

SCOTTISH SOCIETY FOR RESEARCH  
IN PLANT-BREEDING

REPORT

BY THE

DIRECTORS

TO THE

ANNUAL GENERAL MEETING

29th July 1926



1926

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SCOTTISH SOCIETY FOR RESEARCH IN  
PLANT-BREEDING.

R E P O R T.

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IN submitting the fifth Annual Report to the Members of the Scottish Society for Research in Plant-Breeding, the Directors are pleased to record that the work of the Society continues to make satisfactory progress.

In the Report last year it was mentioned that a few of the new selections of Oats and Potatoes which had been evolved and multiplied at the Station showed distinct promise. Some of these during the past year have been further multiplied, and are being tried on field plots. Amongst these may be mentioned the "Glebe" Oat, which is being tried in various districts throughout Scotland on a fairly large scale.

Full details of the research work carried out at the Station at Craigs House, Corstorphine, during the past year are given in the Report by the Director of Research, which appears on pages 13-35 hereof.

**Financial.**

The audited accounts for the year ended 31st March 1926 show an increase of over £700 in the Society's Funds, as compared with the funds at the end of the previous year. The ordinary income shows an increase of about £9 on last year's

figures. There is a decrease in ordinary expenditure of over £500 as compared with the previous year's working. This reduction in expenditure is accounted for mainly by the vacancies occurring and the rearrangements made in 1925 in the staff at the Plant-Breeding Station. Amongst the other items of ordinary expenditure which show a decrease are labour and working expenses. The expenditure, both capital and ordinary, incurred in connection with the experiments at the Sub-Station at Ainville, Kirknewton, will be met by a grant from the Board of Agriculture for Scotland. The item of capital expenditure for manures will, as usual, be charged as ordinary expenditure in the accounts for the year ending 31st March 1927, thus leaving a relatively small sum as having been disbursed in capital expenditure.

The chief assets in the Balance-sheet remain at approximately the same figures as in previous years.

A sum of £1046, 10s. 5d. was received from the Development Fund, through the Board of Agriculture for Scotland, towards maintenance expenditure for the year ended 31st March 1925.

The Wilson Memorial Fund now amounts to £221, 5s., showing an increase of £10 for the year.

### Membership.

The Society consists of 101 life members and 89 annual members (23 at the 10s. rate and 66 at the £1 rate). One life member and 10 annual members were enrolled during the year.

Donors of £20 or over (including donations to the Preliminary Fund) are entitled to become life members without further payment. Donors of £10 or over may become members of the Society by payment of an annual subscription of 10s., and others by payment of an annual subscription of £1.

### **Staff.**

In January 1926, Mr F. W. Sansome, B.Sc., resigned his position as Assistant at the Plant-Breeding Station on receiving an appointment in the Department of Botany at Glasgow University.

In February, the Directors decided to appoint Mr V. E. M'M. Davey, B.Sc., to the vacancy, and he commenced his duties as at 1st March.

At the same time, the Directors appointed Mr William Black, B.Sc., as Assistant in the Potato-Breeding Section, to carry out work at the Society's Sub-Station at Ainville Farm, Kirknewton, and he also commenced duty as at the 1st of March.

### **Ainville Sub-Station.**

The experiments on potato breeding at the Station at Corstorphine have shown that the degeneration diseases—leaf-roll and mosaic—are very prevalent there, and that the breeding work was being seriously retarded in consequence. With a view to raising and growing initial seedling-potato stocks in a more healthy condition than was possible at the Station, it was decided that inquiries should be made as to the possibility of obtaining on lease a small area of ground in a district as near Corstorphine as practicable, where the degeneration diseases might probably be less virulent than in the district around Corstorphine. The Society was successful in obtaining at Ainville, Kirknewton, Mid-Lothian, on lease for three years from November 1925, an area of enclosed ground which has been grazed for many years. This ground, which seemed suitable in many ways for the purpose in view, lies at an elevation of 800 feet, and is situated in a district where the acreage of potatoes grown is relatively small. A small greenhouse and store shed have been erected, and a beginning has been made with the experimental work there.

### Election of Directors.

In accordance with the rules of the Society, the six senior Directors retire at this time. Their names are as follows :—

Sir ISAAC CONNELL, 18 Duke Street, Edinburgh.  
 JAMES HISLOP ELDER, B.Sc., Athelstaneford Mains, Drem.  
 CHARLES E. GREGOR, Innerwick, East Lothian.  
 THOMAS HOGG (Messrs Alex. Cross & Sons), 19 Hope Street, Glasgow.  
 WILLIAM J. REID, Fordhouse of Dun, Montrose.  
 JOHN SPEIR, Newton Farm, Hallside, Glasgow.

To fill the vacancies thus created, the Directors recommend the election of the following :—

D. L. BOWE (Messrs J. H. Bowe & Sons), Dunbar.  
 Professor MONTAGUE DRUMMOND, Botany Department, University,  
 Glasgow.  
 JOHN GIBB, Gladstone, Bishopton.  
 J. H. MILNE HOME, Irvine House, Canonbie.  
 WILLIAM INGLIS (Messrs John Inglis & Sons, Ltd.), Granton House,  
 Edinburgh.  
 Principal W. G. R. PATERSON, West of Scotland Agricultural College,  
 6 Blythswood Square, Glasgow.

JOHN STIRTON,  
*Secretary.*

[ABSTRACT OF ACCOUNTS

## ABSTRACT OF

For year ended

	<i>INCOME.</i>
Subscriptions—	
Life . . . . .	£10 0 0
Annual . . . . .	68 10 0
	£78 10 0
<i>Note.</i> —Annual Subscriptions amounting to £22 are in arrear.	
Donations . . . . .	27 2 3
Interests . . . . .	1,866 9 10
Rents . . . . .	15 0 0
Income Tax Recovered . . . . .	262 10 5
Sale of Produce and Stock on Hand . . . . .	253 10 9
	Total Ordinary Income . . . . . £2,503 3 3
Grant from Board of Agriculture—for year ended 31st March 1925 . . . . .	1,046 10 5
Grant from Board of Agriculture for Ainville Sub-Station (outstanding) . . . . .	230 0 0
	Total Extraordinary Income . . . . . £1,276 10 5
	Total Income . . . . . £3,779 13 8
Funds at 1st April 1925— . . . . .	42,845 2 2½

£46,624 15 10½

## ACCOUNTS.

31st March 1926.

