

REPORT

TO THE

ANNUAL GENERAL MEETING

31st JULY 1952

BY THE

BOARD OF DIRECTORS

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I. ESTABLISHMENT FOR 1951-52.

BOARD OF DIRECTORS.

Trustees.

H.M. SECRETARY OF STATE FOR SCOTLAND, Scottish Office,
St Andrew's House, Edinburgh.

JOHN FINLAYSON M'GILL, Kyle Street, Ayr.

SIR JOHN H. MILNE HOME, D.L., J.P., Elibank, Walkerburn.

ALEXANDER M'CALLUM, O.B.E., M.A., LL.B., 78 Craiglea Drive, Edinr.

Chairman of Directors—Sir JOHN H. MILNE HOME, D.L., J.P., Elibank,
Walkerburn.

Vice-Chairman—Sir JAMES DENBY ROBERTS, Bt., Strathallan Castle,
Auchterarder.

Ordinary Directors.

1949.

Major R. F. BREBNER, C.B.E., The Leuchold, Dalmeny House, Edinburgh
(Deceased).

JOHN CROZIER, B.Sc. (Scottish Agricultural Industries, Ltd.), Charlotte Street,
Leith, Edinburgh.

GEORGE G. MERCER, C.B.E., Southfield, Dalkeith.

JAMES B. MILLER, Easter Ferrygate, North Berwick.

A. GORDON PORTER, West Seryne, Carnoustie.

Sir JAMES DENBY ROBERTS, Bt., Strathallan Castle, Auchterarder.

1950.

JOHN MILLER (Campbell & Miller), 2 Charlotte Square, Edinburgh.

ROBERT HOWIE, B.Sc., The Grange, Kirkcaldy.

ROBERT L. SCARLETT, O.B.E., Sweethope, Musselburgh.

WILLIAM A. SMITH, M.B.E., M.A., B.Sc., 10 South Castle Street, Edinburgh.

FRANK S. NAGEL (Peter Lawson & Son, Ltd.), 1A George IV. Bridge, Edinburgh.

DAVID LOWE, C.B.E., Elvingston, Gladsmuir.

1951.

WILLIAM ALLISON, Almond Hill, Kirkliston.

JOHN ARBUCKLE, Logie, Newburgh.

G. B. R. GRAY, East Fenton, Drem.

Principal JOHN KIRKWOOD, O.B.E., B.Sc.(Agric.), West of Scotland Agricultural
College, Glasgow.

R. M. LEMMON, B.L., 8 Eglinton Crescent, Edinburgh.

A. S. B. WILSON, B.Sc., Boghall, Biggar Road, Edinburgh.

Directors Co-opted.

DAVID BELL, 15 Coburg Street, Leith.

A. D. C. MAIN, B.Sc., Windyedge, Perth.

FRED. MILLS, M.C., M.B.E., J.P. (Roughead & Park, Ltd.), Haddington.

Directors nominated by the Secretary of State for Scotland.

Sir PATRICK R. LAIRD, C.B., F.R.S.E., St Andrew's House, Edinburgh.

ALEXANDER M'CALLUM, O.B.E., M.A., LL.B., 78 Craiglea Drive, Edinburgh.

T. P. M'INTOSH, O.B.E., B.Sc.(Agric.), Ph.D., East Craigs, Corstorphine,
Edinburgh.

ALEXANDER NELSON, Ph.D., D.Sc., N.D.A., University of Edinburgh, Depart-
ment of Botany, Royal Botanic Garden, Edinburgh.

Election of Directors

In accordance with the rules of the Society the following Directors retire from the Board at this time :—

JOHN CROZIER, B.Sc. (Scottish Agricultural Industries, Ltd.), Charlotte Street, Leith, Edinburgh.
 GEORGE G. MERCER, C.B.E., Southfield, Dalkeith.
 JAMES B. MILLER, Easter Ferrygate, North Berwick.
 A. GORDON PORTER, West Scryne, Carnoustie.
 Sir JAMES DENBY ROBERTS, Bt., Strathallan Castle, Auchterarder.

