

Memorandum  
ON THE  
SHEEP FARMING INDUSTRY  
IN THE  
FALKLAND ISLANDS.

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SIGNED

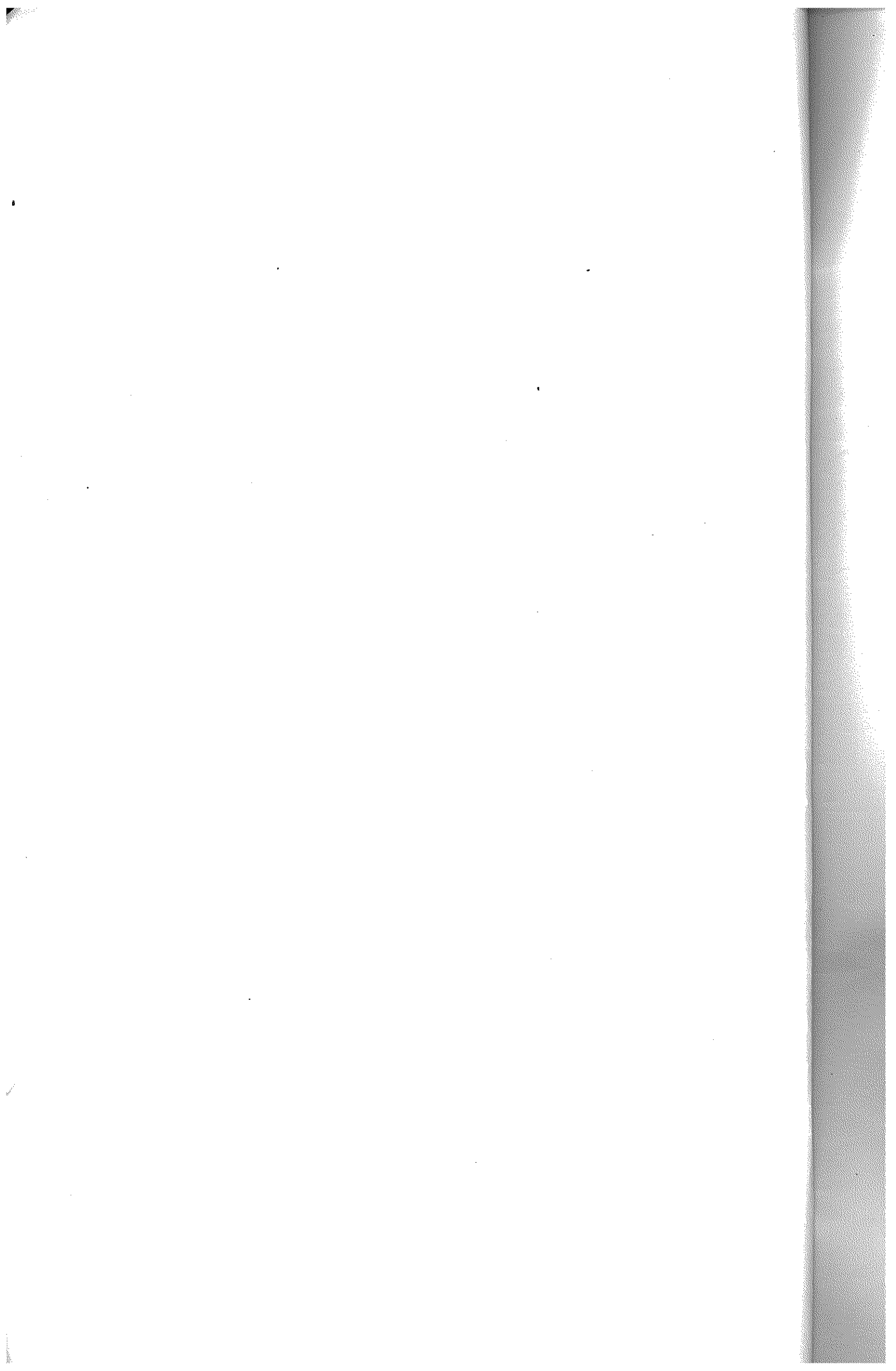
J. MIDDLETON (GOVERNOR)

WITH VARIOUS APPENDICES BY  
SPECIALIST CONTRIBUTORS.

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# Memorandum

ON THE

## SHEEP FARMING INDUSTRY

IN THE

### FALKLAND ISLANDS.

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#### I.—SITUATION AND AREA.

The Falkland Islands lie in the South Atlantic Ocean between 51° and 53° S. latitude and between 57° and 62° W. longitude, and consist of the East and West Islands and a number of smaller islands.

The total area of the group was given in the Colonization Circular (Ch. VIII., 1874)\* of the Colonial Land and Emigration Commissioners as 6,500 square miles, made up as follows:—

	Square Miles.
East Falkland Island ... ..	3,000
West Falkland Island ... ..	2,300
Small Islands ... ..	1,200
Total ... ..	6,500

These areas were no doubt based on calculations from the Admiralty chart, and since their publication they have been generally adopted in official reports. No land survey has been carried out and there is no ordnance map, but two qualified surveyors, Mr. Henry E. P. Cottrell, A.M.I.C.E., and Mr. E. P. Cotton have made independent calculations of the area of the islands by measurement from the Admiralty chart.

The areas as determined by them are as follows:—

	MR. COTTRELL.	MR. COTTON.	DIFFERENCE.
	Acres.	Acres.	Acres.
East Falkland and adjacent Islands ..	1,651,612	1,584,195	67,417
West Falkland and adjacent Islands ..	1,304,211	1,257,693	47,518
	2,955,823	2,841,888	113,935

For the purposes of this memorandum it is proposed to adopt the area of the islands as determined by Mr. Cottrell, that of East Falkland and the adjacent islands being taken as 2,580 square miles, and that of West Falkland and the adjacent islands as 2,038 square miles. The total area is, therefore, 4,618 square miles, in which calculation no allowance is made for mountainous or hilly country.

\* Earlier circulars not available.

## II.—PHYSICAL FEATURES AND GEOLOGY.

The country is briefly described in the narrative of the Challenger expedition as a "Treeless expanse of moorland and bog and bare and barren rock."

The highest point in West Falkland is Mount Adam, 3,215 feet\* above sea level, and in East Falkland, Mount Usborne, 2,245 feet above sea level.

An account of the geological structure, by Mr. Thor G. Halle, has been published in the Bulletin of the Geographical Institute of the University of Upsala (Vol. XI., 1912.).

A geological survey has recently been carried out for the Government by Dr. H. A. Baker, D.Sc. His final report is not yet available, but in one of his progress reports Dr. Baker stated that given the area under examination he had never seen a series of rocks so barren from the point of view of included minerals.

## III.—CLIMATE.

The records of the meteorological observations reported at Cape Pembroke Lighthouse and of the Stokes-Campbell sunshine recorder at Stanley have formed the basis of an exhaustive enquiry by Mr. C. E. P. Brooks, M.Sc., the results of which have been published in the Geophysical Memoirs (Vol. II., No. 15, M.O. 220 E.).

Examination of the records has shown that at Cape Pembroke, which is in the extreme east of East Falkland, the temperature is highest in January (49·3° F.) and lowest in July (36·7° F.), giving a range of only 12·6° F. The corresponding figures for Kew (40 years normal) are 62·7° F. in July and 38·8° F. in January, so that at Cape Pembroke the winters are slightly colder and the summers several degrees cooler, while the mean for the year (42·8° F., compared with 49·6° at Kew) is appreciably lower. The latitudes of the two places are almost identical (Cape Pembroke 51° 41' S., and Kew 51° 28' N.).

Really hot days are unknown, and on only about four days in the year (1 per cent.) does the maximum temperature exceed 62·6° F. On the other hand minimum temperatures below 31·1° F. may be expected on about forty days in each year (11 per cent.). It is noticeable also that the maximum temperature of a day in January, the warm month, may be several degrees below the minimum of a day in July, the cold month, and that temperatures below the average are more frequent than those above, but the latter may deviate more greatly from it.

The average duration of bright sunshine only reaches 50 per cent. of the possible during the three mid-day hours of February; in June it does not reach 30 per cent. even at mid-day. January and February are the sunniest months (5·4 hours), and June the least sunny (1·6 hours). During the year an average of 177 days, or nearly half, have less than three hours of bright sunshine. It must be noted that the exposure is imperfect to the west and south-west, so that no sunshine is recorded after 17h. 30m.

The data are not sufficient for a detailed discussion of the distribution of rainfall since the station is on the sheltered eastern side of the island where the fall is not excessive. At Stanley the average rainfall is only about 25 inches. On the exposed western coasts and on the high ground of the interior the fall must be much greater. The fall is fairly evenly distributed throughout the year, but is greatest in summer. The rainfall is distributed among a large number of rainfall days, so that an excessive fall in one day is not common, the greatest daily fall in 13 years being 1·7 inches. The variation is not extreme, no month being entirely rainless.

\* As determined by Mr. E. P. Cotton.

For the period from 1905 to 1915 snow has occurred in every month except January and February, though it is rare in December and March and the annual total averages only 54 days. Hail occurs on an average two or three times a month and is fairly evenly distributed throughout the year.

The predominant winds are from N.W. Winds between E. and S.E. are comparatively rare. They are more frequent in summer and winter than in spring and autumn. Strong winds (force 4 to 7 Beaufort scale) prevail during more than two-thirds of the time. The average force of the wind is 4.4 in the Beaufort scale, equivalent to 17 miles per hour. The force is greatest in spring and autumn (mean 4.6), and least in summer and winter (mean 4.3). The temperature is invariably lowest with S. winds (*i.e.*, Antarctic winds), and highest with N.W. or N. winds.

#### IV.—POPULATION.

The total population of East and West Falkland and the adjacent islands at the census of 1921 was 2,087, of whom 712 were children under 15 years of age. The population was distributed as follows:—

	Males.	Females.	Total.
Stanley .. .. .	432	458	890
Darwin and Lafonia and adjacent Islands..	224	141	365
East Falkland, other districts .. ..	284	152	436
East Falkland and adjacent Islands, Total..	940	751	1,691
West Falkland and adjacent Islands ..	242	154	396
TOTAL .. .. .	1,182	905	2,087

The total population (including women and children) resident on the sheep farms numbered 1,045 in 1901, 1,276 in 1911, and 1,197 in 1921, the number in 1921 being 79 less than in 1911. Appendix VIII. shows the male population resident on the sheep farms in 1921 classified according to occupations.

#### V.—LAND TENURE.

The first grant of "Country" land, which comprised a large area in East Falkland, was made in 1846. In the following year regulations were published (Proclamation of 2nd July, 1847), under which the Colonists were permitted, by licence, to occupy the unappropriated country lands on the condition, *inter alia*, that the purchaser of every allotment of not less than 160 acres should have the right to depasture cattle and sheep within a distance of two miles from such allotment. The conditions of occupation were modified by Proclamations dated 31st of July, 1849, and 4th of April, 1861, the later of which provided that each "grazing station" should comprise an area of 6,000 acres, having regard to natural boundaries, and that every station should be "defined with reference to the nautical chart of the Colony without requiring any further survey."

By a Proclamation dated the 24th of June, 1867, the conditions relating to the occupation of land which, in practice, had only applied to East Falkland, were extended with slight modification to West Falkland.

The "laws and regulations" relating to the disposal of lands were consolidated and amended by the Land Ordinance (No. 4 of 1871). The Governor was empowered to grant "licences" for one year for the occupation of "sections" of 6,000 acres, "as near as may be." The holder of a "licence"

had the option of obtaining a lease for a further period of 21 years at an annual rental for each "section" of £6 for the first 10 years and £10 thereafter. It was a condition that for every "section" of 6,000 acres, contained in the lease of a "station," a "block" of 160 acres should be purchased within ten years at a price of 4s. an acre.

The law further provided that "every section and station of land shall be defined with reference to the nautical chart of the Colony without requiring any further survey, but the boundaries will subsequently be made by the Surveyor-General or by a competent sworn surveyor and submitted for approval to the Governor."

The Ordinance of 1871 remained in force for over 30 years. In that period the Farmers continued as tenants, paying an annual rent to the Crown, and practically no country land was purchased with the exception of the "blocks" of 160 acres which the law made obligatory.

By Ordinance No. 9 of 1890 the purchase price of "country" land was reduced to 3s. an acre and the Land Ordinance of 1903 (No. 9) made provision for the payment of the purchase price by instalments. Under this law ten per cent. of the purchase price is payable when the application to purchase is registered, and from that time no rent is payable; the balance of the purchase price is payable in 30 instalments at the rate of £4 11s. 10d. a year in respect of every  $666\frac{2}{3}$  acres. The Land Ordinance, 1906 (No. 7), permitted the purchaser, with the approval of the Governor in Council, to anticipate payment.

With the exception of about 80,000 acres, comprising lands which either have been declared to be reserves or are leased in small lots, all the land in the Colony has been alienated or is in process of being acquired by purchase. The land is given up entirely to sheep farming, which is the sole industry of the Colony.

As already stated, no land-survey has been carried out, and it has been recognised by the Government that the quantity of land actually comprised within the boundaries defined in the original leases is considerably greater than the statement of the acreage of the land leased. The difference between the latter and the areas, as calculated from the Admiralty Chart, are shown in Appendix XII. (columns 2 and 3).

It is provided by Section 21 (a) of the Land Ordinance, 1903, that disputes as to the boundaries of adjoining stations shall be settled by arbitration in the usual way at the expense of the parties interested.