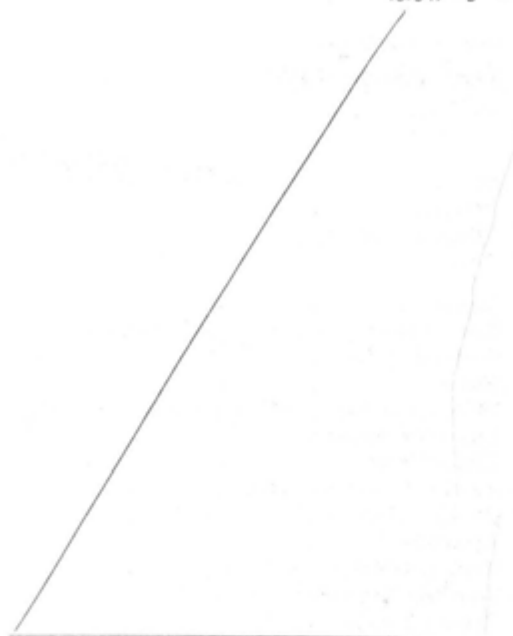
	<i>EXPENDITURE.</i>
Salaries—	
Officers . . . . .	£1,142 1 8
Secretary and Office . . . . .	227 10 0
	£1,369 11 8
Labour . . . . .	610 4 2
National Health and Unemployment Insurances . . . . .	10 7 8
Seeds and Roots . . . . .	21 1 7
Manures . . . . .	110 17 7
Working Expenses, including renewals of Implements and Tools . . . . .	149 3 5½
Laboratory Expenses . . . . .	3 5 10
Library Expenses . . . . .	34 11 8
Rates, Taxes, and Insurances . . . . .	287 12 8
Office Expenses . . . . .	96 12 10
Advertising . . . . .	3 9 0
Heating, Lighting, and Cleaning . . . . .	24 9 8
Travelling Expenses . . . . .	12 6 10
Property Repairs . . . . .	194 3 2
Depreciation on Implements, Tools, Furniture, &c. . . . .	48 19 9
Locality Trials of Oats . . . . .	59 7 4
Ainville Sub-Station Experimental Expenses . . . . .	40 17 4
	Total Ordinary Expenditure . . . . . £3,077 2 2½
Capital Expenditure—	
Laboratory Apparatus . . . . .	£3 5 0
Office Fittings . . . . .	0 10 0
Manures for Crop 1926 . . . . .	105 13 0
Equipment at Ainville Sub-Station . . . . .	183 7 6
	Total Capital Expenditure . . . . . £292 15 6
Funds at 31st March 1926, per Balance-sheet . . . . .	43,547 13 8

£46,624 15 10½

## BALANCE-

As at 31st

<i>LIABILITIES.</i>		
I. Accounts Outstanding . . . . .		£464 8 6
II. Funds at 31st March 1926 . . . . .		43,547 13 8



£44,012 2 2

DR WILSON

Funds at 31st March 1925 . . . . . £221 5 0

£221 5 0

EDINBURGH, 12th May 1926.—The undersigned, having had access to all the Accounts, and verified the same with the Accounts and Vouchers relating thereto, now  
16 ALVA STREET.

## SHEET.

March 1926.

<i>ASSETS.</i>		
I. House and Lands (at Cost) . . . . .		£7,813 16 4
II. Implements and Tools . . . . .		529 15 5
III. Laboratory Apparatus . . . . .		180 13 3
IV. Office Fittings . . . . .		102 11 1
V. Stocks on Hand . . . . .		195 11 0
VI. Accounts Outstanding, including Grant from Board of Agriculture for Ainville Sub-Station . . . . .		347 1 8
VII. Investments at Cost:—		
Value at 31st March 1926.		
£14,253 15 0	1. £14,000 5 per cent War Stock, 1929/47 . . . . .	£12,390 0 0
12,057 10 0	2. £14,000 4 per cent Funding Stock, 1960/90 . . . . .	10,045 0 0
12,611 12 6	3. £16,900 3½ per cent Conversion Stock . . . . .	11,140 3 6
500 0 0	4. £500 Edinburgh Corporation Loan . . . . .	500 0 0
<u>£39,422 17 6</u>		<u>34,075 3 6</u>
VIII. Equipment at Ainville Sub-Station . . . . .		183 7 6
IX. Cash Balances—		
In Bank—		
	On Current Account . . . . .	£289 11 7
	On Deposit Receipt . . . . .	250 0 0
	On Hand . . . . .	44 10 10
		<u>584 2 5</u>
		<u>£44,012 2 2</u>

## MEMORIAL FUND.

Value at 31st March 1926.		
£203 12 6	£200 5 per cent War Stock, 1929/47—valued at date of transfer	£176 5 0
	Interest to date . . . . .	45 0 0
		<u>£221 5 0</u>

Books and Accounts of the Society, and having examined the foregoing Statement of sign the same as found to be correct, duly vouched, and in accordance with law.

W. SLATER BROWN, C.A., *Public Auditor.*



31st March 1926.

ANALYSIS OF MEMBERS.

Aberdeen . . . . .	4	Lanark. . . . .	4
Argyll . . . . .	2	Linlithgow . . . . .	4
Ayr . . . . .	21	Mid-Lothian . . . . .	21
Banff . . . . .	1	Moray . . . . .	1
Berwick . . . . .	12	Nairn . . . . .	..
Bute . . . . .	..	Orkney . . . . .	2
Caithness . . . . .	1	Peebles . . . . .	4
Clackmannan . . . . .	..	Perth . . . . .	14
Dumbarton . . . . .	2	Renfrew . . . . .	16
Dumfries . . . . .	10	Ross and Cromarty . . . . .	6
East Lothian . . . . .	26	Roxburgh . . . . .	4
Fife . . . . .	11	Stirling . . . . .	2
Forfar . . . . .	7	Sutherland . . . . .	1
Inverness . . . . .	..	Wigtown . . . . .	2
Kincardine . . . . .	1	England . . . . .	2
Kinross . . . . .	2		
Kirkcudbright . . . . .	7		<u>190</u>

## ESTABLISHMENT FOR 1925-26.

## BOARD OF DIRECTORS.

*Trustees.*

- THE RIGHT HON. SIR JOHN GILMOUR, Bart., D.S.O., M.P., Secretary for Scotland.  
 THE RIGHT HON. VISCOUNT NOVAR OF RAITH AND NOVAR, K.T., P.C., G.C.M.G., Raith, Kirkcaldy.  
 JAMES ELDER, Athelstaneford Mains, Drem.  
 DAVID BELL, 15 Coburg Street, Leith.  
 JOHN FINLAYSON M'GILL, 69 Kyle Street, Ayr.

*Ordinary Directors.*

## 1923.

- Sir ISAAC CONNELL, S.S.C., 18 Duke Street, Edinburgh.  
 JAMES HISLOP ELDER, B.Sc., Athelstaneford Mains, Drem.  
 CHARLES E. GREGOR, Innerwick, East Lothian.  
 THOMAS HOGG (Messrs Alex. Cross & Sons), 19 Hope Street, Glasgow.  
 WILLIAM J. REID, Fordhouse of Dun, Montrose.  
 JOHN SPEIR, Newton Farm, Hallside, Glasgow.

## 1924.

- JAMES CRUICKSHANK, Kilmarnock Arms, Cruden Bay.  
 JAMES W. DRUMMOND (Messrs W. Drummond & Sons, Ltd.), Stirling.  
 Professor J. A. SCOTT WATSON, Agriculture Department, University, Oxford.

- A. W. M'ALISTER, Seedsman, Dumfries.  
 J. T. M'LAREN, The Leuchold, Dalmeny.  
 ROBERT MILLER, Ferrygate, North Berwick.

## 1925.

- WILLIAM CUTHBERTSON, V.M.H. (Messrs Dobbie & Co., Ltd.), Edinburgh.  
 Sir J. INGLIS DAVIDSON, Saughton Mains, Corstorphine.  
 J. M. HANNAH, Girvan Mains, Girvan.  
 GEORGE G. MERCER, J.P., Southfield, Dalkeith.  
 G. B. SHIELDS, Dolphingstone, Tranent.  
 Sir DAVID WILSON of Carbeth, Bart., D.Sc., Killearn.

*Directors Co-opted.*

- Professor MONTAGU DRUMMOND, Botany Department, University, Glasgow.  
 J. H. MILNE HOME, Irvine House, Canonbie.  
 Principal W. G. R. PATERSON, West of Scotland Agricultural College, 6 Blythswood Square, Glasgow.