The late Major R. F. Brebner was due to retire in 1952 and this vacancy also requires to be filled.

To fill the aforementioned vacancies the Board of Directors recommend the election of the following :—

DAVID BELL, 15 Coburg Street, Leith.
 A. D. C. MAIN, B.Sc., Windyedge, Perth.
 FRED. MILLS, M.C., M.B.E., J.P. (Roughead & Park, Ltd.), Haddington.
 F. W. ROGER, Kenly Green, St Andrews.
 W. J. WRIGHT, Heugh, North Berwick.
 J. R. BARRON, Findowrie Farm, Brechin.

Standing Committees

Management

WILLIAM ALLISON, <i>Convener</i> .	T. P. McINTOSH.
JOHN ARBUCKLE.	A. D. C. MAIN.
DAVID BELL.	GEORGE G. MERCER.
R. F. BREBNER (<i>deceased</i>).	JAMES B. MILLER.
G. B. R. GRAY.	FRED. MILLS.
Sir JOHN H. MILNE HOME.	A. GORDON PORTER.
ROBERT HOWIE.	Sir JAMES DENBY ROBERTS, Bt.
Principal JOHN KIRKWOOD.	A. S. B. WILSON.
ALEXANDER McCALLUM.	

Finance

ALEXANDER McCALLUM, <i>Convener</i> .	JOHN MILLER.
WILLIAM ALLISON.	FRED. MILLS.
Sir JOHN H. MILNE HOME.	ALEXANDER NELSON.
Sir PATRICK R. LAIRD.	Sir JAMES DENBY ROBERTS, Bt.
R. M. LEMMON.	ROBERT L. SCARLETT.
GEORGE G. MERCER.	WILLIAM A. SMITH.

The Directors considered it desirable to dissolve the Research Committee and to replace it with Standing Crop Research

Committees. Hitherto crop research was the concern of Sub-Committees reporting to the Research Committee.

Crop Research Committees

Cereals

ROBERT HOWIE, *Convener*.
 JOHN CROZIER.
 G. B. R. GRAY.
 Sir JOHN H. MILNE HOME.
 T. P. McINTOSH.
 Sir JAMES DENBY ROBERTS, Bt.
 A. S. B. WILSON.
 J. W. GRANT (*co-opted*).

Herbage

DAVID BELL, *Convener*.
 FRED. MILLS.
 Sir JOHN H. MILNE HOME.
 T. P. McINTOSH.
 Sir JAMES DENBY ROBERTS, Bt.
 WILLIAM A. SMITH.

Potatoes

R. L. SCARLETT, *Convener*.
 FRED. MILLS.
 Sir JOHN H. MILNE HOME.
 DAVID LOWE
 T. P. McINTOSH.
 A. D. C. MAIN.
 JOHN MILLER.
 Sir JAMES DENBY ROBERTS, Bt.

Roots

FRED. MILLS, *Convener*.
 DAVID BELL.
 Sir JOHN H. MILNE HOME.
 J. B. MILLER.
 ALEXANDER NELSON.
 F. J. NAGEL.
 Sir JAMES DENBY ROBERTS, Bt.
 A. M. RIDDEL (*co-opted*).

STAFF

Scottish Plant Breeding Station

<i>Director</i>	J. W. GREGOR, Ph.D., D.Sc., F.L.S.
<i>Chief Assistant</i>	W. BLACK, B.Sc., Ph.D., F.R.S.E.
Cereals	D. CAMERON, B.Sc. H. D. GARVIN, B.Sc.
Herbage Plants and Genecology	J. W. GREGOR. Miss P. J. WATSON, M.A., Ph.D. Vacancy.
Potatoes—	
<i>Breeding</i>	W. BLACK. Vacancy.
<i>Virus Disease Investigations</i>	G. COCKERHAM, B.Sc., Ph.D. Miss T. M. R. M'GHEE, B.Sc., N.D.D. A. W. MACARTHUR, B.Sc.
Root Crops	V. M'M. DAVEY, B.Sc., Ph.D. F. J. W. ENGLAND, B.Sc.
Sugar Beet	V. M'M. DAVEY. F. J. W. ENGLAND.
Laboratory Assistants	A. McFARLANE. W. BROWN.
<i>Secretary</i>	R. J. L. GALLIE.
<i>Assistant Secretary</i>	Miss A. MALCOLM.
Clerical Officer	Mrs H. H. GRAY.
Shorthand Typist	Miss R. JACKSON.