All payments, since 1891, for the purchase of land, have been invested for the credit of a Land Sales Fund, which forms a reserve fund and is at the disposal of the Colony for its development or in case of emergency. The total amount so invested up to the 31st of December, 1922, was £174,000, and the payments which fall to be made subsequent to the 1st of January, 1923, in order to complete the purchase, are approximately £128,000. No rent is received for Crown lands, which, although held under lease, are in process of being purchased, but the interest from the Land Sales Fund accrues to the general revenue of the Colony. The amount which will be received in respect of interest in the year 1923 is estimated at £7,350.

## VI.—DEVELOPMENT OF THE INDUSTRY.

When a civil administration was established in 1842 there were considerable herds of wild cattle both in East and West Falkland, but it was considered that the country was better adapted to sheep farming on a large scale than to cattle rearing. There were at the time a few sheep at Port Louis, the principal settlement, the number recorded in 1843 being 310. Of these, 200 Lincolns and 12 Leicesters had been imported from England.



The others had been obtained from the River Plate, from whence small importations were made in the years immediately following. Both scab and foot rot were introduced, and the total number of sheep in East Falkland was reduced by 1846 to 100.

The South American sheep were "of an indifferent breed," costing about 13s. to 15s. each landed in the Colony, but it was considered that they would form a valuable stock on which to improve by crossing with long woolled sheep from England. In order to promote colonization and to assist the settlers in stocking East Falkland, it was made a condition of the first grant of land in 1846 that the grantee should, within a period of four years, import from the River Plate for the Government "20,000 white ewes of a common but good breed (not merinos), similar to those in the Colony, and 200 good rams."

Various circumstances prevented the grantee from carrying out his undertaking, and finally led to the abandonment of this special condition. In consequence, progress in the early days was very slow in East Falkland; the climate proved destructive to South American sheep, and experiments were made with various breeds of sheep from England. In 1853, 122 Cheviots and five South Downs were imported, but unfortunately there are no records of the other breeds introduced or of the results of the experiments. In 1860 the total number of sheep in East Falkland was only 10,000, but from that year it increased steadily.

In 1867 the conditions relating to the occupation of land in East Falkland were applied, with some modification, to West Falkland. Large areas of land were immediately taken up on conditions as to stocking, which proved somewhat onerous, but which gave a strong impetus to the development of the industry, with the result that in less than five years there were 30,000 sheep in the West Island, the original stock being imported entirely from South America.

From 1870 the export of wool to the London Market, on which the industry always has been almost entirely dependent, began to assume considerable proportions. The quantity and value of the wool exported in the five years from 1871 to 1875 were as follows:—

							Quantity.	Value.
							lbs.	£
1871	..	..	..	..	..	..	248,000	10,300
1872	..	..	..	..	..	..	260,000	18,680
1873	..	..	..	..	..	..	406,000	22,150
1874	..	..	..	..	..	..	425,000	—
1875	..	..	..	..	..	..	736,000	28,472

From such information as is available a graph (Appendix IX.) has been prepared showing the number of sheep returned in each year from 1870 to 1921 and the quantity of wool exported from 1888 to 1921. It will be observed that the number of sheep increased rapidly from 1870 until it reached a maximum of 807,000 in 1898, after which there was a marked decrease, which has continued for the remainder of the period under review and is more noticeable in the last five years of it.

From 1895 onwards the number of sheep returned represents the number dipped in March or April of each year, and includes the lambs which were born in the previous spring and which lived to the age of six months or more. The quantity of wool exported in each year represents generally the clip of the sheep returned in the previous year which survived until the following shearing season. The quantity of wool shown to have been exported in any year may have been affected by market prices, shipping facilities and other factors. The total number of sheep shorn in each year

is not yet available but is being obtained. The inference which may be drawn from the figures representing the exports of wool is that, whereas in 1898 when the number of sheep was at its maximum the quantity of wool exported amounted to 4,820,000 lbs., an equally high figure has been reached and even exceeded in several of the succeeding years, although there has been a considerable decrease in the total number of sheep.

A statement (Appendix X.) is attached, showing the value of wool and other products of the industry which were exported between the years 1888 and 1921. The values are those ordinarily given for Customs purposes. Wool and other products are shipped to the London market, and the total realised by their sale is not known. It will be observed that the industry is dependent, almost entirely, on its production of wool, although sheepskins, tallow, and occasional exports of live sheep have contributed, in a small proportion, to the total receipts. The canning of mutton was only carried on to any large extent and profitably for the years from 1916 to 1919, when the conditions of the market for such products were abnormal.

The sudden collapse of the wool market in 1920 reduced the value of the clip to a figure much below the pre-war average.

A notable handicap in the development of the industry of wool-production and one which is particularly felt in a small country where experiments are costly, is the difficulty of foreseeing and breeding to market requirements.

#### VII.—BREED OF SHEEP AND QUALITY OF WOOL.

It was stated in the Stock Inspector's report for 1895 that the "sheep are, generally speaking, a mixed cross-breed and have the appearance of having come originally from merino stock." In the attached short report (Appendix I.) which was written in the end of 1895, it was observed that "there are too many breeds," and that although "efforts have been made to improve the flocks they have in many cases taken the form of experiment and have not been persevered with."

The number, breed and country of origin of rams imported in each year from 1895 to the 30th of June, 1922, is given in Appendix XI. The largest importations were made in 1896 and 1903, and came from New Zealand. In 1896, 241 rams were imported from New Zealand, of which 112 were Lincoln and 127 Romney Marsh. In 1903, 486 rams were imported from New Zealand, of which 75 were Border Leicester, 60 Lincoln, 54 Merino and 297 Romney Marsh.

In 1899, 45 ewes were imported, of which 22 were Lincoln and 12 Romney Marsh, and in 1903, 59 Romney Marsh ewes were imported.

With the exception of the years 1896 and 1903, importations have been small and have averaged for the whole period 49 a year. Of the total number of sheep (1,380) imported since 1895, 68.47 per cent. were Romney Marsh.

In 1917, 21 Cheviot rams were imported for a station which is very exposed and has much poor land. They are stated to have improved the stamina of the flock considerably, but as was anticipated the production of wool has become lighter.

Those stations which introduced the Lincoln strain, at a time when the market demanded a long lustre wool are making every endeavour to work it out and to produce a finer wool. The general tendency is to breed to the Romney Marsh type.

A few farmers, with long experience of the country, are endeavouring, on the advice of experts in the London wool market, to improve the selling quality of their wool by "putting fineness into it," which is said to have been lost through using nothing but Romney Marsh rams for so many years.

With this object they have imported from South America rams and ewes of the Corriedale cross.

The importations made in the last half of 1922, and after the statement in Appendix XI. had been prepared were as follows:—

Country of Origin.	Breed.	Rams.	Ewes.
Argentina (St. Julian) .. .. .	Corriedale * ..	200	300
Tierra del Fuego.. .. .	Romney † ..	497	—
Total .. .. .	—	697	300

There are no statistics showing the average yield of wool per sheep. It is stated in the Stock Inspector's report for 1905 that the yield "in some flocks within the last few years has risen from 5 lbs. to 8½ lbs. per sheep," and again in the report for 1909 that the average was about 8¾ lbs. for that year. In the absence of other information a graph (Appendix XIV.) has been prepared of the average weight of wool, which was exported in each of the years from 1895 to 1921, per sheep returned in that year. The graph shows a marked increase in weight.

The wool in the grease is pressed and packed, on the stations, in bales of from 5 cwt. to 6 cwt. The bales are carried by sea to Stanley and from there shipped to the London market. Although shearing begins in December, owing to difficulties of communication between the stations and Stanley and between Stanley and England, no wool reaches the London market in time for the important March sales. The finer grades of wool are classed between 46 and 50 quality.

A small washing plant, which is intended only for locks and pieces, has been installed recently on one station. It is uncertain whether climatic conditions will prove favourable to effective drying and the experiment will be watched with interest.

#### VIII.—LAMBING.

In the reports of the Chief Inspector of Stock for each of the years from 1901 to 1908 a "lambing percentage" is given. Actual figures were not furnished, and there was considerable variation in the manner of calculating the percentage on the different stations, some taking the number of ewes dipped in March or April, and others the number of ewes counted out when the lambs were marked in November. Moreover some stations took only the lambs counted at marking, while others added the lambs marked during the shearing season. The number of such lambs is stated to be about 5 per cent. of the number marked in November.

The Chief Inspector at the time took great pains when visiting the stations to collect as accurate information as possible with regard to lambing, but it was recognised that strict accuracy was impracticable. The figures as published are given in Appendix II. and represent the percentage of lambs surviving in November, allowance being made for a loss of 10 per cent. in breeding ewes between March and November.

The method of calculation was altered in 1912, and in the report for that year it is stated that "the percentage has been made up on the dipping tally, 7 per cent. being allowed for loss between marking and that period." Owing to differences in the methods of calculation the figures for the years 1901 to 1908 are not comparable with those for the years from 1911 to 1916.

\* Half-bred Corriedale.

† With cross of Corriedale.

There is no information as to the number of lambs born; there is much uncertainty as to the total number reared and marked in any season. Graph C. in Appendix IX. gives for the years 1911 to 1920 a lambing percentage derived from the number of ewes returned in the year under consideration and the number of lambs at the subsequent dipping. With regard to the low percentage (55.95) of 1919 the lambing season is reported to have been "extremely wet and cold." (Stock report, 1919-1920.)

The only figures approaching to accuracy which are at present available are those given in Appendix XIII. of the lambs which survived until dipping in the March or April subsequent to their birth. The most favourable season was 1916-1917, when for every 100 ewes which were put to the rams in April, 1916, 62.67 lambs survived until April, 1917. The most unfavourable season was 1918-1919, when for every 100 ewes which were put to the rams in April, 1918, 48.99 lambs survived until April, 1919. Even assuming that the death rate amongst lambs during their first winter is not greater than the general death rate, the number of lambs which survive to be shorn as hoggets must be very low compared with the number of ewes carried.

On several stations in West Falkland there has in recent years, and especially since 1913, been a noticeable decrease in the number of lambs, and it was suggested that this might be due to enzootic abortion. An important experiment was made on one station, during the lambing season of 1922, of herding a flock of selected ewes on their own ground, of about 4,000 acres, which has good rough feed and good natural shelter. No evidence of abortion was obtained, but particulars of the experiment, which Mr. R. C. Pole-Evans, the Manager of the Station, has been kind enough to furnish are of especial interest.

In the end of April, 1922, 150 fine woolled ewes were put to three Corriedale rams imported from New Zealand; 80 ewes of large frame were put to two Romney rams imported from England; and 751 selected ewes, of which 142 were shearlings, were put to 21 rams of Romney type which had been bred on the station.

One large and ten small pens were erected in convenient positions for lambing, and on the 23rd of September 955 ewes were counted, the loss in ewes during the winter being found to be 2.65 per cent.

Up to the 30th of October 782 ewes had lambed, and of the remainder 39 were in lamb, and 100 or approximately 10 per cent. of the flock were not in lamb. It is not known whether abortion had occurred in any of these 100 ewes. The percentage of ewes which had been put to the Corriedale, Romney and home-bred rams and which were not in lamb was 5.33 per cent., 4.44 per cent. and 11.73 per cent. respectively. Of the ewes lambed 9.6 per cent. were assisted in parturition, and 3.96 per cent. had abnormal presentation; 2.38 per cent. of the ewes died before lambing, and of those which lambed 4 per cent. died after lambing.

Up to the 30th of October, 845 lambs had been born from 782 ewes. The number of these lambs which were marked on the 2nd of November was 594. The total number of lambs marked, including those born after the 30th of October, was 625. There is no information at present as to the history of the lambs after they were marked.

The experiment was carried out under most careful supervision and in favourable weather conditions. The flock was composed of selected sheep and special care was taken of the ewes at lambing, so that the lambs surviving until marking are the product of optimum conditions. Yet for every 100 ewes put to the rams only 63.71 lambs lived to be marked. As was inevitable, the lambing was lower in the main flocks on the same station, and in these for every 100 ewes put to the rams 53 lambs lived to be marked in November.

## IX.—DEATH RATE.

Owing to the wide extent and nature of the country on which the sheep graze, there is no means of ascertaining the number of lambs which die before the gathering for marking takes place. Reference has already been made (page 12) to the lambing in 1922 of a flock of 782 selected ewes. Between the 23rd of September and the 31st of October, 845 lambs were born, of which 113 are known to have died during that period. When the gathering for marking took place on the 2nd of November, 251 lambs were missing, representing a loss of over 29 per cent. of the lambs which were born. The loss between marking and dipping is known to be considerable, and was estimated in the Stock Inspector's report for 1912 to be 7 per cent. If that rate of loss is applied to the 594 lambs which were marked, their number would be reduced to 550 by the time they came to be dipped in the following March, so that in this flock the death rate for lambs under six months old would be 34·79 per cent.

The deaths in sheep and in lambs over six months old has been arrived at by adding to the total sheep of the season under consideration the lambs of the subsequent season and calculating the difference between this sum and the total number of sheep returned for the next season plus those disposed of in it. (Appendix XIII.)

The death rate, so calculated, for the years 1911 to 1921, varied between 10 per cent. in 1916 and 15·45 per cent. in 1912. The rates for the same period are shown graphically in Appendix IX.

The losses in lambs between marking and dipping and the general death rate have been recorded with especial care in the case of one station. The station is in an exposed position and has a large proportion of poor land. The death rate (B) in lambs between marking and dipping and the general death rate (A) (including lambs marked but not surviving until dipping) for the years 1916 to 1922 are given below :—

	1916. %	1917. %	1918. %	1919. %	1920. %	1921. %	1922. %
A .. ..	14·82	16·72	20·13	16·8	12·5	14·2	16·29
B .. ..	19·67	18·96	19·60	20·38	17·66	15·85	18·10

## X.—DISPOSAL OF SURPLUS STOCK.

For many years the profitable disposal of the surplus sheep has been a serious difficulty for the Farmers. Not infrequently, even in recent years, large numbers have been boiled down for tallow, and when freight on this product has been high many sheep have had to be destroyed because there was no market for them.