*Directors nominated by the Board of Agriculture.*

- |                                   |   |
|-----------------------------------|---|
| Sir ROBERT B. GREIG, M.C., LL.D., | } York Buildings, Queen Street,<br>Edinburgh. |
| JAMES WOOD, O.B.E., M.A., B.Sc.,  |   |
| T. ANDERSON, M.A., B.Sc.,         |   |
| ALEXANDER M'CALLUM, M.A., LL.B.,  |   |

- Chairman of Directors*—JAMES ELDER, Athelstaneford Mains, Drem.  
*Vice-Chairman*—DAVID BELL, 15 Coburg Street, Leith.  
*Director of Research*—WILLIAM ROBB, N.D.A., Craigs House, Corstorphine.  
*Chief Assistant*—JAMES W. GREGOR, Ph.D., Craigs House, Corstorphine.  
*Assistant*—F. W. SANSOME, B.Sc., Craigs House, Corstorphine.  
*Secretary*—JOHN STIRTON, 3 George IV. Bridge, Edinburgh.

## COMMITTEES.

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### RESEARCH.

G. Bertram Shields, *Convener*.  
 T. Anderson.  
 James Cruickshank.  
 William Cuthbertson.  
 J. W. Drummond.  
 Professor M. Drummond.  
 James H. Elder, B.Sc.  
 Charles E. Gregor.  
 Sir Robert B. Greig.  
 John M. Hannah.

Thomas Hogg.  
 A. W. M'Alister,  
 J. F. M'Gill.  
 Principal W. G. R. Paterson.  
 William J. Reid.  
 Professor J. A. S. Watson.  
 Sir David Wilson, Bart.  
 James Elder, *Chairman, ex officio*.  
 David Bell, *Vice-Chairman, ex officio*.

### MANAGEMENT.

David Bell, *Convener*.  
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 Sir J. Inglis Davidson.  
 Charles E. Gregor.  
 J. H. Milne Home.  
 J. T. M'Laren.  
 G. G. Mercer.

Robert Miller.  
 G. Bertram Shields.  
 John Speir.  
 Professor J. A. S. Watson.  
 James Wood.  
 James Elder, *Chairman, ex officio*.

### FINANCE.

J. H. Milne Home, *Convener*.  
 David Bell.  
 Sir Isaac Connell, S.S.C.  
 John M. Hannah.  
 Alex. M'Callum.  
 G. G. Mercer.

Viscount Novar, P.C., G.C.M.G.  
 G. Bertram Shields.  
 Sir David Wilson, Bart.  
 James Elder, *Chairman, ex officio*.  
 David Bell, *Vice-Chairman, ex officio*.

# R E P O R T

BY

## DIRECTOR OF RESEARCH.

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### I. Research Programme—General Outline.

IN the first Annual Report by the Directors, at the Annual General Meeting in 1922, the policy of the Society and the methods of working at the Plant-Breeding Station were fully described. There have been no essential changes in the policy or methods of working since then, but the following extract from that Report may enable new members and other readers who do not have a copy of the first Annual Report for reference to follow more readily the trend of the work at the Plant-Breeding Station, as described in the following pages.

“The aim of the Society is to establish a thoroughly equipped Station, and to promote the discovery and the creation of such new and improved races of the leading crop plants as are best suited to Scottish conditions. The work at the Station is directed chiefly towards practical ends, but it should be noted, however, that a certain amount of attention has to be given to problems not of immediate practical importance.

“The methods employed at the Station to obtain improved types of plants are, in the main :—

“*(a)* Collection and classification of suitable living material.

“*(b)* Isolation of pedigree strains, pure lines.

“*(c)* Hybridisation of pedigree strains, varieties, and species.

“*(d)* Comparative trial of varieties, pedigree strains, &c.”

The crop plants on which experiments are being carried out are chiefly Oats, Potatoes, Herbage Plants (Perennial Ryegrass, Cocksfoot, and Timothy), and Swedes. The breed-

ing and testing of new varieties is generally a lengthy process, and therefore a considerable time elapses before the final results of many of the breeding experiments are obtained. The collecting and classification of living material and the breeding work is steadily progressing; methods are being developed and improved, and gradually increasing numbers of new varieties and selections of the above-named plants will be available for field trials.

## II. Research Programme—Detail for 1925.

### A. CEREALS.

*Oats.*—The area under oats in 1925 was approximately six acres. About  $\frac{1}{4}$ -acre was occupied by breeding plots, the remainder of the area being occupied by trial plots of various sizes and by multiplication plots. Comparatively little damage was caused by eel-worm, which in previous years had proved to be very troublesome, and the oat plots, as a whole, presented a much more healthy appearance than in the two previous years. The manuring was slightly modified, and it is possible that this alteration was advantageous; the breeding plots received a dressing of nitrate of soda and sulphate of potash after the oats braided.

*Collection of Named Varieties.*—Further additions were made to the collection in 1925. Over one hundred and fifty selections of named varieties were grown. Many of these are pure line selections. The collection now includes a considerable number of foreign varieties, some of which ripen very early. The majority of these very early-ripening foreign varieties appear to be much less productive of both grain and straw than the varieties commonly grown in this country. Some of them, however, may be useful for breeding where the object is to secure early-ripening types. Some of these early-ripening varieties ripened in about one hundred and thirty-three days (*i.e.*, from the date of sowing), whereas a variety such as Victory took about one hundred and fifty-three days to ripen. A list of the named varieties which were grown in small plots at the Station is given in Table I., pp. 15, 16. Small samples of some of these may be available for exchange with other plant-breeding institutes.

TABLE I. OATS—COLLECTION OF NAMED VARIETIES.

\* = Pure Lines.

Name of Variety.	Station Number.	Name of Variety.	Station Number.
A. brevis . . . . .	Aa F2	Black Mesdag . . . . .	Aa 77*
A. orientalis obtusata alba	" 424	" Mogul . . . . .	" 89*
A. orientalis tartarica .	" 423	" Tartarian . . . . .	" 93*
A. " tristis . . . . .	" 422	Blainslie . . . . .	" 8*
A. sativa aurea . . . . .	" 426	Californie . . . . .	" 49*
A. " brunnea . . . . .	" 416	Captain . . . . .	" 48*
A. " montana . . . . .	" 427	Castleton Potato . . . . .	" 11*
A. " mutica . . . . .	" 415	" Sandy . . . . .	" 381*
A. " praegravis . . . . .	" 428	Comewell . . . . .	" 59*
A. " pugnax . . . . .	" 425	Crown . . . . .	" 29*
A. " trisperma . . . . .	" 417	Culberson . . . . .	" 70
A. sterilis × Golden Rain	" 429	Dala . . . . .	" 22*
A. strigosa . . . . .	" B1	Daubeny . . . . .	" 23*
Abundance . . . . .	" 393*	1000 Dollar . . . . .	" 25*
Algerian . . . . .	" 62*	Dun . . . . .	" 384*
" Red . . . . .	" 94	Early Champion . . . . .	" 53*
" Grey . . . . .	" 96	" Hamilton . . . . .	" 12*
" I . . . . .	" 95	" Siberian . . . . .	" 368*
Argentine 2 . . . . .	" 449	Echo . . . . .	" 405
" 3 . . . . .	" 450	Eighty Day . . . . .	" 21*
" 6 . . . . .	" 451	Fortuna . . . . .	" 407
Ascot . . . . .	" 33*	Fulghum . . . . .	" 52*
" " . . . . .	" 44*	Garris . . . . .	" 104*
Aurora . . . . .	" 50*	Giant Yellow . . . . .	" 61*
Banner . . . . .	" 38*	Glebe . . . . .	" 17*
" " . . . . .	" 444	Glen Innes . . . . .	" 433
Bathurst (12) . . . . .	" 432	" Innes (8) . . . . .	" 438
" (16) . . . . .	" 439	Golden Rain . . . . .	" 65*
Beardless Propsteier .	" 31*	Gordon . . . . .	" 379*
Bell . . . . .	" 76*	" " . . . . .	" 378*
Beseler's Prolific . . .	" 27	" " . . . . .	" 385*
" " . . . . .	" 32*	Grange . . . . .	" 18*
" " . . . . .	" 387	Guyra . . . . .	" 434
Big Four . . . . .	" 383*	Hamilton . . . . .	" 20*
" " . . . . .	" 389	Hardy Winter . . . . .	" 74*
		Hedehavre (white) . . .	" 19
		" (tawny) . . . . .	" 72