[ABSTRACT OF ACCOUNTS

II. ABSTRACT

For the year ended

	INCOME.	
Interest Received		£1,074 3 3
Recoverable Income Tax		500 6 6
		£1,574 9 9
Sales—		
Ordinary, including Stocks on Hand	£1,060 5 0	
Extraordinary—		
“Early Miller” Oat Account	£37 2 5	
“Craigs Afterlea” Oat Account	24 2 9	
“Albyn Donside” Oat Account	12 0 10	
“Scotia” Cocksfoot and Timothy Account, including Stocks on Hand	127 14 0	
	201 0 0	1,261 5 0
Subscriptions—Annual		171 15 0
<i>Note.</i> —Annual Subscriptions amounting to £20, 10s. are in arrear.		
Donations—Sums under £10		21 4 0
	Total Ordinary Income	£3,028 13 9
Equipment sold to other Organisations		499 3 1
Grants received from the Department of Agriculture for Scotland for the year 1951-52—		
Maintenance	£18,656 0 0	
Capital	4,514 3 10	
	23,170 3 10	
Capital Income—		
Life Membership Subscription	£10 0 0	
Donation over £10	20 0 0	
Interest on Donations and Life Member- ship Subscriptions (£3989, 19s. 7d. at 3 per cent, less Income Tax)	£80 9 2	
Recoverable Income Tax	39 4 10	
	119 14 0	149 14 0
	Total Income	£26,847 14 8
Balances at 1st April 1951—		
Funds in Hand—		
General	£46,422 4 9	
Dryden	8,871 16 9	
	£55,294 1 6	
Department of Agriculture for Scotland Main- tenance Grant—		
General	£5,122 8 7	
Dryden	2,232 2 10	
	7,354 11 5	62,648 12 11
	Total	£89,496 7 7

OF ACCOUNTS

31st March 1952.

	EXPENDITURE.	
Salaries—		
Officers, including Sub-Station		£10,343 4 2
Secretary and Office		1,526 5 9
		£11,869 9 11
Superannuation Contribution		1,089 16 10
Auditor's Fee		31 10 0
Labour, including Sub-Station		3,227 15 8
National Insurance		289 18 7
Seeds and Roots		20 8 2
Manures		317 11 7
Sundry Working Expenses, including Renewals of Implements and Tools		999 5 4
New Equipment		448 18 8
Laboratory Expenses		119 16 11
Library Expenses		121 11 2
Rent, Rates, Taxes, and Insurances		120 13 2
Printing, Telephone, Postages, and Office Supplies		350 16 6
Heating, Lighting, and Cleaning		608 6 6
Travelling Expenses		286 12 5
Property Repairs		333 19 8
Regional Trials and Potato Multiplications		153 5 7
Boghall Sub-Station Maintenance Expenses		267 0 4
Seafield—Fencing, Cultivation, and Preparation of Land		853 7 1
Edinburgh Centre of Rural Economy—Contribution towards Upkeep		487 10 0
	Total Ordinary Expenditure	£21,997 14 1
Depreciation on Temporary Buildings, Tools, &c.		95 5 9
	Total Expenditure	£22,092 19 10
Capital Expenditure—		
Dryden—Cottages	£744 18 2	
Seafield—Cottages under Construction and Surveyors' Fees	3,769 5 8	
	£4,514 3 10	
Department of Agriculture for Scotland Appropriations—		
Dryden—Value of Assets transferred to other Organisations—		
Recovered or Recoverable by D.O.A.S.	£9,616 12 8	
Maintenance Grant	1,452 0 0	
	11,068 12 8	
Balances at 31st March 1952—		
Funds in Hand per Balance-sheet	£50,246 0 11	
Department of Agriculture for Scotland Main- tenance Grant :—		
Brought forward from pre- vious year	£7,354 11 5	
Sale of Equipment	499 3 1	
	£7,853 14 6	
Less D.O.A.S. Ap- propriations	£1,452 0 0	
Overspent on Gen- eral Account during Financial Year 1951-52	313 0 4	
	1,765 0 4	6,088 14 2
	Total	£56,334 15 1
	Total	£89,496 7 7

SUGAR BEET

INCOME.