From 1884 onwards there was a small demand for stock for the farms which were being taken up in Patagonia, but that was soon satisfied.

In 1886 the first shipment of mutton was made to London, the number of carcasses exported being 28,000 and their value £15,070. The carcasses were not frozen before shipment but were carried in a vessel which had been specially fitted up for the trade. The Frozen Meat Company shipped a second cargo, valued at £13,882, in 1887, after which its operations ceased for financial causes.

The trade was revived in 1891 and continued up to 1895, during which period the following shipments were made:—

	Number of Carcasses.	Value. £
1891 . . . . .	18,277	—
1892 . . . . .	17,881	—
1893 . . . . .	—	—
1894 . . . . .	11,681	4,672
1895 . . . . .	19,432	6,802

In 1895 the Farmers received 5s. 6d. for wethers and 4s. 6d. for ewes. The price at the time in London of Australian mutton was 1s. 5d. to 1s. 6d. per stone of 8 lbs. Falkland Islands mutton fetched rather less owing to the irregularity of the supply and the trade did not prove financially successful.

The Chief Inspector of Stock, who had had experience of the frozen mutton trade in New Zealand and considered that the local sheep were suitable for freezing, visited London in 1896, as the representative of the Farmers, for the purpose of conferring with importers and salesmen and endeavouring to establish the trade on a satisfactory basis.

Amongst the difficulties which arose, purchasers required a guarantee that the quality of mutton should be equal to certain recognised brands from New Zealand, and this could not be given owing to the unevenness of the carcasses and for other reasons. Moreover, the arrival of large consignments at long and irregular intervals was not convenient to purchasers who could obtain regular and small supplies from Australia and New Zealand. No definite arrangements were concluded and the trade has not been reopened.

An experiment was made in 1889 of shipping 2,278 live sheep to London. Of this number 238 died on the voyage and there was an average loss in weight of 14 lbs. In the absence of the necessary health certificate the sheep were landed and killed at Deptford, the price realised averaging 30s. per head. The experiment has not been repeated.

In recent years there have been occasional shipments to Argentina of live sheep for slaughter as follows:—

	Number.	Value. £
1913 .. .. .	10,800	6,810
1914 .. .. .	38,000	17,886
1920 .. .. .	21,000	9,517

Arrangements have been made for the shipment to Argentina, in 1923, of about 40,000 live sheep. The price f.o.b., has been fixed at 6s. for wethers and 5s. 6d. for ewes. It is possible that this trade may continue and may develop.

A canning factory was opened in 1911 on which heavy initial expenditure was incurred; a second factory was also installed, but only continued its operations for two years. The canning industry, while it lasted, absorbed a large proportion of the surplus sheep of the Colony, the average number for the ten years from 1911 to 1920 being 32,000 and the maximum 61,000 in 1918. (Appendix XIII.) Unfortunately a fall in prices in 1919 and 1920 resulted in serious financial loss and the factory was closed in the latter year.

The average number of surplus sheep which were disposed of in the ten years from 1911 to 1920 was 53,000. (Appendix XIII.) During part

of that period conditions were abnormal and the number of sheep killed for local consumption and supply to shipping was in excess of ordinary requirements. The sheep available for disposal are four year old wethers and five year old ewes, but there is no surplus of lambs.

## XI.—FARM MANAGEMENT.

The number of males resident on the sheep farms at the census of 1921 was 465, of whom 161 were returned as shepherds. (Appendix VIII.) The number of sheep returned in the same year was 668,000, giving approximately 4,000 sheep to each shepherd. The number actually employed in tending sheep is probably greater than is shown by the census returns. Allowing one Farmer or Manager to each of the larger stations, and assuming that the majority of Farmers and Managers on the smaller islands are engaged in tending sheep, the total number so employed would be increased to 190; this number would permit of the general division of sheep into ewe and hogget flocks not exceeding 3,000 with wether flocks of a larger number and this division is probably in accordance with what is generally the practice.

The sheep are kept all the year round under natural conditions and no artificial food or shelter is given. The rams are turned out in the last week in April or the first week in May. Rams for future use are bred from a stud flock of selected ewes which are mated with imported or selected rams. Lambing commences in the end of September and takes place in the open. The lambs are marked with the station mark in the early part of November and the males are castrated at the same time. Shearing is done entirely by hand; machine shears, after a short trial about 30 years ago, were abandoned, owing, it was said, to the danger of heavy losses from bad weather after the close clip given by machine shearing. Shearing begins in the last days of November or the first days of December with the "dry" sheep, and continues until the end of January or the middle of February. The lambs are generally weaned when the ewes are shorn. One dipping is, by law, compulsory for all sheep between the 1st of March and the 30th of June. During the busy season from lamb-marking to dipping all hands on the farm are employed on the particular work in progress and a few extra hands, if available, may also be employed.

The large area of the holdings and the fixed character of the management are not favourable to the application of scientific development in farming. The chief points in the management appear to be the selection of grazing grounds and the improvement of the quality of the wool by crossing the stock, which has been naturalised for 50 years on wide extents of moor, with other breeds.

The allotment of land to the flocks has led to considerable expenditure on division fences as distinct from boundary fences, which are, by law, obligatory. Practically no land, which is not too exposed for winter use, is freed from stock for any part of the year. Further subdivision by fencing, it is generally admitted, would facilitate the management of the flocks and would repay the cost. Such a measure, with some modification of existing farm methods, would have the additional advantages of allowing blocks of land to be rested in rotation and the grasses to seed.

In the absence of systematic costing in farm book-keeping and a strict analysis of all expenditure, the costs of production are not known, the adoption of forms of account, on the lines of those which have been devised by the Agricultural Costings Committee with the express object of minimising work and with modifications to suit local conditions, would probably not involve more work than the existing books of accounts and would prove valuable.

## XII.—CARRYING CAPACITY OF LAND.

The area of each station as stated in the instrument of title, the area as calculated from the Admiralty chart, and the number of sheep which the station has carried for the years from 1902 to 1921, are given in Appendix XII.

The summary of the stock returns from 1911 to 1921 (Appendix XIII.) shows the number of rams, wethers, ewes and lambs and the number of sheep disposed of in each of these years.

Taking the area of each station as calculated from the Admiralty chart (Appendix XII, column 3) and the average number of sheep carried for the years from 1910 to 1921, the acreage per sheep varies in East Falkland between  $2\frac{1}{2}$  and 6 with an average of 4.05 and in West Falkland between 4.33 and 7.75, with an average of 5.38. The smaller islands carry on an average one sheep to three acres.

## XIII.—PASTURE.

An exhaustive treatise on the flora has been published by Dr. Carl Skottsberg in his Botanical Survey of the Falkland Islands (Kungl. Svenska Vetenskapsakademiens Handlingar Band 50 N: 03. Botanische Ergebnisse der Schwedischen Expedition nach Patagonien und dem Feuerlande 1907-1909).

An account of the flora is also given in a paper by Mr. C. H. Wright, A.L.S., in the Journal of the Linnean Society—Botany (Vol. XXXIX, p. 313).

The relations between the climatic factors and the character of the vegetation is discussed in the annexed extract (Appendix III.) from Dr. Skottsberg's Botanical Survey.

A list of grasses which occur in the Falkland Islands taken from Dr. Skottsberg's Botanical Survey (with references to the species in Bentham and Hooker's Handbook of the British Flora) is given in Appendix IV., and Mr. Wright's list of grasses is given in Appendix V.

A comparison of certain species of grasses, described as "abundant" by Sir Joseph Hooker (1842) with Dr. Skottsberg's records (1907-1909), is shown in Appendix VI.

## XIV.—CULTIVATION.

One or two small patches are dug up for oats, but no land is cultivated except at Hill Cove, which is in a sheltered position in the north-west of the West Island, and at Darwin in East Falkland. At both stations there is an area of 14 acres under oats, which are cut green as a forage crop.

Mr. Robert Blake, the owner of Hill Cove, has been good enough to furnish copies of reports made by Dr. Augustus Voelcker and Sons and by Dr. Bernard Dyer, D.Sc., on samples of soils from his farm. These reports are given in Appendix VII.

Mr. Blake has carried out experiments, extending over a period of 40 years, with a view to improving the feeding power of the land by sowing English grasses. Broad-casting proved a failure, and in Mr. Blake's opinion it is necessary to plough, harrow and bring the land into a proper tilth before attempting to sow seed. The cost of these operations is heavy and special care is necessary in the selection of ground with a good depth of soil.

Thirteen acres which yield a hay crop, have been ploughed, harrowed and planted with the following mixture of grass seeds, the weight in lbs. being given in parentheses in each case:—Oat Grass (96), Cocksfoot (120),



Rough-stalked Meadow (18), Chicory (36), Burnet (72), Yarrow (12), Timothy (72), Alsike Clover (18), Late and Red Clover (18), White Dutch Clover (18), Kentish Wild White Clover (24). Small crops of cabbages and swedes are also grown at Hill Cove.

#### XV.—DISEASES, PARASITES, ETC.

The annual stock reports record that the general health of the flocks has been "good," "very good," "excellent," and the report for 1915-1916 states that the "flocks are practically free from every contagious and infectious disease so common among sheep in other parts."

Special reference is made in the reports to the existence at different periods of malignant œdema, scrofula and ophthalmia, all of which still occur.

It is stated in the report for 1910 that "intestinal parasites are common and also, but to a lesser extent, lung worms"; and that "the camp being badly infected with them and being also the main source of infection renders treatment practically impossible."

For the last 20 years the sheep seem never to have been free from lice, and it is pointed out in the reports that the extent of the damage from these parasites is not generally realised. A special ordinance was passed in 1907 to make provision for preventing the spread of lice. By it an annual dipping of all sheep, not earlier than the 1st of March, is made compulsory, and the Inspector is empowered to require sheep affected with lice to be dipped to his satisfaction. The measures taken to eradicate lice have not proved altogether effective, and the sheep on two stations in East Falkland and one in West Falkland were affected in 1922. Towards the end of that year an Ordinance was passed which empowers the Inspector to apply to sheep affected with lice all measures which are applicable to sheep infected with an infectious or contagious disease.

Two species of lice have been identified, (1) *Trichodectes Sphaerocephalus*, a species of Mallophaga (bird lice and mammal lice) with biting mouths; and (2) *Linognathus Ovilus*, a species of true louse with sucking mouth.

The common Blue Bottle is stated to have been introduced by the ship which carried the first cargoes of mutton to England in 1875 and 1876. Be that as it may, a Blue Bottle, of especially large size, is distributed over the whole Colony and is increasing in number. Special measures for its reduction are called for.

#### XVI.—STOCK INSPECTION.

The prevalence of scab caused special measures for its eradication to be taken in 1895, and a scab Ordinance was brought into force towards the end of that year. It was not found possible to select in England an Inspector competent to carry out the provisions of the new law, and an Inspector, who had long experience of sheep farming in New Zealand, was, on the recommendation of the Government of that Dominion, appointed to the post. He held the appointment for a little over twelve months, during part of which time he was absent from the Colony on duty. His successor also had experience of sheep farming in New Zealand, and held the appointment from 1897 to 1909.

In 1896 there were two Assistant Inspectors with experience of farming in New Zealand, and from 1897 to 1900 there was one Assistant Inspector. The measures taken proved effective and the report of the Chief Inspector for 1901 records that no scab had been observed since the last infected station was released from quarantine in May, 1900.

It was decided in 1909 that the post of Chief Inspector should be held by a Veterinary Surgeon possessing a "complete knowledge of sheep," and a candidate recommended by the Board of Agriculture was appointed. On his resignation in 1916 temporary arrangements were made locally for the discharge of the duties of the post until 1919, when a Veterinary Surgeon, who possessed no special knowledge of sheep and had no experience of sheep farming, was appointed as Chief Inspector. He has recently resigned and the post is now vacant.

The Chief Inspector is responsible for the administration of the Live Stock Ordinance of 1901 relating to infectious diseases among animals. He is also required to visit each station at least once a year and to advise the farmers on matters relating to sheep farming, so that it is essential that he should have a special knowledge of that subject. Having regard to the large area of the stations and the difficulties of communication inspection, as at present carried out by one official, is necessarily perfunctory and ineffective.

The salary of the Inspector and the expenses connected with inspection were defrayed by the farmers themselves up to the end of 1918. In 1919 the direct taxation on the industry was greatly increased, and since that time all the expenses of inspection have become a charge on the general revenue of the Colony. At the time this change was made there was a balance of £2,280 standing to the credit of the "Stock Fund." It has since been transferred to the general revenue of the Colony.

#### XVII.—CHARGES ON THE LAND.

Direct taxation on the sheep farming industry took the form of an export duty on wool and other farm produce up to the end of the year 1918 when a graduated land tax was substituted.

The tax is levied on acreage, irrespective of the value of the land, and the rates fixed by the Land Tax Ordinance of 1918\* are as follows:—

	Rate per acre.
Under 5,000 ... ..	one farthing.
Over 5,000 but under 50,000 acres ... ..	one halfpenny.
Over 50,000 but under 100,000 acres... ..	three farthings.
Over 100,000 acres ... ..	one penny.

The ordinance provides that the tax shall be assessed on:—

- (1) The acreage as ascertained by survey.
- (2) When no survey has been made:—
  - (a) The acreage stated in the Crown grant or lease.
  - (b) When the acreage is not stated in the Crown grant or lease, the acreage as declared by the Governor in Council.