TABLE I.—*continued.*

Name of Variety.	Station Number.	Name of Variety.	Station Number.
Hero (close) . . . . .	Aa 40	Red Oat . . . . .	Aa 66*
Hutcheson . . . . .	" 73*	" Rustproof . . . . .	" 67*
Idamine . . . . .	" 386	Richland . . . . .	" 51*
Iowar . . . . .	" 58*	Ruakuras . . . . .	" 406
Joanette Hybrid . . . . .	" 75*	Sandy . . . . .	" 2*
Kent Birle . . . . .	" 13*	" . . . . .	" 3*
Kherson . . . . .	" 63*	" . . . . .	" 107*
King . . . . .	" 446	Scots Berlie . . . . .	" 16*
Kinness . . . . .	" 26*	Sir Douglas Haig . . . . .	" 90*
Lachlan . . . . .	" 431	Sixty Day . . . . .	" 60*
Leader . . . . .	" 47*	Sparrowbill . . . . .	" 56*
Liberty . . . . .	" 412	Stable King . . . . .	" 392
Ligowo . . . . .	" 28*	Storm King . . . . .	" 45*
Lincoln . . . . .	" 377*	Sunrise . . . . .	" 436
" . . . . .	" 394	Superb . . . . .	" 452
Mansholts III. . . . .	" 101	Supreme . . . . .	" 88*
Mortgage Lifter . . . . .	" 453	Swedish Select . . . . .	" 35*
Mulga . . . . .	" 430	" " . . . . .	" 391
Myrtle A. . . . .	" 91	Tam Finlay . . . . .	" 7*
" B. . . . .	" 92	" " . . . . .	" 382*
Naked × Polish . . . . .	" 371	Terset's Potato . . . . .	" 410*
" " . . . . .	" 409	Trifolium . . . . .	" 103*
New Sandy . . . . .	" 411	Triumph . . . . .	" 46*
Naked . . . . .	CI	Triumphal . . . . .	" 388*
O.A.C. 72 . . . . .	" 447	Tyrone Tawny . . . . .	" 71
Odal . . . . .	" 36	Victory . . . . .	" 30*
" . . . . .	" 37	Waverley . . . . .	" 9*
" . . . . .	" 408	Wexford Tawny . . . . .	" 68
Orion . . . . .	" 442	White Horse . . . . .	" 34*
Ostend's Glory . . . . .	" 57*	" " . . . . .	" 395
Potato . . . . .	" 10*	" Russian . . . . .	" 54*
" . . . . .	" 396*	" " . . . . .	" 55*
" . . . . .	" 397*	Wide Awake . . . . .	" 440
" . . . . .	" 400*	" " . . . . .	" 441
" . . . . .	" 401*	Wilga . . . . .	" 437
" . . . . .	" 402*	Winter Turf . . . . .	" 69*
Prolific Pfeffelbacker . . . . .	" 43	Wisconsin . . . . .	" 390
Record . . . . .	" 24*	Yellow Naesgaard . . . . .	" 64*
" . . . . .	" 41*	Yielder . . . . .	" 42*

Pure lines of the following varieties selected at the Station were multiplied—Sandy, Potato (two selections), Tam Finlay, Victory, and Dala.

*Breeding.*—In continuation of the breeding experiments to obtain improved varieties suitable for different conditions of soil and climate, over two hundred selections, representing the progeny of thirty-two different hybrids, were grown. The hybrids vary in age from the  $F_1$  generation to the  $F_8$  generation. A large proportion of these hybrids are unfixed—*i.e.*, not breeding true to type, but further selections from these have been made. These selections are of promise, and include types which give indication of possessing at least one of the following characteristics, *viz.*—early-ripening period, free tillering and leafy habit, stiff straw, or high yield of grain. Twenty-seven selections from various hybrids appeared to be breeding true in 1924, and these were grown in rod-row plots for preliminary trial and multiplication. One of these, however, was found not to be breeding true. This latter selection is therefore not being multiplied, but a few single-plant selections from it have again been taken. Grain from the most promising hybrid selections which were breeding true has been retained for further trials in 1926. These hybrid selections are mainly of the Potato and Sandy type. Further trials at the Plant-Breeding Station and in other localities will serve to indicate whether any of these selections are suitable for growing in districts in which the old-established and hardy types—Sandy and Potato—have usually been preferred. Grain from the most promising of these new varieties will probably be available for small locality trials in 1927. Until locality trials have been carried out at different centres the results of the trials at the Station are limited in their applicability. In Table II., p. 18, is shown the average yield of grain obtained from the small rod-row trial plots; the rod-rows were almost all in duplicate. The yield is expressed in terms of that of Potato, which is taken as 100.

The weight of 1000 grains of each selection is also given; this figure indicates the relative size of the grain.



TABLE II. OATS—TRIALS OF SELECTIONS (FIXED) FROM  
HYBRIDS RAISED AT THE STATION.

Reference No.	Relative Yield of Grain.	Weight of 1000 Grains in grammes.	Days to Mature.	
Potato (Aa 10)	100	33.54	143	Pure Line Selection.
Sandy (Aa 2)	91	28.36	146	" "
Victory (Aa 30)	124	39.79	153	" "
8 (27) H (2) A	115	40.93	158	From Golden Rain hybrid.
8 (27) H (5) A	127	43.03	153	From Golden Rain hybrid.
8 (27) H (6) A	127	44.61	159	From Golden Rain hybrid.
9 (6) B (4) A	97	31.48	157	From Sandy hybrid.
9 (12) A (3) A	88	32.13	158	" "
20 (a) (1) D (2) B	100	31.41	140	From Potato hybrid ; very short straw.
21 (a) (16) D	106	37.06	145	From Potato hybrid.
47 (8) D (1) B	127	39.61	157	From Algerian hybrid.
47 (8) D (1) C	109	43.03	154	" "
48 (b) (3) C	106	32.6	143	From Sandy hybrid.
48 (b) (3) D (1)	94	36.62	143	" "
48 (b) (3) D (2)	91	34.77	143	" "
48 (b) (3) D (3)	91	34.73	143	" "
48 (b) (3) D (5)	97	34.46	142	" "
48 (b) (3) D (6)	100	34.90	142	" "
48 (b) (3) D (7)	91	35.23	142	" "
48 (b) (3) D (8)	109	35.86	142	" "
49 (c) (5) C (2) A (1)	103	33.25	144	" "
49 (c) (5) C (2) C (1)	88	33.48	144	" "
49 (c) (5) C (2) D (1)	91	33.87	146	" "
59 (4) H (1)	117	36.31	152	" "
59 (4) H (5)	114	33.81	152	" "
59 (4) K (4)	106	35.12	145	" "
59 (16) E (2)	91	36.12	153	" "
59 (16) E (3)	100	37.81	143	" "
72 (22) G (1)	106	36.21	154	From Potato hybrid ; stiff straw.