Grant received from Sugar Beet Research and Education Committee during the year 1951-52	£1,167	3	2
Less: Balance due for previous year	152	3	2
	£1,015	0	0
Balance due to Society for year 1951-52	157	0	8
	£1,172	0	8

BUILDINGS AND EQUIPMENT

Balance at 1st April 1951	£93	3	10
Interest		0	11
	£93	15	6

DR WILSON MEMORIAL

Funds at 31st March 1952—			
Value at 31st March 1952.			
£155, 10s.	Investments at Cost (£200 3½ per cent War Stock)	£176	5
	Sum in Savings Bank	284	19
		£461	4
		5	

W. J. REID

Funds at 31st March 1952—Sum on Deposit Receipt	£503	14	11
	£503	14	11

INVESTIGATIONS:

EXPENDITURE.

Salaries and Superannuation Contribution	£783	0	6
Wages	223	4	6
National Insurance	18	1	10
Travelling Expenses	19	1	9
Manures	20	12	10
Sundry Working Expenses	52	16	6
Equipment	55	2	9
	£1,172	0	8

—FIRE DAMAGE ACCOUNT.

Expenditure on Restorations	£51	5	6
Balance at 31st March 1952—Sum on Deposit Receipt	42	10	0
	£93	15	6

FUND ACCOUNT.

Funds at 1st April 1951	£447	8	5
Interest for year	13	16	0
	£461	4	5

BEQUEST.

Funds at 1st April 1951	£500	0	0
Interest	3	14	11
	£503	14	11

BALANCE-

As at 31st

LIABILITIES.

I. Accounts Outstanding, due by Society	£723 8 7
II. Subscriptions paid in advance	8 5 0
III. Department of Agriculture for Scotland :— Balance of Maintenance Grant	6,088 14 2
IV. Funds at 31st March 1952	50,246 0 11

£57,066 8 8

EDINBURGH, 7th May 1952.—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 1952.

ASSETS.

I. Houses and Lands, at Cost, less Depreciation	£7,943 6 0
II. Virus Scheme Buildings, &c., at Cost, less Depreciation— Craig's House	£1,625 9 4
Boghall	226 17 3
	1,852 6 7
III. Seafield—Cottages under Construction and Surveyors' Fees	3,769 5 8
IV. Greenhouses, Huts, Frames, and Equipment at Sub-Station, at Cost, less Depreciation	93 5 0
V. Implements and Tools, at Cost, less Depreciation	£171 6 5
Additions during year	421 1 8
	£592 8 1
Less Charged to Revenue	421 1 8
	171 6 5
VI. Laboratory Apparatus, at Cost, less Depreciation	£47 11 7
Additions during year	27 17 0
	£75 8 7
Less Charged to Revenue	27 17 0
	47 11 7
VII. Office Furniture and Fittings, at Cost, less Depreciation	45 18 4
VIII. Stocks on Hand, as valued by Directors	374 18 0
IX. Accounts Outstanding, due to Society— General	£390 7 11
Balance of Grant due to Society for Sugar Beet Investigations	157 0 8
	547 8 7
X. Income Tax Recoverable	539 11 4
XI. Investments, at Cost :— Value at 31st March 1952.	
£10,985 0 0 1. £14,130, os. 9d. 3½ per cent War Stock	£12,530 0 0
13,475 0 0 2. £14,000 4 per cent Funding Stock, 1960-90	10,045 0 0
13,139 15 0 3. £16,900 3½ per cent Conversion Stock	11,140 3 6
£37,600 15 0	33,715 3 6
XII. Cash Balances— In Bank on Current Account	£5,781 6 9
In Savings Bank	2,040 2 0
On Hand	144 18 11
	7,966 7 8
	£57,066 8 8