In practice the tax is assessed:—

- (1) In the case of five small holdings, of which the total area is about 50,000 acres, on the acreage as ascertained by survey.
- (2) In the case of all the principal stations, with one exception, on the acreage stated in the Crown grant or lease.
- (3) In the case of one large station, in the grant of which there is no statement of acreage, on the acreage as computed at the Admiralty from the Admiralty chart.

The tax was imposed with a view to producing an annual revenue of £8,700; the revenue actually received from the tax is £8,240 a year.

Appendix XV. gives the total charges on the land in respect of those stations which are not freehold. The general situation is that the farmers are not in a position to incur expenditure on the development of their properties or on experimental work.

12th March, 1923.

J. MIDDLETON.

\* An Export Tax on Wool has been substituted for a Land Tax with effect from 1st January, 1924.

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## APPENDIX I.

## REPORT OF MR. J. T. MOWAT, CHIEF INSPECTOR OF STOCK.

## GENERAL REMARKS.

29th December, 1895.

Sheep farming in the Falkland Islands has not progressed with the times, possibly owing to its isolated position and the smallness of the area. The sheep-farmers are not, in most cases, alive to their own interests—the sheep are not well bred—the rams are not good—there are too many different breeds. No doubt efforts have been made by importing rams to improve the flocks, but these efforts have in many cases taken the form of experiment, and have not been persevered with. Sufficient attention has not been paid to culling and selecting ewes, and there seems to have been an idea that the more sheep there are on the ground the more wool will be clipped, such an idea is a fallacy. Sheep-farmers have suffered from general unpractical management, that is, speaking in comparison with the system in vogue in the Australian Colonies. I consider that the great want here is more sub-dividing fences, which would at once increase the sheep carrying capacity of the Islands.

Much might be done in many places towards improving the feed by grass sowing, especially on Islands.

[241469]

Many small Islands which are a mass of decayed tussac bogs might be made productive.

In cases where sheep are boiled down for tallow, the farmer would do well to put back the scraps on the land as these would form good manure, also the sheep droppings from under the killing and woolsheds.

Farmers here should exert themselves more towards exporting frozen mutton and live sheep. There seems to have been a disinclination to combine together towards this object, and I am fully satisfied that 50,000 to 70,000 prime sheep could be exported annually from these Islands. Although the general system of management has been bad, I understand that farmers have been considerably hampered by lack of capital and expensive labour. The shortness of the supply of labour is, however, not severely felt now, and as the Colony becomes more in touch with the outer world this difficulty will disappear altogether.

I regret that I am not satisfied with the dip used at some stations, as all stations where that particular dip was used last year are at present infected.

Although the weather in the Spring of this year was exceptionally bad, worse in fact than has been known for many years, the average increase shewn at lamb-marking was 65 per cent., which may be considered very satisfactory.

It is too soon to forecast the result of this season's clip, but to all appearances it is likely to be satisfactory.

I should like to mention that the sheep-farmers have rendered every assistance to myself and the Sub-Inspector.

I have, etc.,

THE HON. COLONIAL SECRETARY,  
Stanley, Falkland Islands.

(Sgd.) JOHN T. MOWAT,  
*Chief Inspector of Stock.*

## APPENDIX II.

### LAMBING PERCENTAGE AS GIVEN IN ANNUAL STOCK REPORTS FROM 1901 TO 1916.

Year.	Percentage.	Remarks in Reports.
1901	70	Exceptionally good spring.
1902	55	Bad winter and spring.
1903	75	Lambing most satisfactory.
1904	73	Severe weather in spring and heavy death rate.
1905	75	Percentage in some flocks as low as 50, and in others as high as 88.
1906	75	Season variable, but on the whole favourable for stock.
1907	75	Open winter, little snow; summer exceptionally dry.
1908	77	Mild winter, very little snow; latter part of spring cold and wet.
1909	—	—
1910	—	—
1911	72	Heavy rain in winter and spring; lambs more plentiful than in 1910.
1912	68-82	—
1913	67-34	Some mortality amongst ewes at lambing.
1914	—	—
1915	59-70	Open winter; rainfall below average; late spring.
1916	63-80	Winter exceptionally open and mild; rainfall in late spring above average.

## APPENDIX III.

EXTRACT FROM A BOTANICAL SURVEY OF THE FALKLAND ISLANDS  
BY DR. CARL SKOTTSBERG. (Page. 82.)

Let us now try to establish the relations between the climatic factors and the character of the vegetation. The climate is of a very distinct insular type. The summer is not very warm, and there is hardly a month when a slight frost cannot be expected. Further, there is not a very marked periodicity, for the winter is mild, and it is quite natural that annual species should be scarce, that open or little protected buds should be a common feature, and that evergreen species should be frequently met with; however, periodicity is sufficiently marked to produce a constant rest in floral phenomena (see below). The vegetation enjoys but little sunshine, and there is not such a great difference between sunny and shaded slopes as in many other countries.

It is to be regretted that no observations have been made on the temperature of the soil, save for what I have published. However, we may easily imagine that the Falklands have a cold, moist soil throughout the year, but also that it is seldom hard frozen and never to any considerable depth. In spite of the regular amount of rainfall, the plants can be expected to show a marked xerophytic structure, especially as the formation of peat is exceedingly favoured by a climate such as this. Another factor has the same influence, viz., the strong wind. The Falkland Islands are very windy indeed, and I have already shown that the everlasting westerly winds account for the total absence of arboreous vegetation. This is easily proved by the experiments made by the inhabitants. Especially instructive is the small planted "forest" in Hill Cove on West Falklands. There is a small depression where a number of European trees, principally Scots firs, seem to thrive well. But they only attain a very limited height, for as soon as their shoots rise above the shelter they are killed. Everybody in the Islands knows very well that it is impossible to grow trees without protecting them to the west. And Table I indicates that winds between N.N.W. and S.S.W. predominate. Fig. 10 shows a hawthorn tree in Stanley, planted behind a wall; the wind cuts it off level with the shelter, and has given its head a characteristic, one-sided shape.

The rainfall is rather equally distributed. There is nearly always the same, regular supply of moisture in the soil, but there is a maximum in summer and autumn, and it is of importance that the spring gets less rainfall than do other seasons. At the same time the force of the wind is greatest in the spring, certainly an unfavourable combination, making a xerophytic structure necessary.

Thus everything seems to co-operate in making the plants protect themselves against drought; low temperature of air and soil through the summer, strong winds and very few calm days, and the distribution of the rainfall. There are no observations to show how large the annual amount of snow is. But I have some experience of the Falkland winter. From what was said above on the temperature, we easily understand that one cannot count on a protective snow-cover; the snow never finds time to accumulate, there is perhaps, a week, or even a fortnight, with snow and frost, but generally the winds prevent the equal distribution of the snow, any day it may be transformed into water, and there follows a period of rain.

The plant formation to be expected in this kind of climate is the cold-temperate, oceanic heath. Both Birger and I have used this word. For South Georgia I have referred the vegetation to the tundra (taken in a wide sense), on account of the great likeness between the associations rich in *Polytricha* and other mosses of the same growth, and the true Antarctic tundra. Undoubtedly, there are many relations between Falkland and South Georgia vegetation. The perpetually frozen soil of the geographic tundra is totally wanting; really I do not see that it has much importance in comparison with other factors, and from a botanical point of view South Georgia may be said to possess a tundra-vegetation. For the Falklands the word "heath" is partly most appropriate. However, in the dominant association, grasses form the vegetable cover, and I have separated the "Cortaderia-association" from the "Empetrum-heath." In 1909 I spoke of the former as steppe, but since that I have changed my opinion. Certainly I was, also at that time, aware of the fact that the word "steppe" has been used for a widely different formation. I used it only because I regarded the "Cortaderia-association" as the oceanic representative of the continental, Patagonian-Fuegian steppes (pampa). Now I have come to the conclusion that it is far better to keep the word "steppe" in its original sense. There are, indeed, some important characters that seem to prohibit the use of this term in our case. Thus, the vegetation is not open, there is a ground cover of cryptogams, and matforming herbs, and the soil consists of peat of some kind, features quite foreign to a typical steppe. Further, the

predominant grass, "*Cortaderia pilosa*," does not at all occur in the Magellan steppes; this is also the case with *Festuca erecta*. And the common steppe-grasses are either absent or do not play any important part. For the non-swampy "*Cortaderia*-association" I have used the word meadow, but I am convinced that many plant geographers will disapprove of the use of this word here. It is difficult to find a suitable name for it; however, the wet facies of it bears some resemblance to a meadow-moor, and therefore I thought that the drier type would deserve to be called meadow. But, at the same time, there are also transitions between this meadow and the heath, and thus the term "grass-heath" for the former suggests itself. In fact, Warming has classified the "tussock-formations" (*Poa flabellata*) with grass-heath, as peculiar to the Southern Hemisphere. Then the *Cortaderia*-association also might be called grass-heath. The European grass-heath, as described by Gräbner a.o. is a facies of ericaceous heath rich in grasses, among which *Nardus stricta* is especially mentioned, and its equivalent in the Falklands is hardly the *Cortaderia*-association—not to speak of the *Poa-flabellata*-association, see below—but an "Empetrum heath" rich in grasses such as *Festuca erecta*, *Deschampsia flexuosa*, *Agrostis magellanica*, and other setaceous gramineæ.

It is of a certain interest to observe how Warming deals with the vegetation of the Falklands. On p. 214 we find a short description of what he calls Antarctic heath in Kerguelen, South Georgia, and the Falkland Islands. In the latter place, "the heath consist of a number of dwarf-shrubs including *Empetrum rubrum*, *Pernettya pumila*, *Gaultheria microphylla*, *Drapetes muscosus*, *Vaccinium oxycoccus*\* and *Myrtus mummularia*." The Antarctic heath belongs to the "Oxylophytes" or formations on acid soil. But if we look at p. 260, Falkland vegetation appears once more—now as an Antarctic fell-field, grouped among the "Psychrophytes," or formations on cold soil. This is described as consisting of tussock-grass and evergreen dwarf-shrubs as *Chilotrimum amelloideum* and *Pernettya empetrifolia*; further, he mentions *Azorella caespitosa* as especially characteristic; the first of these is no dwarf-shrub, this is a mistake of little importance; more noteworthy is that Warming in this place, has mixed together two different associations. For one is certainly bound to distinguish the tussock-grass association from the fell-field, the former being strictly confined to the coastal zone, and furthermore nearly pure. If we exclude *Poa flabellata*, the fell-field becomes identical with the Antarctic heath; the dwarf-shrubs "often give rise to true heath" (Warming, l.c.). The confusion about the Falklands in the book in question is not diminished by the fact that the tussock, on p. 200, is described (after Birger) as a separate formation also.

It is of course true that the Falkland vegetation much reminds of the Arctic and Alpine fell-field, as well as of the heath. And in fact, if it is certain that the Falkland soil is cold, it is quite as true that it is acid, and the plants it bears are oxylophytes and psychrophytes at the same time. Warming does not follow his own nomenclature when speaking of the Falkland vegetation as fell-field. For according to the descriptions in the literature, quoted by Warming, the oxylophytic character of the main plant associations is most striking. There is also a true fell-field, the poorly developed Alpine "Bolax-Azorella-association," with open vegetation, scattered cushion-plants, dwarf-shrubs, etc., and patches of mosses and lichens; this vegetation is only found on the higher mountains, where there is a more regular snow-cover and a cold soil all the year; the vegetative season is shorter than in the low land. From the relative scarceness of vegetation it is understood that peat is formed to a much less extent than elsewhere. But Warming cannot have thought of this vegetation when he classified the islands, for it will be described for the first time in this paper.

I do not think that anybody has drawn sufficient attention to the great likeness between the vegetation of the Falklands and the Atlantic heath, such as it is, developed in Scotland, on the Faeröes, etc., and in Western Norway. During a visit to the region of Bergen I was quite struck, as we arrived at the "Erica-zone," where climatic factors distinctly inimical to the growth of trees enter, for the vegetation of this zone in many respects strongly resembled what I had seen in the Falklands: the same dark ericaceous heath with similar mosses and lichens, with grasses also, all grazed on by sheep, with ferns and herbs of the same growth forms; not less is one struck by the occurrence of *Hymenophyllum tunbridgense*, densely matted in the crevices just as *H. falklandicum* in the south. Lately a paper appeared, entitled "Das Klima von Bergen. I. Niederschläge," by N. J. Föyn, and it is of very great interest to learn that the climate in the matter of rainfall is exactly of the same type as that of the Falklands; the rainfall is equally distributed, there is always less in the spring and early summer and more in the autumn, and as to the snow, just the same conditions as in the Falklands seem to prevail. Further, also, in Bergen the rainfall is connected with the occurrence of certain winds, in this case S. That there is much more—up to four times as much—rain as in the Falklands does not affect anything that has been said here. The temperatures also show great resemblance, but are generally higher. Taken as a whole, it is evident that the coastal region of Norway in the district of Bergen has

\* Does not exist in the Falklands.

the same kind of climate and also the same kind of vegetation as the Falkland Islands.

It seems certain that the vegetation in the Falklands is related physiognomically to that of the islands in the North Atlantic, as the Faeröes, described by Ostenfeld in *Plantevaaxten paa Faeroerne*, Copenhagen, 1906. The climate seems to be of exactly the same type, and so is probably the heath, and Ostenfeld writes, that it bears greater resemblance to the heath of the Norwegian west coast than to any other. There is, however, no association exactly corresponding with the "Cortaderia-association." Much in the descriptions of Scottish vegetation cannot fail to remind the reader of the Falkland Islands, thus the hill pastures, grass associations and heather association described from the sub-alpine or sub-arctic region in Edinburgh and North Perthshire districts by Robert Smith (*Scottish Geogr. Magaz.* 1900). And the same may be said of the moorland plant formation, "the dominant stable formation in Caithness," so skilfully treated by C. B. Crampton (*The Vegetation of Caithness considered in relation to the Geology*; published under the auspices of the Committee for the Survey and Study of British Vegetation, Edinburgh, 1911).