*Glebe (Wilson) Oat Trials.*—This oat has been multiplied at the Station from its early stages. The results of trials in 1923 and 1924 had indicated that further trials should be carried out. Arrangements were made with each of the three Agricultural Colleges in Scotland in 1925 whereby trials were carried out in different districts in Scotland that year. The trial plots were half an acre in extent, and the seed for these was supplied by the Society from the stock grown at the Plant-Breeding Station. The various reports on the trials were kindly furnished through the Colleges by their respective County Organisers in the counties in which trials were carried out. A summarised report in tabular form of the trials is given in Table III.

TABLE III. GLEBE OAT TRIALS, 1925.

County.	Elevation of Trial Plot.	Total Yield of Grain from $\frac{1}{2}$ -acre Plot.	Yield of Straw from $\frac{1}{2}$ -acre Plot.	Days to ripen from date of sowing.	Remarks. (Extracted from Reports received.)
Ayr	ft. 60	cwt. 10.1	cwt. ....	145	Braird good, no lodging, and better crop than Potato.
Kirkcudbright	270	7.5	6.2	152	Threshed nice sample of grain.
Ayr	90	16.3	14.3	157	Tillered well, and very little lodging.
Lanark	....	8.5	8.0	163	Season unfavourable for the trial on the ground on which it was carried out.
Stirling	....	7.2	8.4	129	Compared with Victory thicker on ground but shorter in straw.
Kirkcudbright	50	7.5	7.4	121	Conditions unfavourable for trial.
Kincardine	250	16.1	....	140	Straw between 5' and 6' long, with large head of grain. Considerable part of field lodged after crop ripe.

TABLE III.—*continued.*

County.	Elevation of Trial Plot.	Total Yield of Grain from $\frac{1}{2}$ -acre Plot.	Yield of Straw from $\frac{1}{2}$ -acre Plot.	Days to ripen from date of sowing.	Remarks. (Extracted from Reports received.)
W. Aberdeen	ft. 400	cwt. 12.5	cwt. 17.5	139	Germination good, subsequently much thinned by grub, and looked very disappointing for a time. Crop made a wonderful recovery, and finally produced a very good crop.
Banff	350	11.7	12.8	153	Yield of grain similar to that of Potato. Deficient in straw.
Moray	110	10.7	16.7	134	Braird very thin, but tillered exceedingly well. Straw good quality, and grain a fair sample.
Inverness	100	9.5	....	130	Braird thick enough. It did not come away so quickly as Yelder alongside, but gradually drew up, and finally overtopped it. Head well developed, numerous grains, well filled.
Berwick	400	16.0	19.3	145	Ripened unevenly, straw good length. Part of plot laid.
Forfar	150	10.6	....	129	The Glebe oat is apparently a fairly good oat. In type and cropping capacity it very much resembles Potato. At threshing the "run" of grain was rather better than was anticipated, while the quality of the straw was very good indeed. The preference

TABLE III.—*continued.*

Connty.	Elevation of Trial Plot.	Total Yield of Grain from $\frac{1}{2}$ -acre Plot.	Yield of Straw from $\frac{1}{2}$ -acre Plot.	Days to ripen from date of sowing.	Remarks. (Extracted from Reports received.)
	ft.	cwt.	cwt.		
Fife	250	7.3	6.8	143	shown for this straw by the cattle was very marked. Yield of grain better than appearance of crop indicated. Straw good quality. A second trial suggested.
W. Lothian	250	9.1	9.0	126	Comparatively better than Victory except in straw. Straw somewhat fine and short. The grain threshed a hard sound sample.
Peebles	600	6.8	....	130	Better than Victory, but both very poor at this centre, conditions being unfavourable.

It will be observed from the results quoted in Table III. that the yield of grain has varied greatly in different districts. The largest yield of grain was that obtained in Kincardineshire—viz., 16.1 cwt. from a half-acre plot. The conditions here seem to have been very favourable. In areas where there was insufficient moisture during the growing season the yield of grain was low and the straw was short. A dry district seems unsuitable for this oat. A desirable characteristic that the Glebe oat seems to possess is its capacity to tiller abundantly, and to recover to a marked degree if the crop has been attacked by wire-worm or other soil pests which thin out the braird. There appears to have been very little lodging of the crop except in certain instances where the crop was very heavy.

Glebe is a Potato type of oat. In districts where oats of

the Victory or Abundance types can be satisfactorily grown, Glebe will not give as large a yield of grain as those varieties ; but in districts where the Potato oat is grown, it seems Glebe might compare favourably with Potato. The grain of Glebe is well filled, and is not thick in the husk ; it seems to be an oat well suited for milling purposes, as will be seen from the report on its milling qualities.

The Cereals Sub-Committee of the Research Committee have decided that further trials should be carried out in 1926, preferably in districts where Potato oats are usually grown.

*Multiplication Plots.*—Plots of Glebe oats were grown in East Lothian, in Ayrshire, and at the Plant-Breeding Station. A bulk sample of grain from the East Lothian plot was available for the carrying out of a milling test. Messrs John Inglis & Son, Oatmeal Millers, Leith, received the grain, and permission has been obtained to quote their report, which is as follows :—

“ We have formed a very favourable opinion of this new variety for milling purposes. These are really very nice well-handled grain, and we consider you have hit off a type of oat which points to be eminently suitable for milling if succeeding crops retain their distinctive good qualities. They produced 13 stones 12½ lb. of meal to the quarter.”

## B. POTATOES.

An area of approximately two acres was under potatoes, the greater part of this being occupied by experimental varieties.

*Breeding.*—The main objects of the breeding work are to obtain improved varieties, ripening at different periods, immune from wart disease, and possessing other desirable characteristics which will commend them alike to the grower and the consumer ; also to study the inheritance of various characteristics of importance in raising new varieties. The breeding work falls into two divisions : the first, obtaining seed and raising seedlings ; the second, selecting what appear to be desirable types of seedlings, and propagating them for further trial and observation.

The potato seeds sown in the early part of the season under glass included seeds from the most promising crosses in the remainder of the Wilson seed collection. About 1200 seedlings were selected from amongst the progeny for planting out in the field. While the seedlings were being grown under glass, precautions were taken to keep the green-houses as free as possible from *Aphis* (greenfly) by fumigating the houses periodically. Neither leaf-roll nor mosaic diseases were observed in the seedlings while they were under glass, but symptoms of leaf-roll developed in a few seedlings after they had been planted out in the field. In order to minimise the spread of leaf-roll and mosaic disease to surrounding plants, each seedling suspected of having either of these diseases was removed as soon as any indication of disease was apparent. Only a small proportion of the seedlings had shown signs of being affected by virus diseases up to the time of lifting. They were lifted early, however, and not allowed to become ripe, thus reducing the chances of infection by disease. A large selection of the seedlings raised in 1925 have been retained for further trial in 1926 as regards their probable economic value. The total yield of tubers from all the seedlings retained at the end of last year was determined, and further notes made on the essential characteristics of the tubers during the winter.