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

ROBERT MACDONALD, C.A., *Approved Auditor.*

**Distribution of Membership
as at 31st March 1952**

Aberdeen . . . 20	Fife 32	Perth 22
Angus 35	Inverness . . . 4	Renfrew 4
Argyll 2	Kincardine . . . 2	Ross and Cromarty. 12
Ayr 18	Kinross 3	Roxburgh 13
Banff 2	Kirkcudbright . 3	Selkirk 2
Berwick . . . 36	Lanark 29	Stirling 9
Bute 1	Linlithgow . . . 14	Sutherland 2
Caithness . . 8	Midlothian . . . 109	Wigtown 6
Clackmannan . 2	Moray 10	England 36
Dumbarton . . 4	Nairn 1	Ireland 3
Dumfries . . . 11	Orkney 3	Abroad 6
East Lothian . 75	Peebles 4	
	Total <u>543</u>	

**List of Members elected since
31st March 1951**

BARCLAY, WILLIAM (W. Drummond & Sons, Ltd.), Stirling.
 BLACK, DAVID, 16 Railway Place, Montrose.
 DAWSON, J. LESLIE, B.Sc. (The Angus Milling Co., Ltd.), West Craigton, Peterculter, Aberdeen.
 DUNCAN, G. F., Waterton, Elgin.
 ELLIS, JOHN, Crookmore, Alford.
 FASCIONE, F., 203 Great Junction Street, Edinburgh.
 GRANT, J. W., B.Sc., North of Scotland College of Agriculture, 3 Union Street, Inverness.
 HAMILTON, WILLIAM, Phantassie, East Linton.
 MAKEPEACE, NEVILLE (R. Carmichael & Sons), 64 High Street, Coldstream.
 MILLER, DAVID, Moatmill, Tealing, Dundee.
 MUIR, JOHN, Freelands, Ratho.
 NICOL, JOHN D., Bankhead Farm, Windygates.
 PALMER, JOHN D. (Miln & Co. (Seedsman), Ltd.), Boughton, Chester.
 PETERKIN, DONALD, Kinchyle, Scaniport, Inverness.
 SUTTON, F. W., N.D.A. (British Sugar Corporation, Ltd.), Cupar.

III. ADMINISTRATION

Finance

The audited accounts for the year ended 31st March 1952 and Balance Sheet prepared at that date appear on the foregoing pages and give full particulars of income and expenditure during the year and the Society's financial position at 31st March.

Ordinary maintenance expenditure was higher than for the previous year and the excess of ordinary expenditure over ordinary income, amounting to £313, os. 4d., was met from accumulated unexpended balances of Government grants.

Expenditure on construction work at Seafield and Dryden, amounting to £4514, 3s. 10d., was met by a Capital grant from the Department of Agriculture for Scotland.

Capital income, not accountable in reckoning the amount of Government grant, amounted to £149, 14s.

The Society's investments are valued at cost price. The market value on 31st March 1952 compared with that on 31st March 1951 shows a reduction of £5380.

The Directors tender their thanks to the Department of Agriculture for Scotland and the Sugar Beet Research and Education Committee for grants received during the year. They also wish to record their appreciation to individuals, firms, and organisations who gave donations for their generous recognition of the value of the Society's work.

Membership

During the year 23 members died or resigned and 13 new members were elected. Lapsed memberships numbered 34. At 31st March 1952 the total membership was 543, comprising 188 life members and 355 annual members.

Donors of £10 and over are entitled to become life members without further payment. Donors of £5 may become members of the Society by payment of a reduced annual subscription of 5s., the standard annual subscription being 10s.

The Scottish Society for Research in Plant-Breeding is

recognised as an approved Research Association for the purposes of Section 27 of the Finance Act, 1944, and members are reminded that an agriculturist may regard payments to the Society as an expense in his accounts in respect of income tax.

