March. 1946, made it necessary to cut field planting out of the Kerugoya Division programme completely in the short rains, only 200 acres of cabbage being grown under irrigation.

Issues of Seed and Seedlings

The following seed was issued from the Central Store. Karatina, to the field during the periods January-July (long rains) and August-September (short rains).

	January-July	*December*
	Cabbages	*Carrots*
Karatina	227 lb.	3. 882 lb.
Kerugoya	88 lb.	4. 204 lb.
	August-Dece*mber*	
Karatina	186 lb.	2, 108 lb.
Kerugoya	80 lb.	854 lb.
Grand Total	581 lb.	11. 048 lb.

Remarks.—The Chantenay type carrot remains the best for this area. although there have been good reports on "Henderson's Coreless", particularly as a dehydrated product.

Two new cabbages were tried out on a field scale. namely, "Early Jersey Wakefield" and "Charleston Wakefield", both of the market-garden type. Both were quick growing and pest-resistant, but yields were poor and the dehydrated product tough.

Seed and seedling issues in the field were as follows: —

	Cabbage Seedlings	Carrot Seed lb.	Sweet Pepper Seedlings	Beans Bags	Potatoes Bags
Karat inn Division—					
L. R's..	5. 948, 407	3, 989	10, 440		
S. R ' s . .	1, 669. 531	1, 248		j	71
Kerugoya Division —					
L. R's	903, 004)	4. 204	1. 826. 000	70	
S. R's		692			
	Swamps and	Irrigations for the Year			
Karatina	2, 947, 050	1. 807	440, 000	12½	1, 393
Kerugoya	1, 970, 000	402	374. 000	36	
Grand Total	13, 454. 988	12, 342	2. 650. 440	127	1. 404

Co-operative Irrigation: Karatina Division

The following analyses of yields, etc., for the years 1943, 1944 and 1945 are set out below for comparison.

Cabbage

Year	Total Growers	Acres	Yield lbs.	Yield Per Acre tons	Average Supplier lbs.
1943	267	115	851. 564	3 3	3. 189
1944	232	115	2. 656. 578	10. 3	11. 450
1945	232	115	2, 114, 310	8. 2	9. 113
		Carrot			
1943	276	115	53, 839	0. 2	210
1944	232	115	598. 542	2. 3	2, 579
1945	232	115	573, 853	2. 2	2, 469

(1) During the year under review 19. 303 lb. of paprika and 143, 914 lb. of French beans were also produced.

(2) Advances in the form of wages to the growers amounted to Sh. 48. 034/43 and the net profit to the growers after deducting advances, cost of manure, wages of casual labourers, amounted to Sh. 1. 058/32 or a return of Sh. 211/60 to the grower.

Direct Production: Karatina Division

Certain areas of irrigable land and swamps were taken over by arrangement with the African landowners and worked direct by this project. In 1944 there were only 20 acres of such land, but this was increased to 190 acres in 1945. The response of vegetables to correct cultural practices and particularly to manure in quantity, led to this step being taken. The yields obtained have amply rewarded our efforts in this direction. As an example. 111 acres produced 2, 121. 515 lb. or 8. 5 tons per acre of out-of-season cabbage, apart from a crop of carrots and French beans during the year.

Total returns from 190 acres, excluding part of the carrot crop overlapped into 1946, were as follows: —

Cabbage	*Carrot*	*French Beans*	*Seed Beans*	*Paprika*
lb.	*lb.*	*lb.*	*lb.*	*lb.*
3. 187, 383	513. 437	268. 903	17, 583	146, 816

Forest Wanting

This is part of the direct production, but it is not included in the above figures. The Rutui Forest planting in the Kerugoya Division was a failure due to poor soil and as soon as the 1944 plantings were harvested this area was closed.

The Chehe Forest area was. however, increased to 115 acres.

Forty acres of cabbage planted in July yielded at the rate of 4. 3 tons per acre, or 390, 931 lb. Total returns from the area during the year, which include an overlap from 1944 but do not include crop still in the ground in 1946, were as follows: —

Cabbage	*Carrot*	*Seed Beans*
lb.	*lb.*	*lb.*
482, 436	280, 232	799

Sweet Pepper [Paprika)—Cash Purchases

Karatina	*Kerugoya*
186, 485 lb.	408. 226" lb.