*Trials of Selections and Varieties raised from Seed prior to 1925.*—These trials comprised 322 selections one or more years from the berry. Of these selections, five were planted in quadruplicate in plots of 25 tubers each, three were planted in duplicate in plots of the same size. The remaining selections were planted in single plots ranging in extent from 5 tubers to 25 tubers. Three standard named varieties were, as usual, grown throughout the plots as controls. A large proportion of these selections was raised from seed in 1924. Throughout the growing season notes were made regarding foliage characteristics and vigour of each selection. Amongst all the more recently raised selections in these trials, plants which early in the season had become affected with leaf-roll were destroyed. The remaining plants were lifted before they were fully ripe. The object of early lifting was to facilitate the selection of healthy plants. Undesirable types and selections largely affected with virus diseases were discarded when lifted. The yield of tubers from each selection was

determined, also the amount of ware and seed and the amount of small.

Table IV., below, shows the yield of tubers and certain other data obtained from some of the more promising older seedlings, and from some of the recently raised seedlings, together with similar data from the control varieties. As the plants were lifted before they had become fully ripe, the ripening period, particularly in the later-ripening selections, is only approximate. As in previous reports, the yield from each selection is stated on the basis of the average yield per plant from a known number of plants taken consecutively in the drill. Some of the varieties varied considerably from plot to plot. This variation in yield was no doubt due in large measure to the effects of virus diseases.

Some of the selections seem to be of excellent cooking quality, as shown when the tubers were boiled. A considerable number of the selections, as will be seen from Table IV., compare favourably as regards total yield with the standard named varieties, and these will be further tried in 1926.

TABLE IV. POTATOES, TRIALS OF UNNAMED SEEDLINGS.

Reference No.	Year raised from Seed.	Average weight of Tubers per Plant, 1925.			Average weight of Tubers per Plant in previous years, if sufficient quantity of variety grown.		Occurrence of Virus Diseases during 1925.	Appearance of Tubers when boiled.	Approx. amount of "disease" in Tubers during storage.	No. of Plants grown. 1925.
		lb.	lb.	lb.	1924.	1923.				
<b>EARLY AND MID-SEASON VARIETIES.</b>										
21 (19)	1923	3.0	2.2	...			Free	Rather waxy	27%	12
31 (38)	1924	2.7	...	...			"	...	Nil	4
32 (7)	"	3.5	...	...			"	Very dry	6%	5
64 (4)	"	4.2	...	...			"	...	Nil	4
668 (δ) (6)	1923	3.6	2.0	...			"	...	60%	25
" (7)	"	3.2	3.1	...			"	...	45%	5
677 (a) (7)	"	2.5	2.6	...			"	...	56%	12
679 (4)	"	2.8	3.8	...			"	...	30%	12
964 (a) (13)	"	2.3	1.8	...			"	Very dry	30%	12
964 (δ) (4)	"	2.3	3.0	...			"	"	Almost all	12
964 (c) (4)	"	1.8	2.5	...			"	...	20%	5
965 (δ) (1)	"	2.9	2.5	...			"	Very dry	6%	10
" (2)	"	2.5	2.4	...			"	...	50%	12
" (14)	"	2.2	2.6	...			Slightly unhealthy	Very dry	7%	43

TABLE IV.—*continued.*

MAINCROP AND LATE VARIETIES.								
Reference No.	Year raised from Seed.	Average weight of Tubers per Plant, 1925.	Average weight of Tubers per Plant in previous years, if sufficient quantity of variety grown.		Occurrence of Virus Diseases during 1925.	Appearance of Tubers when boiled.	Approx. amount of "disease" in Tubers during storage.	No. of Plants grown. 1925.
			1924.	1923.				
I (13)	1921	lb. 2.9	lb. 2.7	lb. 3.9	Much Mosaic	Rather waxy	Nil	100
I (21)	"	2.6	2.1	3.2	A little Leaf-roll	...	Traces	50
I (22)	"	2.9	2.9	3.7	Much Leaf-roll	Very dry	Nil	100
16 (19)	1922	3.8	4.3	4.3	Unhealthy	...	58%	11
20 (6)	1923	3.6	1.8	...	Free	...	Traces	5
21 (18)	"	3.9	3.4	...	"	...	"	12
" (26)	"	3.9	...	...	"	...	40%	12
" (28)	"	3.0	2.5	...	Mosaic (?)	...	30%	23
28 (17)	1924	3.7	...	...	Free	...	8%	4
31 (23)	"	3.2	...	...	"	...	12%	5
" (24)	"	3.5	...	...	"	...	5%	5
" (29)	"	3.0	...	...	"	Very dry	Nil	5
" (32)	"	3.9	...	...	"	Dry	"	5
" (36)	"	3.5	...	...	"	...	"	5
" (39)	"	3.2	...	...	"	Fairly dry	"	5
32 (6)	"	3.4	...	...	Leaf-roll (?)	...	"	5
" (8)	"	5.2	...	...	Free	Slightly waxy	"	5
" (15)	"	3.5	...	...	"	...	2%	5
" (19)	"	3.0	...	...	"	...	Nil	5
41 (5)	"	4.0	...	...	"	...	"	5
64 (13)	"	3.6	...	...	"	Very dry	"	...
77 (4)	"	3.6	...	...	"	...	20%	4
449 (a) (1)	1914	3.1	2.5	4.5	Mosaic	...	10%	25
480 (a) (7)	1921	2.8	2.8	3.2	Much Leaf-roll	...	Nil	25
" (23)	"	2.9	2.3	4.0	"	...	No	12
" (41)	"	1.7	1.9	4.3	"	...	Tubers kept 15%	100
" (48)	"	3.3	2.4	4.0	Leaf-roll, but less than in previous year	Waxy	Traces	100
" (52)	"	3.8	2.6	4.0	A few unhealthy plants	...	Nil	12
878 (3)	1919	2.7	2.4	3.5	All plants very unhealthy appearance	Fairly dry	8%	100
963 (a) (7)	1923	3.8	3.4	...	Free	...	8%	11
964 (b) (5)	"	3.5	3.2	...	"	...	22%	21
966 (a) (2)	"	3.7	...	...	"	...	Nil	5
" (6)	"	4.0	...	...	"	Fairly dry	43%	4
966 (b) (9)	1924	3.3	...	...	"	Very dry	25%	5
British Queen	...	3.5	...	...	Traces of Leaf-roll and Mosaic	"	20%	200
Great Scot	...	3.4	3.0	3.5	Traces of Leaf-roll	Fairly dry	3%	170
Kerr's Pink	...	3.2	2.9	3.2	A few plants severe Leaf-roll	Dry	2%	200
Epicure	...	2.1	2.4	4.0	Much Leaf-roll	...	Nil	100



*Virus Diseases.*—In order to see whether early lifting of apparently healthy plants would ensure healthier seed-tubers, and thus a healthier crop being obtained than lifting the tubers after the plants were allowed to ripen, a number of selections, apparently healthy, were lifted early in August 1924. The progeny in 1925 from plants lifted green in the previous year were, in general, healthier and more vigorous than the progeny of the same varieties which had not been lifted until the usual period, but leaf-roll and mosaic were not entirely absent. While it would thus appear that lifting healthy plants in the green stage for seed tends to ensure that more vigorous stocks may be retained than by allowing the seed-tubers to ripen before being lifted, in districts where virus diseases are of frequent occurrence the difficulty is to know whether apparently healthy plants have been infected before lifting.

The virus diseases are to a large extent the cause of the "degeneration" and subsequent rejection of many varieties which in the early stages of trial were of considerable merit. Further, the prevalence of virus diseases hinders greatly the study of the manner of inheritance of some important characteristics in potatoes.