Consequently, I have gained the opinion that in the Atlantic heath and moorland formations we have to look for the equivalents in the Northern Hemisphere of Sub-Antarctic oceanic vegetation, a fact not at all likely to cause surprise.

#### APPENDIX IV.

##### LIST OF GRASSES OCCURRING IN THE FALKLAND ISLANDS, AS GIVEN BY DR. SKOTTSBERG.

Where a genus or species is described in Bentham and Hooker's Handbook of the British Flora, reference is made to the page, as numbered in the eighth edition.

- Hierochloa magellanica*, Hooker ... .. B. & H. 511, genus.  
syn. *H. redolens*, *H. arenaria*.
- Alopecurus antarcticus* Vahl. ... .. B. & H. 515, *A. alpinus*.  
syn. *A. alpinus* L., var. *aristatus* Hooker  
fil., *A. Magellanicus* Lam.
- \* *Agrostis alba* L. ... .. B. & H. 518.  
syn. *A. caespitosa*.
- Agrostis canina* L. var. *falklandica* (Hook) B. & H. 518, *A. canina*.  
syn. *A. falklandica*.
- Agrostis magellanica* Lam.  
syn. *A. antarctica* Hooker.
- Agrostis prostrata* Hooker fil.
- Aira antarctica* Hooker.  
syn. *Airidium elegantulum* Steud.
- Aira Parvula* Hooker. ... ..
- \* *Aira praecox* L. ... .. B. & H. 522.
- \* *Aira caryophyllea* L. ... .. B. & H. 522.
- Deschampsia flexuosa* (L) Trin ... .. B. & H. 521 *Aira flexuosa*.
- Trisetum subspicatum* (L) under *Avena* in  
B. & H. genus, p. 522.  
syn. var. *phleoides* (d'Urv.) Hack, *Avena*  
*phleoides* d'Urv.
- Cortaderia pilosa* (d'Urv.) Hack.  
syn. *Arundo pilosa* d'Urv.
- Koeleria bergii* Hieron, var. ... .. B. & H. 545 genus.  
syn. *K. kurtzii* Hack.
- Poa alopecurus* (Gaud) ... .. B. & H. 538 genus.  
syn. *Arundo alopecurus* Guad. *Festuca*  
*alopecurus* Brongn. *Festuca arundo*  
Hooker.
- Poa antarctica* (d'Urv.)  
syn. *Arundo antarctica* (d'Urv.) *Festuca*  
*antarctica* Kunth. *Poa*.
- Poa rigidifolia* Steud. ... ..
- Poa flabellata* (Lam.) Hooker.
- \* *Poa annua* L. ... .. B. & H. 541.
- \* *Poa pratensis* L. ... .. B. & H. 541.
- Atropis preslii* Hack. var. *breviculmis* Hack.

- Festuca arenaria* Lam. ... B. & H. 534 genus.  
*Festuca erecta* d'Urv.  
*Festuca magellanica* Lam.  
 syn. *Festuca ovina* L. var. *magellanica*  
 Hack.  
*Agropyrum magellanicum* (Desv.) Hack.  
 syn. *Triticum glaucum* Lam. *Triticum*  
*repens* L. *Triticum repens* ... B. & H. 529.  
 \* *Lolium perenne* L.  
 \* *Phleum pratense* L.

The species marked with an asterisk are considered by Dr. Skottsberg to have been introduced. *Festuca bromoides* should be added to the list of introduced species.

#### APPENDIX V.

##### LIST OF GRASSES GIVEN BY MR. C. H. WRIGHT, J.L.S. BOTANY XXXIX., p. 313.

The numbers refer to those in the list of Dr. Skottsberg.

<i>Hierochloe redolens</i> (1)	<i>Triodia antarctica</i>
<i>Alopecurus alpinus</i> (2)	<i>Arundo pilosa</i> (11)
<i>Agrostis alba</i> (3)	<i>Poa contraversa</i>
<i>Agrostis alba</i> var. <i>stolonifera</i>	<i>Poa flabellata</i> (15)
<i>Agrostis antarctica</i>	<i>Festuca antarctica</i> (14)
<i>Agrostis canina</i> (4)	<i>Festuca arenaria</i> (17)
<i>Agrostis magellanica</i> (5)	<i>Festuca arundo</i> (13)
<i>Agrostis prostrata</i> (6)	<i>Festuca bromoides</i> (24) (introduced)
<i>Eriachne malouinensis</i>	<i>Festuca erecta</i> (18)
<i>Aira caryophyllea</i> (introduced)	<i>Festuca magellanica</i> (19) ( <i>F. ovina</i> var. <i>magellanica</i> Hack)
<i>Heschampsia martinii</i> .	<i>Lolium perenne</i> (27)
<i>Deschampsia flexuosa</i> (9)	<i>Agropyron magellanicum</i> (20)
<i>Deschampsia antarctica</i>	<i>Agropyron repens</i> , Blue Grass.
<i>Trisetum subspicatum</i> (10)	

#### APPENDIX VI.

##### COMPARISON OF CERTAIN SPECIES DESCRIBED AS "ABUNDANT" BY SIR JOSEPH HOOKER WITH DR. SKOTTSBERG'S RECORDS.

	SIR J. HOOKER.	DR. SKOTTSBERG.
<i>Hierochloe magellanicus</i> ... ..	Abundant.	Very local.
<i>Agrostis canina</i> ... ..	Abundant.	Not very common.
<i>Triticum subspicatum</i> ... ..	Abundant.	Not very common.
<i>Poa alopecurus</i> ... ..	Abundant.	Very rare.
<i>Poa antarctica</i> (common enough, but apparently not at all so abundant as in old times (Sk.)).		
<i>Poa flabellata</i> ... ..	Very abundant.	Confined mostly to small unstocked islands.

Dr. Skottsberg gives *Agrostis magellanica* as abundant in East Falkland and believes that he saw it West Falkland.

*Cortaderia* "the most important grass of the meadow of both islands" (Sk.)  
*Agropyrum magellanicum* "frequent" (Sk.).

#### BLUE GRASS.

From the remarks of Dr. Skottsberg on *Poa alopecurus* on p. 14 it seems reasonable to conclude that this was the species so named, he stated that it was abundant in Sir J. Hooker's time, and is now very rare. "A most conspicuous grass, the foliage being of a bluish colour."



The specimen in the museum is over 12 inches long.

Synonyms *Poa alopecurus* (Gaud.), *Festuca arundo* Hook. *F. alopecurus* d'Urv., *Arundo alopecurus* Gaud.

Mr. Wright, however, definitely names *Agropyron repens* Beauv. "Blue Grass," adding, "abundant in Hooker's time, now becoming extinct."

*Agropyrum repens* Beauv. is the name of the Couch Grass which is abundant in Britain. The species has a very wide range, extending over a great part of the Palearctic Realm and occurs in North and South America.

It has an extensive creeping rootstock, which it is believed is rather characteristic. (Bentham and Hooker's Handbook of The British Flora, p. 529.)

## APPENDIX VII.

### COPY OF ANALYSIS MADE BY DR AUGUSTUS VOELCKER & SONS.

ANALYTICAL LABORATORY,  
STUART HOUSE,  
1, TUDOR STREET,  
LONDON, E.C.,

ROBERT BLAKE, ESQ.,

July 18th, 1914.

Dear Sir,

We have pleasure in handing you herewith our report upon the two samples of soil forwarded by you. The following are the figures of the analysis:—

Soils dried at 212° F.	No. 2.	No. 1.
Organic matter and loss on heating .. .. .	42.26	64.71
Oxide of iron .. .. .	0.83	—
Alumina .. .. .	3.59	3.49
Lime .. .. .	0.17	0.33
Magnesia .. .. .	0.50	—
Potash .. .. .	0.32	—
Soda .. .. .	0.16	—
Phosphoric Acid .. .. .	0.22	0.45
Sulphuric acid .. .. .	0.16	—
Insoluble siliceous matters .. .. .	51.79	30.56
	100.00	—
Nitrogen .. .. .	1.51	

Both soils were of a decidedly peaty character. No. 1 was very black in colour and wet, while No. 2, though peaty, was much drier and not so black in colour as No. 1. Apart from the differences in regard to moisture and vegetable matter (humus), the two soils do not appear to us to differ widely in respect of the lime, phosphoric acid and other constituents of fertility.

The considerably high amount of siliceous matter shown in No. 2 is accounted for mainly by the smaller amount of organic (vegetable) matter. The main fact brought out is that which we anticipated, viz., that both soils are manifestly deficient in respect of lime. No. 1 has the larger quantity, but even this is quite small, and lime is clearly needed in both cases, and its application is especially necessary because of the peaty nature of the soil. We can well understand that "Finger and Toe" in swedes is prevalent on such land, and we are confident that you will get little improvement in the case of crop-growing generally or of pasture until you lime the land well.

In phosphoric Acid No. 1 is much the richer. Notwithstanding this, we should consider No. 2 quite fairly well supplied in this constituent, while No. 1 is more than ordinarily well supplied. Of Potash, the amount present is not by any means large, though there may be quite sufficient for corn-growing. For roots and grass cultivation, however, we would suggest the additional use of potash salts, preferably as sulphate of potash. The analysis shows the soil No. 2 to be, as one might expect from its peaty character, extremely rich in nitrogen. This, however, is not altogether a benefit, as the nitrogen is largely in an inactive form. Further, the tendency of high nitrogen is

to produce coarseness of growth. The use of lime, on the other hand, tends to correct this.

One other noticeable point strikes us in this analysis, and that is, the comparatively high relation of the magnesia present to that of lime, a point to which we have directed much attention of late, and the existence of which emphasises still more strongly the need of liming the soil.

The soils are not those which we should consider well suited for the production of the best class of pasture, and we should be afraid that the growing of a strong grass like Cocksfoot would result in the production of large quantities of coarse grass. Nor should we think that the soils were those upon which the mixture of plants and grasses recommended by Mr. Elliot would be most likely to answer best. It is not as if one had a poor soil that wanted vegetable matter storing up in it, nor again as if you had a heavy impervious soil which required breaking up by the roots of strong-growing plants and grasses.

You want really to select grasses well suited to peaty land and without special reference to their deep rooting habits.

Rye-grass is one of those that should do well.

Yours faithfully,

(Signed) AUGUSTUS VOELCKER & SONS.

COPY OF ANALYSIS MADE BY DR. BERNARD DYER.

ANALYTICAL LABORATORY,  
17, GREAT TOWER STREET,  
LONDON, E.C.,

Dear Mr. Blake,

September 11th, 1914.

I have now analyzed the two samples of soil from the Falkland Islands which you sent me a little time back. No. 1 was a dark peaty soil, almost as dark, in the moist state in which it arrived, as charcoal. No. 2 was a drawn, friable, peaty soil, dark chocolate in colour in its moist state, and containing a great many roots, which were picked out before analysis.

It is usual, for purposes of comparison, to state all analytical results on the dry soil, that is, on one hundred parts of the soil freed from all moisture that evaporates at a temperature of 212° F.

The results obtained are as follows:—

Calculated for Soil dried at 212° F.	No. 1.	No. 2.
(1) Organic matter and a little water of hydration .. .. .	67.152	43.440
Silica and silicious matter undissolved by strong hydrochloric acid. . . . .	27.820	50.460
Mineral constituents dissolved by strong hydrochloric acid:—		
Oxide of iron .. .. .	0.732	1.073
Alumina .. .. .	2.540	3.620
Lime .. .. .	0.302	0.146
Magnesia .. .. .	0.280	0.300
Soda .. .. .	0.246	0.197
(2) Potash .. .. .	0.160	0.285
(3) Phosphoric Acid .. .. .	0.448	0.307
Sulphuric acid .. .. .	0.320	0.172
	100.000	100.000
(1) Containing Nitrogen .. .. .	2.270	1.410
(2) Including potash soluble in 1 per cent. citric acid solution, presumably in readily available condition .. .. .	0.078	0.049
(3) Including phosphoric acid soluble in 1 per cent. citric acid solution and presumably in a readily available condition .. .. .	0.070	0.023

When in this dry state you will notice that No. 1 contains approximately two-thirds of its weight in organic matter, that is, vegetable or peaty matter, apart from sand, clay, and other earthy constituents; while in the case of No. 2 there is over 40 per cent. of such organic or vegetable matter. It will be noticed that both soils, as would be expected from the enormous amount of vegetable matter in them, are exceedingly rich in nitrogen.

The obvious deficiency in both soils is the scarcity of lime. No. 1 contains only .302 per cent. of lime, and contains an almost equal quantity of magnesia. In the case of No. 2 the lime is only .146 per cent., and the magnesia is nearly twice as much. There is a certain amount of evidence that a really healthy condition does not obtain in soils in which lime is not present in excess of magnesia; but, considered altogether without reference to the magnesia contents of the soils, the proportion of lime is too small to be likely to allow of successful cropping of an all-round nature. The small quantities of lime that exist are not in the potentially-alkaline condition of carbonate, the soils, like all soils containing an excessive quantity of peat, being what one would call "acid" in character, being sufficiently sour to turn blue litmus paper red.