Obituaries

Through the death of Major R. F. Brebner, C.B.E., on 30th April 1952 the Society lost one of its Directors. Elected to the Board of Directors in 1937 Major Brebner took an active interest in the work of the Society and remained a Director until his death. The Directors wish to record their sincere appreciation of his valuable services.

The Directors also record with regret the death on 27th April 1952 of Dr F. Earnshaw, who since his appointment to the staff in 1949 had been engaged in genecological research. Sincere sympathy is extended to his widow and children.

Staff Changes

The appointment of Mr R. J. L. Gallie to succeed Mr R. M. Lemmon on 1st August 1951 gave to the Society its first full-time Secretary.

The Directors wish to express their gratification for the long and friendly association between the Society and The Royal Highland and Agricultural Society of Scotland, and particularly for the valuable service rendered by Mr Lemmon.

Dr J. C. Haigh left the service of the Society on 30th September 1951 to take up an appointment at the National Vegetable Research Station, Wellesbourne, Warwick. In view of the limited accommodation at Boghall Sub-Station, it has been decided that the appointment of a successor to Dr Haigh should not be considered until the Plant Breeding Station has moved to the new site at Seafield.

Mr A. McFarlane, engaged in potato breeding work, was promoted Senior Assistant (Scientific) and Mr W. Brown was promoted Assistant (Scientific) with effect from 1st September 1951.

Miss R. Jackson, Typist, was appointed in October 1951 to take the place of Miss J. K. Gordon, who left the Society's service to be married.

Seafield

The work of constructing the buildings has made steady progress. Two workmen's cottages are almost complete and the foundations of the main block of buildings have been laid. An application has been made to the Edinburgh Centre of Rural Economy for permission to erect workers' houses at the community in Bush Estate.

Maintenance of Virus-free Stocks of Potatoes

The Society has acquired the use of land from Mr William Mitchell, West Loch, Eddleston, to accommodate virus-free potato material. This followed discussions with the Department of Agriculture for Scotland, who had already established virus-free stocks there; and the Society is indebted to the Department for their offer to share the facilities provided by Mr Mitchell.

IV. SCHEMES FOR THE MULTIPLICATION AND MARKETING OF PLANT BREEDING STATION PRODUCTS

The Directors of the Society have from time to time considered the problem of introducing Plant Breeding Station productions to the market in the best possible way. In 1934 the possibility of forming a Company for the purpose was examined, but for a number of reasons such a project was deemed impracticable.

A scheme has now been formulated which will function on an experimental basis and is designed to utilise the experience and facilities of members while avoiding the need for the Society to engage in commercial marketing. Official agents have been appointed from the membership for handling varieties allocated to them, and they will be the sole recipients of seed from the Plant Breeding Station. The proposal was examined in detail by the Research Committees to ascertain how it affected varieties under their charge, and the Directors have accepted the Committees' recommendations.

Cereals

In considering the appointment of agents to handle cereal productions of the Plant Breeding Station it was necessary to consider the wide commercial interest in oats, together with :—

- (a) The application of the Government Seed Oat Certification Scheme to certain Plant Breeding Station oat varieties.
- (b) The ineligibility of certain varieties for the Government Scheme.
- (c) The handling of cereal productions other than oats—*e.g.*, Craigs Triumph Barley and Albyn Tick Bean.

It has been decided that the conditions governing the appointment of agents to handle oat varieties will be as follows :—

- (a) An agent appointed by the Society shall either be a member or be represented by a member of the Society.