*Selving (Inbreeding).*—When these experiments were started, it was expected that desirable information as regards the inheritance of cropping capacity would be obtained. A widely grown large cropping variety was selfed in 1923, and a large number of seedlings were secured in 1924. The progeny of these were grown in 1925 with the object of comparing the yield of tubers from the parent variety with that of the individual plants in the progeny. Leaf-roll disease developed to a large extent in the seedlings, however, and rendered comparisons futile. Only a few of the plants seemed healthy. It was noted that almost all the apparently healthy plants gave a lower yield of tubers than the average yield from plants of the parent variety. It is probable that inbreeding by itself may result in decreased vigour to a certain extent, but definite information on that question cannot be obtained unless seedlings can be raised where virus diseases are much less virulent than they are under the conditions near Edinburgh.

With the object of raising more healthy stocks, arrangements have been made to carry out experiments in raising

seedlings in a high-lying district where potatoes are not grown to any great extent, and where infection by virus diseases may not spread very rapidly. A piece of ground, lying at an elevation of about 800 feet on the north side of the Pentland Hills about 12 miles from Edinburgh, which has been in grass for many years, has been obtained by the Society on lease for three years, and it is hoped it may be found possible to study the effects of inbreeding more satisfactorily, and also to raise healthy seedling stocks. A grant has been promised from Government funds through the Board of Agriculture for Scotland towards the cost of this scheme.

*Registration and Immunity Trials.*—As a result of the previous years' trials by the Board of Agriculture for Scotland, three varieties raised at the Plant-Breeding Station were included in the Registration Trials conducted by the Board in 1925. These varieties were found to be distinct, and to be immune from wart disease, but were not recommended for registration. They were all affected more or less with virus disease.

One hundred and fifty-seven single-tuber samples from the previous years' seedlings were sent to the Wart Disease Trials at Philpstoun. The report of the trial shows that thirty-five varieties were susceptible to Wart Disease. Of the susceptible varieties only a few have been kept for breeding.

*Hybridisation.*—The hybridisation of a number of immune varieties, particularly those ripening early, was successfully carried out. In order to study further the effects of inbreeding, a few varieties were successfully selfed. As already indicated, the object of selfing is to obtain further data as regards inheritance of certain characteristics in the potato.

*Named Varieties.*—Small stocks of named varieties were also grown. The majority of these stocks have been grown at the Plant-Breeding Station at Corstorphine for about four seasons. Some of the varieties have reached an advanced stage of "degeneration." Amongst varieties such as Up-to-Date, Kerr's Pink, Great Scot, and British Queen, which generally appear to be more resistant than certain other varieties to virus diseases, some very "degenerate" plants were evident last year, and the crop from these plants was very small.

*Dry Matter of Potatoes.*—During the early months of 1926 preliminary experiments were made with a view to finding

a suitable method of comparing potato varieties by means of their dry-matter content. Methods of sampling were investigated. It was found that single tubers of the same variety, grown in the same plot, may vary in dry-matter content by 3.5 per cent or more. Dry-matter percentage does not appear to be in any way connected with the weight of the tuber. Experiments indicated that if thirty tubers or more of a variety were pulped together, uniformly mixed, and the dry-matter content estimated, the figure obtained would indicate with fair accuracy the dry-matter content of the variety. As the number of tubers of "ware" size required to give an average sample is more than is usually obtained from a seedling plant, it is thus impracticable to select seedling potatoes in their first year on the basis of dry-matter content. On multiplying seedlings under comparable conditions and taking representative sample tubers from them at the same period, relative values might be assigned to varietal differences.

### C. HERBAGE PLANTS.

The preliminary investigations which have been carried out in the previous two years with a view to obtaining more satisfactory methods of breeding pasture types of Perennial Ryegrass, Cocksfoot, and Timothy have enabled further progress to be made.

*Collection of Material.*—Further lots of pasture grasses have been collected from several heavily grazed populations on areas which have not been under the plough for many years. A few samples of grass seeds from foreign countries have been received, and small samples of these will be sown to observe the characteristics of the plants.

*Breeding.*—The results of experiments carried out indicate that less variability in type is likely to occur in the early generations (thus permitting of quicker progress being made) by breeding from individual plants from "wild" local populations than from plants selected from cultivated strains. The "wild" populations have almost always produced progenies containing a high proportion of desirable grazing types. In general, the progenies are leafy, and in some the late-flowering habit is pronounced, which characteristics will no doubt increase the usefulness of Perennial Ryegrass for pasture

*Erect type.**Prostrate type.*

COCKSFOOT.

*Broad-leaved type.**Narrow-leaved type.*

COCKSFOOT.

*Erect type.**Prostrate type.*

## PERENNIAL RYEGRASS.

*Broad-leaved erect type.**Narrow-leaved prostrate type.*

## TIMOTHY.

purposes. Various types of Perennial Ryegrass have been compared, and there is reason to believe that the plants best suited to pasture purposes are those which develop tillers from the stem joints, below or at the ground level, as in types where the tillers arise at a higher point of the shoot the effects of close grazing may retard or possibly inhibit any further development of the plant. Crosses were made between individuals selected from a coastal population. Seeds from twenty-seven crosses were sown in January this year, and the progeny of the various lots will be grown for further study.

The study of "wild" local populations of the important agricultural grasses and of the progeny of individual plants selected from these "wild" populations has been continued. The observations which have been made in studying plant populations indicate that the Linnæan species *Lolium perenne* (Perennial Ryegrass), *Dactylis glomerata* (Cocksfoot), *Phleum pratense* (Timothy) each comprises many different types. These different types fall into two different groups: the first, in which the characteristics possessed by the parent are normally always passed on to the progeny (*i.e.*, inherited) irrespective of whether external conditions are varied or not; the second, in which the characteristics possessed by the parent are not passed on to the progeny if environmental conditions are varied. Types falling into either group may be separated after appropriate breeding experiments have been made. The photographs on pp. 29 and 30 illustrate contrasting types of Perennial Ryegrass, Cocksfoot, and Timothy. In cultivated strains of these grasses the erect type is common, and usually produces a large amount of seed, while the prostrate type is rare, and generally produces little seed. The latter type is more readily obtained from heavily grazed populations.

It has been found that the individual plants in local populations studied are generally more or less uniform for certain characteristics. In this Report space does not permit of giving a detailed account of all the observations made and experiments carried out in studying the units of a population, but it is intended shortly to publish a paper dealing with the study of "wild" populations of Perennial Ryegrass.

*Perennial Ryegrass.*—Last year's seedlings, after having been started in pots, were later planted out in the nursery.

The individual plants of cultivated and "wild" populations were studied as regards their habit of growth, and comparisons were made regarding the types found in each population. Many differences were observed amongst these populations, particularly as regards habit of growth (prostrate or erect) and time of flowering. Only a few of the cultivated populations gave indications of being more or less uniform for the pasture type; but the majority were mixed, the predominating types being erect and early flowering. The greatest uniformity and the highest proportion of desirable types were found in the populations collected from the "wild," and in populations raised from seed produced by "wild" plants. Seeds from the coastal type of Perennial Ryegrass, which shows considerable promise of being a desirable pasture strain, have been secured for further trial. In addition to the study of populations as units, plants have been selected from these populations and planted out in the clone plots (vegetative multiplication plots), where observations can more readily be made on the different types.