There is ample sufficiency of available potash and of available phosphoric acid in both soils, and, as I have already said, there is a great abundance of nitrogen. The nitrogen will be, of course, for the most part, in an inert form, and not available for plant use until it has undergone nitrification. If you can obtain lime at such a cost as to enable you to use it, this would correct the acidity of the soil and at the same time promote nitrification. You would then have an ample supply of all the elements of fertility. If one could treat these soils as one would like, one would give them a dressing of ground lime every few years, or, if the lime could only be obtained in the coarse form of slaked lime, heavier dressings at longer intervals. I fear, however, that you may have a difficulty as regards lime. I have been looking up such fragmentary information as I could find in the Encyclopædia Britannica and also in Darwin's "Voyage of the Beagle," about the geology of the Falkland Islands, and I see no mention of limestone. If there is any limestone in the Islands, the application of lime may be easy; if not, it would be difficult, as importation would presumably be expensive.

If you cannot obtain lime, perhaps it would be possible to get shell-sand, if it exists on the coast. If there is no shell-sand, is it possible to collect sea-shells and grind them inexpensively by means, say, of a windmill, to a fine powder? Lime, in some form or other, is the great desideratum.

Cocksfoot (*Dactylis glomerata*) is one of the grasses that is known to grow well in spite of a scarcity of lime, and Yorkshire Fog (*Holcus lanatus*), the other grass of which you speak, is also a grass that grows well under similar conditions, but the latter is scarcely a grass that you would care to encourage.

Some of the plots in the experimental grass-field at Rothamsted which have been mown continuously, without the application of any lime-containing fertilisers for a great number of years, and which are now in consequence destitute of carbonate of lime and in an acid condition, grow Cocksfoot (*Dactylis glomerata*) well, and also Meadow Foxtail (*Alopecurus pratensis*) and the so-called False Oat Grass (*Arrhenatherum avenaceum*). I doubt, however, whether the latter is a grass you can get from the seedsman, but Cocksfoot and Meadow Foxtail are, of course, easily obtainable in bulk, and might be worth trying. I believe also the Alsike Clover sometimes grows well on peaty soils in Germany and Holland.

Of the ordinary farm crops, those that grow best on peaty, acid soil, are potatoes, oats and rye. Rye, of course, need not be ripened as a corn crop, but can be cut when it is green and succulent, when, as you are doubtless well aware, it forms a very valuable forage crop. Rye is more indifferent than any other crop to an acid condition of soil, next comes potatoes, then oats. Oats can be cut immaturely as a forage crop, like green rye. I take it that it is the ability of potatoes to flourish in peaty soil that made the potato in early days the staple crop of the Irish peasantry. With regard to your question about the determining factor in the nutritive value of grasses, the chief points to be regarded on analysis are the albuminoids, digestible fibre and soluble carbohydrates; but the composition of grass depends not only upon the species, but also upon the time at which it was cut. Grass on a pasture that is always grazed has a higher nutritive value than the produce of a meadow which is mown, because animals crop the grass while it is young and succulent.

As you raise this question, however, I think you will possibly be interested in a series of grass analyses, made a good many years ago by my old friend Dr. Voelcker, which forms a valuable appendix to a book on "Permanent and Temporary Pastures," by the late Martin J. Sutton. Dr. Voelcker's analyses represent practically all the important cultivated grasses, and were all made at the same comparative stage of growth, namely, just before the grasses would, in the natural course, have been cut for hay. The results are given both for the moist state in which the grasses were analysed and also, for purposes of comparison (as the moisture contents vary very considerably), in the dry state.

Thinking you would probably like to have this book, I sent for a copy, and have pleasure in posting it on for your acceptance.

Yours faithfully,

(Signed) BERNARD DYER.

## APPENDIX VIII.

## FALKLAND ISLANDS.

## MALES RESIDENT ON SHEEP FARMS AT CENSUS OF 1921 CLASSIFIED ACCORDING TO OCCUPATIONS.

No.	Name of Station.	Farmer.	Manager.	Student.	Overseer.	Shepherd.	Foreman.	Labourer.	Carpenter.	Mariner & Cutterman.	Cook.	Total.	No.
EAST FALKLAND.													
1.	Berkeley Sound ..	5	—	—	—	—	—	3	—	—	1	9	1
2.	Bluff Cove ..	1	1	—	—	1	—	—	—	—	—	3	2
3.	Douglas Station ..	—	1	—	—	7	—	10	—	1	1	20	3
4.	Evelyn Station ..	1	—	2	—	7	1	5	1	—	1	18	4
5.	Fitzroy North ..	—	—	—	—	1	—	—	—	—	—	1	5
6.	Fitzroy S. and Port Louis ..	—	1	—	1	8	—	9	—	—	1	20	6
7.	Gibraltar Station ..	1	—	—	—	4	1	5	—	1	2	14	7
8.	Lafonia, Darwin, etc.	—	1	2	3	61	5	53	3	1	3	132	8
9.	Moody Valley ..	1	—	—	—	1	—	—	—	—	—	2	19
10.	Mullet Creek ..	1	—	—	—	—	—	—	—	—	—	1	10
11.	Peninsula ..	—	—	—	—	—	—	—	—	—	—	—	11
12.	Port Louis North ..	5	—	—	—	4	—	—	—	—	1	10	12
13.	Rincon Grande ..	—	1	3	—	—	—	4	—	—	1	9	13
14.	San Carlos North ..	—	1	—	—	7	1	8	—	—	1	18	14
15.	San Carlos South ..	1	1	—	—	5	—	8	—	—	1	16	15
	Totals ..	16	7	7	4	106	8	105	4	3	13	273	
WEST FALKLAND.													
16.	Adelaide Station ..	—	1	3	—	6	—	7	1	—	1	19	16
17.	Chartres ..	—	1	1	—	5	1	13	1	—	1	23	17
18.	Dunnose Head, Fox Bay & Pt. Howard ..	—	1	1	—	6	1	3	—	—	1	13	18
19.	Fox Bay West ..	—	1	—	—	4	1	3	—	—	1	10	19
20.	Port Howard ..	—	1	1	—	10	1	11	—	—	1	25	20
21.	Port Stephens ..	—	1	1	—	10	1	10	—	1	—	24	21
22.	Spring Point ..	—	1	—	—	2	—	1	—	—	1	5	22
23.	Westbourne Station ..	—	1	—	—	3	1	5	1	—	1	12	23
	Totals ..	—	8	7	—	46	6	53	3	1	7	131	
ISLANDS.													
24.	Beaver Island ..	—	1	—	—	—	—	3	—	—	—	4	24
25.	Bleaker Island ..	1	—	—	—	—	—	3	—	1	—	5	25
26.	Carcass & Jasons ..	1	—	—	—	—	—	—	—	1	—	2	26
27.	Clifton Station ..	1	—	—	—	—	—	2	—	—	—	3	27
28.	Great, Ruggles, Swan ..	—	—	—	—	—	—	—	—	—	—	—	28
29.	Keppel Island ..	—	—	—	—	—	1	2	—	—	—	3	29
30.	Lively Island ..	—	1	—	—	1	—	3	—	—	—	5	30
31.	New Island ..	—	1	—	—	—	—	1	—	—	—	2	31
32.	Passage Island ..	—	—	—	—	—	—	—	—	—	—	—	32
33.	Pebble Island ..	—	1	—	—	4	1	6	—	3	2	17	33
34.	Saunders ..	—	1	—	—	—	—	5	—	—	—	6	31
35.	Sea Lion Island ..	2	—	—	—	—	—	—	—	—	—	2	35
36.	Speedwell Island ..	—	—	—	—	—	—	—	—	—	—	—	
	George Island, etc. ..	—	1	—	—	1	—	1	1	—	—	4	36
37.	Weddell ..	—	1	—	—	3	1	1	1	—	1	8	37
38.	West Swan Island ..	—	—	—	—	—	—	—	—	—	—	—	38
	Totals ..	5	7	—	—	9	3	27	2	5	3	61	
	Grand Total ..	21	22	14	4	161	17	185	9	9	23	465	

Note.—No. 2. One retired farmer.

No. 3. One wool sorter.

No. 6. One gardener.

No. 8. One doctor, one horse tamer, two engineers, three storekeepers, one bricklayer, one travelling teacher.

No. 16. One gardener.

No. 20. One carter, one horse tamer.

No. 21. One female cook.

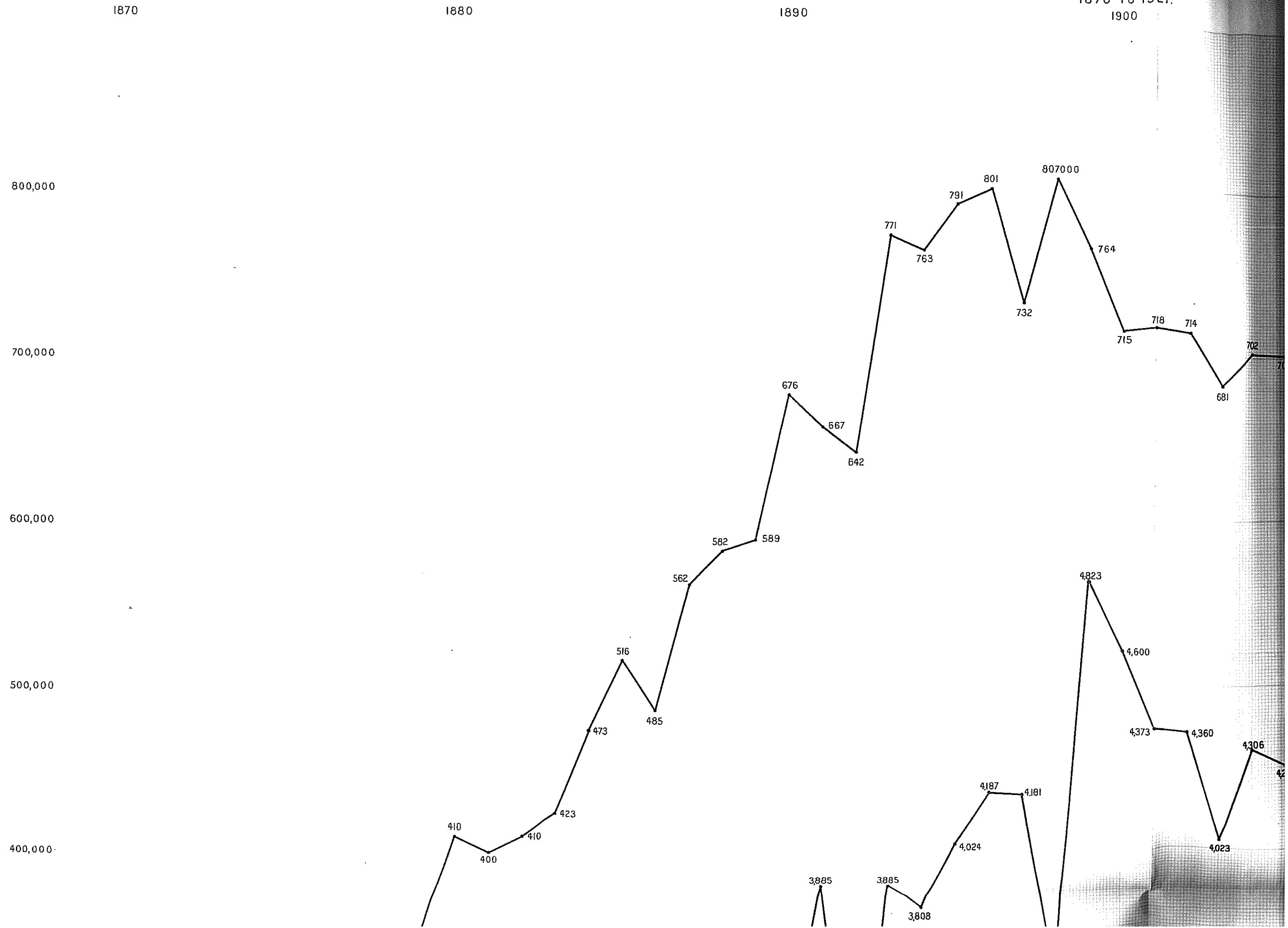
No. 28. Only visited during shearing season; no sheep on this Island in 1921.

No. 32. Do. do. do.

No. 38. Do. do. do.

At date of taking of Census (24th April, 1921) certain Stations had finished the seasons work and in consequence a few farm hands would be in Stanley.