In July the Military relegated the rating of the crop from highest to lowest priority. No further planting was. therefore, carried out and the Kerugoya Sweet Pepper irrigations were handed back to the Africans in September.

Factory Production

KARATINA FACTORY

	Receipts lb.	To Kerugoya lb.	Rations lb.	Waste lb.	Processed lb.	Output ton
Cabbage	2, 246, 640	152, 485	32, 275	44, 710	2, 017, 170	44. 29
Carrot	9, 162, 312	185. 098	5, 668	239, 88	8, 625, 418	332-00
Potato	10, 090, 051	–	8, 268	81, 490	9, 696, 998	722-60
Sweet Potato	29. 878	–	3, 199	–	26, 679	1. 36
Beans	27, 116	–	1. 016	–	26, 094	1. 03
Paprika	22, 817	6, 512	25	523	15, 757	0 43
Totals	21, 578, 808	344, 095	50, 451	366, 111	20, 408, 111	1101. 17

Mechanical Efficiency

The actual capacity for the y e a r	70, 080 unit hours
Maintenance, repairs, alteration and holidays..	23, 825 unit hours
Net operating time.	46, 255 unit hours

KERUGOYA FACTORY

	Receipts lb.	To Keratia lb.	Rations lb.	Waste lb	Processed lb.	Output ton
Carrot.	18, 982, 722	1, 382, 478	1. 900	520, 123	17, 087, 221	630. 82
Cabbage	2, 412, 399	200, 658	377, 008	_	1, 834, 683	47. 11
Potatoes	2, 669, 502	–	–	225. 180	2, 444, 322	172. 44
Beans	1, 148, 632	290	–	46, 247	1, 102, 095	35 88
Sweet Pepper	1, 545, 165	3, 290	_	52. 129	1, 489, 746	62. 50
Totals	26, 758, 420	1, 686, 716	378, 958	843, 679	23, 949, 067	948-75

Mechanical Efficiency

Capacity of factory for the year	70,	080 unit hours
Maintenance, repairs, alterations and holidays	16,	568 unit hours
Net operating hours	53,	512 unit hours

A great improvement in the quality of dehydrated production was obtained *by: —*

(a) Altering and tightening-up methods of selection.
(A) Immersion of potatoes in water alter peeling and prior to trimming.
(c) Peeling of carrots.
(d) Alteration in times and temperatures of drying.

In July-August an acute labour shortage was experienced at the Kerugoya Factory, owing to the suspension of conscription. This was eventually overcome by tactful but firm handling of the situation by the District Commissioner, Embu.

Throughout the year the Factory Engineer, Karatina, has experienced difficulty in providing continuous power for the Factory from the Sagana Falls Hydro-Electric Station owing to the necessity to shut down for adjustments and repairs. Most of the troubles have been eliminated and we have reason to believe that trouble-free running can be expected during 1946.

Finance

Payments to Natives. 1945

	Sh.
(a) For Vegetables	1, 430, 118. 70
,, Wages	921, 712, 60
,, Bicycle allowances	1, 575. 00
,, Manures	543. 62
,, Wood fuel	40, 189, 34
,, Charcoal	917. 50
,, Miscellaneous	19, 258. 39
Total	2, 414, 315. 15

(b) Value of Issue to Natives—

	Sh.
Rations	236, 544. 01
Uniforms	58, 210. 65
Total	294. 754. 66

General

The Light Animal Transport Company, stationed at Chehe, transporting fuel from the forest, was withdrawn by the Military in July and the work let out to contract. The buildings erected and housed bv the L. A. T. Company were purchased by the Dried Vegetable Project and wherever possible were dismantled and the land cleared and handed back to the native owners.

In July the management of the factories was taken over by Mr. F. J. Ferguson, replacing Mr. P. C. Chambers, who left on transfer.

A 1. 000 ton contract from the War office through the Secretary of State for the Colonics was received in August; deliveries to start in April, 1946, and to be completed on or before the 31st December of that year. The contract calls for 750 tons of potatoes and the balance vegetables.

F. J. FERGUSON,
Officer in Charge.