Two plants of Perennial Ryegrass which had been multiplied vegetatively were grown at a fairly high elevation on the Lammermuir Hills in order to determine if it was possible to obtain seed of this species from such a hill district where there is natural isolation—*i.e.*, isolation from other plants of Perennial Ryegrass. One of the plants set approximately 50 per cent of seed, while the other produced no seed.

*Cocksfoot*.—Several hundred seedlings were raised, most of which were grown from commercial samples received from different parts of the world. Types corresponding to those found in Perennial Ryegrass exist in this species, and a distinction can be made between hay and pasture types.

*Timothy*.—Two species were under observation, *Phleum pratense* and *Phleum alpinum*. Crosses were made between the two, and these should give many new types for experimental purposes. A few "wild" plants of *Phleum pratense* have been obtained, and these are quite distinct from any of the cultivated strains at the Plant-Breeding Station.

*Self-Sterility*.—Further investigations on self- and cross-sterility have been carried out. For the experiments in self-sterility ten inbred populations of Perennial Ryegrass were used, and an average of 150 flowers on 200 plants were self-pollinated. The results show a high degree of self-sterility.

Two inbred populations were used for the cross-sterility experiments, and approximately 1000 flowers were crossed by hand. In the great majority of crosses a very high percentage of flowers produced seed. But no seeds were obtained from certain combinations, although the crosses were repeated, and the male and female organs were proved to be functional in compatible crosses. This purely experimental work, which has been in progress for the last three years, has now advanced sufficiently far to indicate methods of breeding best suited to the experiments here with cross-fertilised grasses.

#### D. SWEDES AND TURNIPS.

The work with Swedes and Turnips, which in the main has for its immediate objects the production of pure breeding strains, and the devising of suitable methods of selecting parent roots, has been similar to that outlined in previous Reports. Attention has been concentrated this year chiefly on Swedes.

*Pedigree Breeding.*—About fifty individual roots of Swedes and forty of Turnips were seeded separately in cotton-fabric isolation bags in 1924. The seed obtained was sown in short drills, replicated in various parts of the experimental plot. The various strains include the progeny of crosses made between Purple Top roots and Green Top roots, and also the progeny of selfed lines from commercial varieties. Roots from several of these strains, which showed promising characteristics, were again selected for seeding in 1926; each selected root is to be selfed. Two strains are to be multiplied, and each strain is being seeded under natural isolation in order to obtain as much seed as possible for further trials on a small field scale. Thanks are due to Mr J. T. M'Laren, Dalmeny, and Mr C. Smith, Corstorphine, for giving facilities for this multiplication at Dalmeny and Cramond Island respectively.

Together with the routine work of pedigree line breeding, experiments have been made in a number of problems the solution of which may be of use in future work.

*Inheritance of "Splitting."*—This term "splitting" has been applied to that condition in which a groove-like hollow of varying depth occurs in Swedes or Turnips, generally in a vertical plane of the bulb. It has been found that the tend-



ency to "splitting" is greater in some lines of Swedes and Turnips than in others. Since two lines obtained from the same original commercial variety have been found to breed differently for this characteristic—in one line all the bulbs were "split," in the other only a small percentage,—it seems that the tendency to "split" is an inherited characteristic. There is a possibility, therefore, that strains free from this tendency to "splitting" may be raised.

*Controlled Seeding.*—About one hundred plants representing five varieties of Turnips and fourteen varieties of Swedes were seeded in isolation during 1925. The majority were selfed; but a number of hand crosses were also made. Under the favourable conditions prevailing in 1925, an average of 2000 seeds per selfed plant was obtained in Swedes. Evidence was gained that enclosing the flowers of two plants together in one bag does not ensure a large percentage of crossing; hand emasculation and pollination is essential when it is desired to ensure that only hybrid seeds are obtained.

The five pedigree lines which were multiplied in isolation gave an average yield of  $1\frac{1}{4}$  lb. of seed. There is thus sufficient seed of these lines to have them tested on a larger scale and compared with the commercial varieties of similar type from which they were selected.

The  $F_1$  generation of the hybrid, Lincolnshire Red Globe  $\times$  White Globe, has red skin. It has been seeded with the object of finding how the roots segregate as regards colour of skin in the second generation.

A detailed account of the more important work carried out at the Station on dry-matter content of Swedes has been published in an article in the 'Journal of Agricultural Science,' Vol. XVI., Part 1, January 1926, entitled "Dry Matter of Swedes," I., by F. W. Sansome, B.Sc., Ph.D., lately Assistant at the Plant-Breeding Station, and who was in charge of the work on root crops. Tables are given setting out the results obtained from Swedes grown at the Station, and tracing certain strains from 1913, when they were first selected by the late Dr Wilson. The following extracts are taken from the summary of Dr Sansome's paper :—

"Sampling of single roots of Swedes by means of cores is subject to errors of various kinds, of which one due to the asymmetrical growth of the root in a north-south direction

has previously been overlooked. Cores should be taken horizontally in a north-south direction.

"In the case of plants left standing in the field there is a marked decrease in dry-matter content during winter and spring; this is presumably due to movement of food material from the root into the developing flowering shoot. A detailed study of the metabolism of the Swede during the winter is urgently needed, if only for the practical purpose of determining the 'metabolic turning-point,' which is the ideal time at which to determine potential dry-matter content.

"For one pair of strains of common parentage clear evidence of the inheritance of dry-matter content has been obtained. In other instances the figures are inconclusive."

*Finger-and-Toe Disease Trials.*—Seven commercial varieties of Swedes and five of Turnips, representing the various types, were tested for resistance to Finger-and-Toe Disease in a specially infected plot. Every variety was affected with the disease to a large extent. Only 7 per cent of the total number of roots were apparently free from the disease. Several of these non-affected roots are to be seeded (selfed), and the progeny tested for resistance to Finger-and-Toe Disease, with the object of obtaining strains resistant to that disease.

*Hybridisation.*—In Swedes, crosses have been made between White Fleshed and Yellow Fleshed strains to discover how these characteristics segregate in the hybrid progeny, and if colour of flesh is of practical importance.

### III. Publications, Lectures, and Official Visits by Staff.

#### PUBLICATIONS (P) AND LECTURES (L).

Director :—

"Some Aspects of Plant Breeding"—St Andrews and East of Fife Farmers' Club, February 1926. (L)

Chief Assistant (J. W. Gregor, Ph.D.) and Assistant (F. W. Sansome, B.Sc., Ph.D.) :—

"The Genotypic Response of Plant Species to Environ-

- ment"—Botanical Society of Edinburgh, February 1926. (L)  
 "Dry Matter of Swedes," I., 'The Journal of Agricultural Science,' Vol. XVI., Part I, January 1926. (P)

#### VISIT.

The Director, Chief Assistant, and F. W. Sansome, B.Sc., Ph.D., attended the Conference of the Scottish Agricultural Research Council in Edinburgh in July 1925.

#### IV. Demonstrations and Exhibits.

In June a party of students from the Edinburgh and East of Scotland Agricultural College visited the Station. Members of the Scottish Agricultural Research Workers' Conference visited the Station in July. In August visits were paid by members of the Lanark Branch and by members of the Anstruther Branch of the National Farmers' Union of Scotland, and also by a party of Perthshire farmers. Demonstrations on the work in progress were given to the various parties by members of the staff.

The Society set up an exhibit at the British Empire Exhibition, Wembley, illustrating "The Improvement of Oats by Selection and Hybridisation" as carried out at the Scottish Plant-Breeding Station. The cost of the exhibit was borne by the Ministry of Agriculture and Fisheries.

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WILLIAM ROBB,  
*Director of Research.*