GRAPH OF NUMBER OF SHEEP AND EXPORTS OF  
1870 TO 1921.  
1900



NUMBER OF SHEEP AND EXPORTS OF WOOL

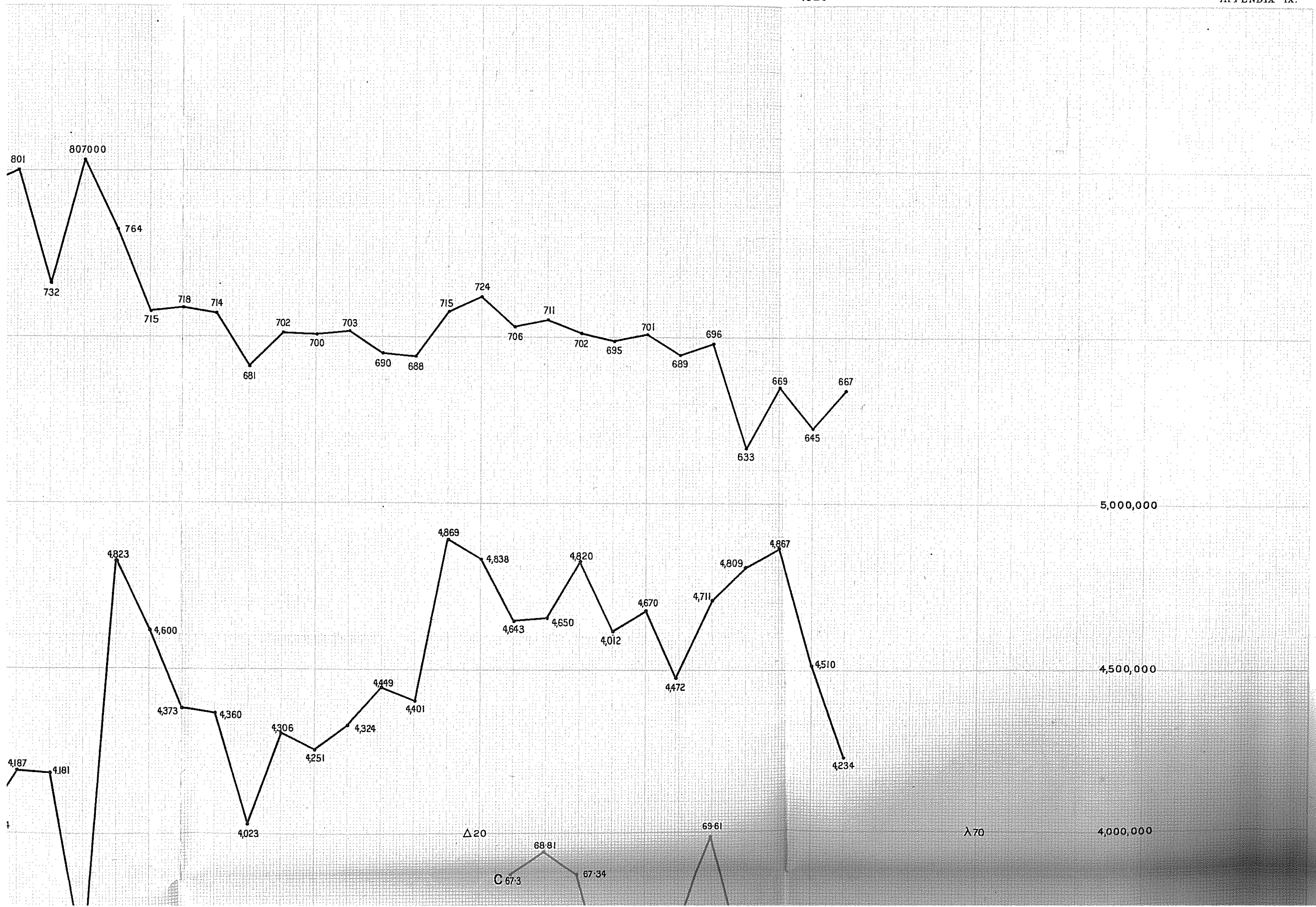
1870 to 1921.

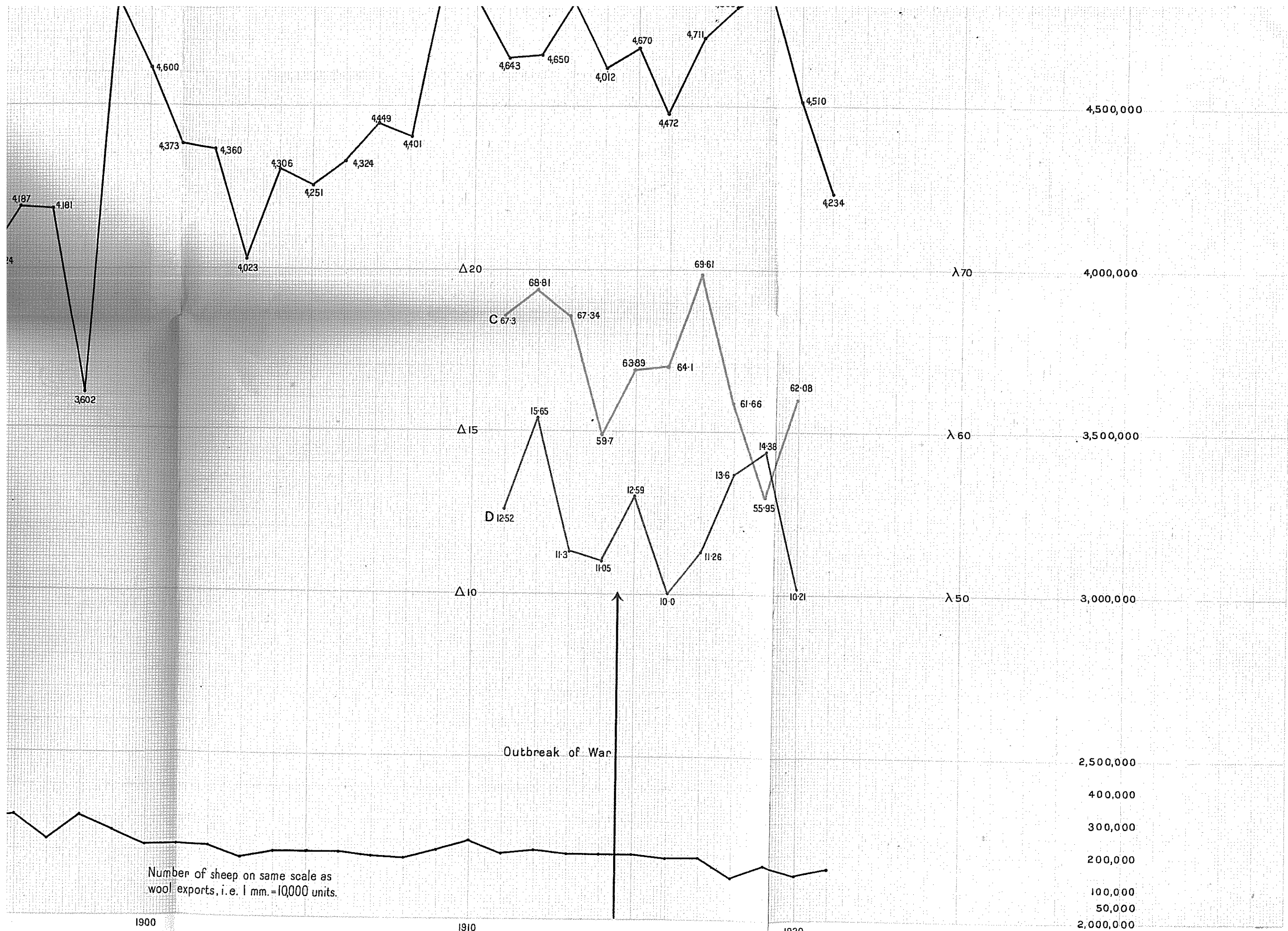
1900

1910

1920

APPENDIX IX.





Graph C ( $\lambda$ ). Percentage of lambs produced by

Graph D ( $\Delta$ ). Death rate per cent. of total of

500,000

400,000

300,000

200,000

100,000

0

1870

1880

1 Cm. = 1 Year.  
(Horizontal Scale)

A

64,600

73,800

124,0

169

170

185

271

283

319

351

410

400

410

423

473

516

485

Graph A. Vertical Scale 1 mm. = 2,000 Sheep.  
After 1872 the numbers are given in thousands.  
From 1872 each number is that of the number of

1,000,000

900

800

700

600

500,000

B

2297

1890

1900

Graph B. Wool exported in lbs.  
to nearest 10,000 lbs.  
1 m.m. = 10,000 lbs.

3602

3808

3885

3885

4024

4187

4181

4023

4306

4360

4373

4,600

4,251



APPENDIX X.  
STATEMENT OF EXPORTS OF WOOL AND FARM PRODUCE 1880—1921.

DATE.	WOOL.		TALLOW.		CANNED MEATS.		SHEEP SKINS.		LIVE SHEEP.		TOTAL VALUE. £
	lbs.	Value. £	lbs.	Value. £	Cases.	Value. £	No.	Value. £	No.	Value. £	
1880 ..	—	68,327	—	6,760	—	—	—	2,144	—	—	77,231
1881 ..	—	70,937	—	4,519	—	—	—	3,266	—	—	78,712
1882 ..	—	57,655	—	10,120	—	—	—	3,903	—	—	71,678
1883 ..	—	68,314	—	8,735	—	—	—	4,345	—	—	81,394
1884 ..	—	74,652	—	13,314	—	—	—	5,686	—	—	96,372
1885 ..	—	82,113	—	3,360	—	—	—	5,125	—	—	92,676
1886 ..	—	72,998	—	3,640	—	—	—	3,813	—	—	91,400
1887 ..	—	80,065	—	4,475	—	—	—	5,039	—	—	92,893
1888 ..	2,297,190	76,573	335,880	4,799	—	—	48,000	5,932	1,118	3,314	86,422
1889 ..	3,015,200	100,540	479,160	3,993	—	—	42,112	5,264	3,499	4,467	114,264
1890 ..	3,393,061	102,460	172,695	2,800	—	—	17,669	2,310	3,297	1,133	108,703
1891 ..	3,885,210	105,225	384,053	3,200	—	—	68,164	8,584	3,430	1,893	118,902
1892 ..	3,065,761	92,423	478,500	5,034	—	—	94,638	6,776	—	—	104,233
1893 ..	3,885,194	109,697	240,970	3,008	—	—	63,844	12,285	3,869	1,343	126,333
1894 ..	3,808,475	105,042	261,000	2,640	—	—	82,150	16,430	810	1,670	125,782
1895 ..	4,024,500	100,612	329,900	2,749	—	—	80,230	10,028	—	—	113,389
1896 ..	4,187,628	112,139	636,740	5,305	—	—	76,209	11,431	—	—	128,875
1897 ..	4,181,500	104,537	213,881	1,782	—	—	72,700	9,087	—	—	115,406
1898 ..	3,602,647	103,501	152,500	1,769	—	—	33,519	5,203	25,811	6,670	117,143
1899 ..	4,823,458	118,961	495,173	4,135	—	—	83,592	10,389	14,188	2,859	136,344
1900 ..	4,600,000	83,333	221,766	2,500	—	—	41,000	4,202	13,300	2,648	92,683
1901 ..	4,373,340	89,029	560,000	4,666	—	—	95,410	9,366	—	—	103,061
1902 ..	4,360,260	72,671	679,728	6,372	—	—	106,044	10,604	—	—	89,647
1903 ..	4,023,807	103,597	428,076	4,000	—	—	74,502	7,450	—	—	115,047
1904 ..	4,306,132	116,897	—	3,178	—	—	75,279	11,610	36	18	131,703
1905 ..	4,251,052	141,701	496,496	5,542	—	—	99,987	17,498	—	—	164,741
1906 ..	4,324,215	162,158	481,600	5,375	—	—	62,371	10,915	—	—	178,448
1907 ..	4,449,599	166,859	618,800	6,906	—	—	109,734	19,133	—	—	196,848
1908 ..	4,401,089	110,186	—	—	—	—	75,685	12,095	13,256	3,950	196,848
1909 ..	4,869,275	138,818	1,159,739	11,483	—	—	474,249	16,071	786	611	222,892
1910 ..	4,828,109	161,666	271,040	8,439	—	—	33,198	4,138	492	329	166,701
1911 ..	4,643,781	150,134	762,160	8,830	1,335	—	123,642	16,853	—	—	174,243
1912 ..	4,650,771	134,680	362,880	3,901	7,005	—	73,158	10,826	426	419	177,571
1913 ..	4,820,552	158,442	497,280	4,516	5,049	—	128,160	17,906	5,658	1,312	157,529
1914 ..	4,612,805	153,812	—	6,208	4,708	—	38,345	5,961	12,901	5,229	192,542
1915 ..	4,670,255	188,541	—	3,679	3,111	—	89,977	17,818	39,003	17,886	188,617
1916 ..	4,472,675	228,491	—	7,505	9,073	—	45,921	11,849	7,278	3,327	219,206
1917 ..	4,711,271	239,727	—	10,850	9,645	—	84,157	19,319	230	230	266,253
1918 ..	4,809,539	294,310	—	—	5,662	—	79,461	26,888	77	77	295,983
1919 ..	4,867,200	283,884	515,200	18,004	11,992	—	100,884	36,055	157	157	335,341
1920 ..	4,510,627	269,170	535,260	21,798	4,839	—	86,447	36,205	987	552	394,983
1921 ..	4,234,665	124,155	26,880	909	—	—	49,138	2,009	21,093	9,592	360,117
											127,073

## APPENDIX XI.

## RAMS IMPORTED FROM 1895—1922.

Breed.	Country of Origin.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.	GRAND TOTAL.
		TOTAL.																
BORDER LEICESTER	New Zealand ...	—	2	—	—	—	—	—	—	75	—	—	—	—	—	—	—	77
CHEVIOT ...	England ...	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
CORRIEDALE	New Zealand ...	—	—	—	12	—	—	—	—	—	—	—	—	—	—	—	—	6
LINCOLN	England ...	27	—	—	—	—	—	—	—	—	—	—	—	5	—	—	—	
MERINO	New Zealand ...	—	112	—	—	—	—	—	12	60	—	—	—	—	—	—	—	172
	New Zealand ...	—	—	—	—	—	—	—	54	—	—	—	—	—	—	—	—	
	France...	—	—	—	2	—	—	—	6	—	—	—	—	—	—	—	—	5
SHROPSHIRE...	England ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
ROMNEY MARSH	England ...	—	—	—	25	6	3	14	3	—	—	5	22	16	9	19	38	391
	New Zealand ...	—	127	—	—	—	—	—	—	297	—	—	10	—	24	—	—	
	Totals ...	32	241	—	27	18*	3	14	21	486†	—	5	32	21	33	22	38	1,276
		1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.	1922 (to 30th June).	TOTAL.				
BORDER LEICESTER	New Zealand ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	77
CHEVIOT ...	England ...	—	—	—	—	—	—	21	—	—	—	—	—	—	—	—	—	
CORRIEDALE	New Zealand ...	—	—	—	—	—	—	—	—	—	—	—	—	6	—	—	—	6
LINCOLN	England ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
MERINO	New Zealand ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	71
	New Zealand ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
SHROPSHIRE...	France...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	874
ROMNEY MARSH	England ...	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
	England ...	27	4	14	21	5	10	22	16	55	42	—	—	—	—	—	—	874
	New Zealand ...	—	15	10	—	—	—	—	—	—	—	—	15	—	—	—	—	
	Totals ...	27	19	24	21	5	10	43	16	55	42	—	21	TOTAL.				1,276
		27	19	24	21	5	10	43	16	55	42	—	21	TOTAL.				

Note.—Numbers of sheep imported are taken from annual reports of Chief Inspector of Stock supplemented by information from other sources.

1899. \* In 1899, 18 Lincoln ewes and 12 Romney Marsh ewes were imported from England; 15 Lincoln ewes were imported from Buenos Aires.

1903. † In 1903, 59 Romney Marsh ewes were imported from New Zealand.

In 28 years a total of 1,380 rams and ewes were imported giving an average of 49 a year. Of 1,380 rams and ewes imported 68.47 per cent. were Romney Marsh.

## APPENDIX XII.

## STATEMENT OF AREAS OF STATIONS AND NUMBER OF SHEEP.

1	2	3					
No.	Name of Station.	Area in instrument of title. "Acres."	Area calculated from Admiralty Chart. Statute Acres.	Maximum number of sheep, 1902-1921.	Average number of sheep, 1910-1921.	Acreage per sheep.	No.
EAST FALKLAND.							
1	Berkeley Sound (Johnson's Harbour)	36,000	52,578	16,412	16,009	3.28	1
2	Bluff Cove ... ..	15,485	15,485	6,070	3,907	3.96	2
3	Douglas ... ..	80,777	153,295	31,771	29,463	5.20	3
4	Evelyn (Teal Inlet) ...	85,655	141,701	31,810	28,745	4.93	4
5	Fitzroy North ... ..	15,143	15,143	2,700	2,520	6.0	5
6	Fitzroy South, etc. ...	103,283	152,446	34,636	32,475	4.69	6
7	Gibraltar (Salvador) ...	40,000	81,951	22,033	18,579	4.41	7
8	Grande, Rincon ... ..	12,000	24,479	11,480	10,129	2.42	8
9	Lafonia, Darwin, etc....	658,207	764,501	195,441	187,035	4.08	9
10	Moody Valley ... ..	7,775	7,775	2,174	1,721	4.52	10
11	Mullet Creek ... ..	4,521	4,521	1,940	1,400	3.24	11
12	Peninsula ... ..	1,800	1,800	453	—	—	12
13	Port Louis North ... ..	24,000	39,500	16,110	15,252	2.59	13
14	San Carlos North ... ..	42,720	82,880	28,500	27,021	3.07	14
15	San Carlos South ... ..	61,000	90,504	29,113	27,051	3.34	15
TOTAL EAST FALKLAND		1,188,366	1,628,559	—	401,307	4.05	
WEST FALKLAND.							
16	Adelaide (Hill Cove)	109,720	143,124	34,712	31,760	4.50	16
17	Chartres ... ..	100,000	131,147	32,124	30,251	4.33	17
18	Fox Bay East ... ..	111,120	117,839	26,630	22,945	7.75	18
19	Fox Bay West ... ..	76,298	104,476	19,646	17,798	5.87	19
20	Port Howard ... ..	141,000	180,000	45,916	37,271	4.83	20
21	Port Stephens ... ..	182,800	234,910	45,815	38,710	6.06	21
22	Spring Point ... ..	60,493	64,189	12,911	12,235	5.24	22
23	Westbourne (Roy Cove)	63,100	77,628	16,736	15,721	4.93	23
TOTAL WEST FALKLAND		844,531	1,113,313	—	206,691	5.38	
ISLANDS.							
24	Beaver ... ..	12,000	13,480	4,678	2,289	5.88	24
25	Bleaker ... ..	10,000	10,000	4,776	3,516	2.84	25
26	Carcass and Jasons ...	11,200	11,200	4,521	4,124	2.71	26
27	Clifton (West Point)	2,700	2,700	3,080	2,492	1.08	27
28	Great, etc. ... ..	8,494	8,494	6,283	5,771	1.47	28
29	Keppel ... ..	8,960	10,414	3,186	2,879	3.62	29
30	Lively ... ..	16,640	16,640	9,606	8,115	2.05	30
31	New ... ..	5,840	5,946	2,592	2,090	2.84	31
32	Passage ... ..	6,480	6,480	1,117	747	8.67	32
33	Pebble ... ..	25,540	37,433	33,574	21,004	1.78	33
34	Saunders ... ..	21,000	32,000	10,851	9,268	3.45	34
35	Sea Lion ... ..	2,548	2,548	1,124	709	3.59	35
36	Sedge and Wreck ... ..	1,600	1,529	304	—	—	36
37	Speedwell ... ..	24,755	24,755	11,395	8,133	3.04	37
38	Weddell ... ..	54,000	65,743	20,055	13,446	4.88	38
39	West Swan ... ..	982	982	620	365	2.69	39
TOTAL ISLANDS ...		212,739	250,344	—	84,948	2.94	

Note.—Column 3. The areas were calculated from the Admiralty Chart by Mr. H. E. P. Cottrell, A.M.I.C.E. No allowance is made for increase of area due to mountainous or hilly land. Since the areas were calculated an adjustment was made of the boundaries of Stations 16, 17 and 20, but information is not available as to the effect of the adjustment of the boundaries on the areas of these three stations.

Station 9. Area in column 3 does not include Lively, Bleaker, Sea Lions, Speedwell, Great Islands.

„ 20. Do. do. West Swan Island.

„ 23. Do. do. West Point Island (Clifton).

„ 26. Do. do. Elephant, Flat and South Jasons (2,188 acres), but includes Dunbar Island.

„ 36. Number of sheep refer to Hummock Island which is included in area of Station 23.

## APPENDIX XIII.

## (A) SUMMARY OF STOCK RETURNS, 1911-1921.

	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
Rams ...	9,284	9,130	8,720	8,857	9,657	9,877	9,607	9,743	9,720	9,608	9,707
Wethers ...	200,749	215,463	205,766	192,489	210,670	186,656	197,671	188,463	182,440	179,763	190,092
Breeding ewes ...	259,440	267,065	263,217	267,010	271,356	267,394	263,366	251,104	265,501	258,537	257,458
Other ewes ...	68,005	63,254	61,040	70,893	71,112	71,610	79,265	76,741	82,683	62,839	65,319
Lambs ...	158,928	156,455	165,116	158,823	140,726	154,367	154,558	165,132	137,261	129,953	142,410
Total sheep...	706,170	711,367	702,859	698,072	701,268	689,904	696,975	699,368	669,996	640,803	667,677
Death rate per 100 ...	12.52	15.45	11.3	11.05	12.59	10	11.26	13.6	14.38	10.21	—

## (B) LAMBS.

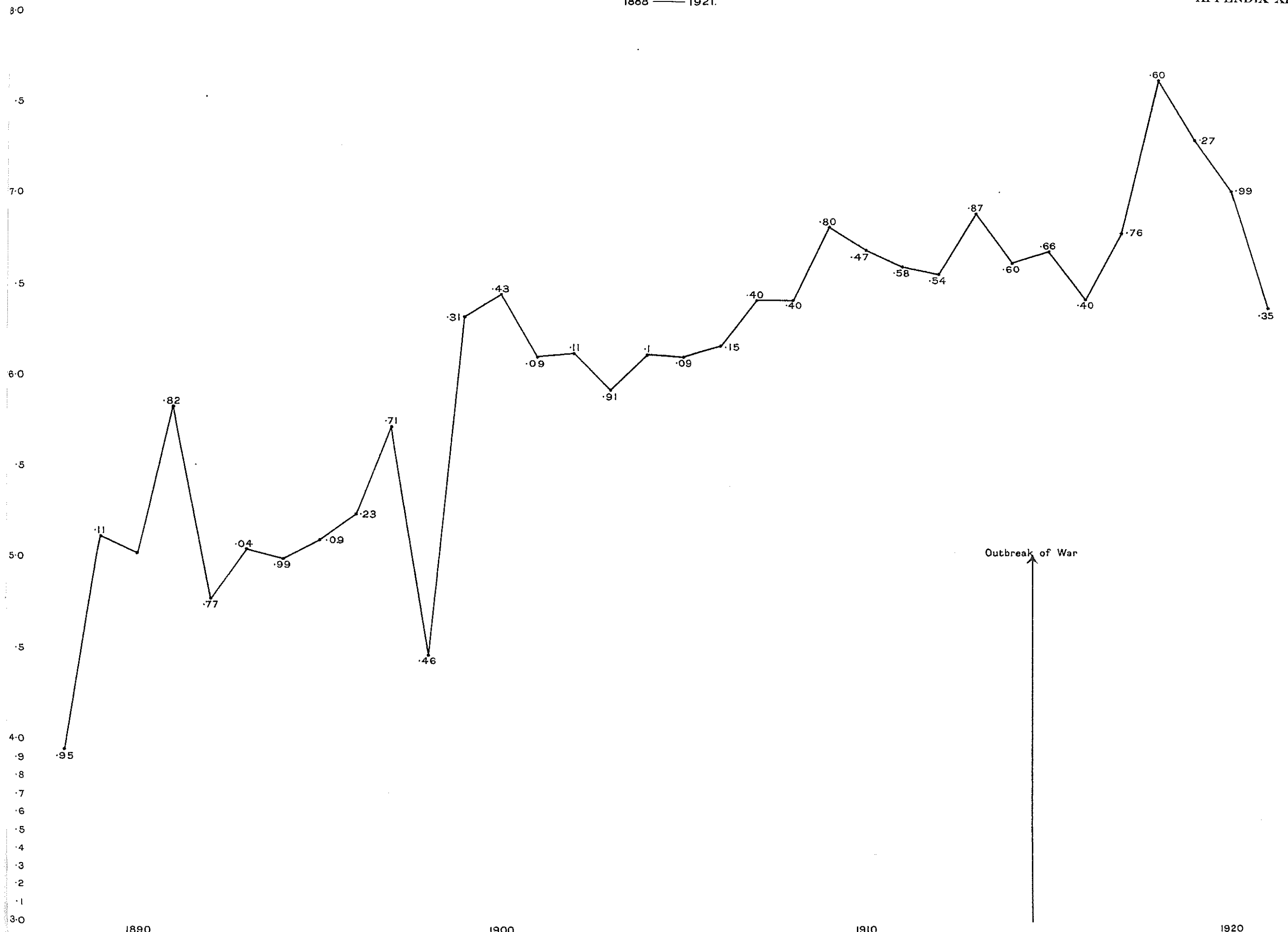
Male ...	73,653	72,440	78,048	73,981	60,256	72,534	72,669	76,847	63,936	60,266	65,424
Female ...	85,275	84,015	86,068	84,842	78,217	81,753	81,889	88,285	73,325	69,687	79,676
Percentage of lambs (surviving to age of 6 months) to breeding ewes ...	60.3	61.81	60.34	52.70	56.89	57.1	62.67	54.66	48.99	55.08	—

## (C) SHEEP DISPOSED OF.

Canned ...	22,410	27,696	28,870	17,276	15,787	37,329	42,711	61,181	43,224	25,979	—
Boiled down ...	42,924	18,591	8,116	5,963	5,250	10,243	11,222	1,000	9,413	4,598	28,415
Exported (live sheep) ...	255	3,450	12,701	38,124	7,337	—	600	—	157	15,477	—
Total ...	65,589	49,737	49,687	61,363	28,374	47,572	54,533	62,181	52,794	46,054	28,415
Sold and Killed for local consumption ...	8,895	13,137	14,000*	22,804	31,982	29,871	23,920	22,142	18,626	16,712	21,475
Total sheep disposed of ...	74,484	62,874	63,687	84,167	60,356	77,443	78,453	84,323	71,420	62,766	49,890

\* Estimate: figure not given in returns.

GRAPH OF WEIGHT OF WOOL PER SHEEP EXPORTED ANNUALLY.  
1888 — 1921.



\* Estimate : figure not given in returns.

Outbreak of War

Horizontal Scale 1 cm = 1 Year.

Average weight of wool per sheep exported annually.  
1 mm. = .02 lbs.

## APPENDIX XV.

## ANNUAL CHARGES ON LAND WHICH IS NOT FREEHOLD.

Name of Station.	Assessed acreage.	Amount paid in Land Tax.	Amount paid towards purchase.	Total annual charges.
		£	£	£
<b>EAST FALKLAND.</b>				
Berkeley Sound (Johnson's Harbour) ...	36,000	75	246	321
Bluff Cove ... ..	15,485	32	107	139
Douglas ... ..	80,777	252	422	674
Fitzroy South ... ..	103,283	430	640	1,070
Port Louis North ... ..	24,000	50	161	211
Salvador (Gibraltar) ... ..	40,000	83	269	352
San Carlos North ... ..	42,720	89	287	376
San Carlos South ... ..	61,000	191	410	601
<b>WEST FALKLAND.</b>				
Chartres ... ..	100,000	417	670	1,087
Fox Bay East ... ..	111,120	463	657	1,120
Fox Bay West ... ..	76,298	238	511	749
Spring Point ... ..	60,493	189	406	595
Port Howard ... ..	141,000	591	952	1,543
Port Stephens ... ..	182,800	762	1,073	1,835
<b>ISLANDS.</b>				
Carcass ... ..	11,200	23	70	93
Saunders ... ..	21,000	44	105	149
Weddell ... ..	54,000	169	362	531