- (b) The Committee will review the operation of the scheme annually and will satisfy itself that the best interests of the Society and agriculture generally were being upheld by the agent handling the cereal variety in his charge.
- (c) The Directors shall reserve the right to terminate the appointment of an agent at any time, although it is expected that appointments will normally be of long duration.
- (d) Normally only one Plant Breeding Station cereal variety shall be allocated to an agent; he may, however, be asked to accept in addition a variety which has a limited appeal on the market.
- (e) An agent shall endeavour to preserve his Raiser's Stocks against total loss by growing them in not less than two separate districts; wherever possible he shall give to members of the Society occupying farms the opportunity to grow his Raiser's Stocks.
- (f) In the case of oats an agent shall be bound to purchase from the Society each year such available quantity of Elite seed produced by the Society from a maximum of two acres at a price double the price for milling oats prevailing at Edinburgh Corn Market on 31st December.
- (g) Where an appropriate Department of Agriculture for Scotland Seed Certification Scheme in respect of a cereal operates, an agent shall be obliged to enter for certification the Raiser's Stocks of the variety allocated to him provided such a variety is eligible for certification. In the case of varieties which are ineligible an agent shall be expected to raise his stock in reasonable conformity with the Department of Agriculture for Scotland Seed Oat Certification Scheme, and these stocks will be inspected by the Department of Agriculture for Scotland. (In this connection the Department of Agriculture for Scotland has agreed, as the Plant Breeding Station is a State-aided Institution, to inspect Raiser's Stocks of the Society's varieties which are ineligible for certification under the Seed Oat Certification Scheme.) For cereals other than oats, the staff of

the Society or any persons appointed for the purpose by the Society shall be free to inspect and report on an agent's Raiser's Stocks.

- (h) No seed of a Plant Breeding Station variety shall be sold as Raiser's Stock which is more than two generations removed from Elite seed, but an agent with the consent of the Committee may hold back a portion of his second-generation Raiser's Stock to make good a failure of his first-generation crops.
- (i) **Applications from members for seed of Raiser's Stock shall receive priority provided they are received by the agent on or before 30th November.**

In the event of a dispute arising it shall be settled in accordance with the Rules 56 and 57 of the Society.

To ensure that all members interested in marketing oats were provided with the opportunity to apply for an agency a circular was issued inviting applications. From replies received the Directors decided after careful consideration to appoint the following as official agents :—

BELL	Messrs Macfarlan, Shearer & Co., Greenock.
ALBYN DONSIDER	} Scottish Agricultural Industries, Ltd., 35 Charlotte Street, Leith.
CRAIGS AFTERLEA	
EARLY MILLER	Mr George Clapperton, Sheriffhall Mains, Dalkeith.

The Directors also appointed the following agent :—

ALBYN TICK BEAN	Messrs Roughead & Park, Ltd., Haddington, East Lothian.
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As these varieties have a limited appeal on the market the terms of agencies for handling them are a matter of arrangement between the Society and the agents, the Society retaining a supervisory interest.

Herbage Plants

The Herbage Committee decided that, as a prerequisite of the scheme, the title "Elite" should be applied to crops now designated as "Stock," thus making three instead of the present two categories of authenticated seed. There would then be the following classes of Seed Crop :—

- (a) Elite Crops—Plant Breeding Station Foundation Stock.
- (b) Stock-Seed Crops—Raiser's Stocks derived directly from Elite Seed.
- (c) Crops eligible for Certification—derived directly from Stock Seed.

The effect of this change would be to increase the number of crops eligible for inspection under the Grass Seeds Certification Scheme operated jointly by the Society and the National Institute of Agricultural Botany.

The Committee found it particularly difficult to formulate conditions which would not have the effect of prejudicing the interest an agent would wish to have in varieties allocated to him. The fluctuating perennial demand for and the rather specialised nature of seed of Scotia strains make it difficult to arrange agencies for these grasses. In these circumstances it was considered advisable that the terms under which an agent would function should be experimental and subject to adjustment between the agent and the Society as was thought desirable from time to time. However, it was decided that the Society should continue to supervise the growing of Elite crops in co-operation with the National Institute of Agricultural Botany and the cleaning of the seed should be done by an approved firm and that the agent should be obliged to buy from the Society an agreed quantity of Elite seed at a price to be arranged between the Society and the agent. The agent would be given the exclusive right to multiply and sell his "Raiser's" Stock, but would require to enter his crops for field inspection by the certifying authority. A Stock-Seed Certificate may be issued for an agent's "Raiser's" Stocks.

It was further decided that applications from members for stock seed should be sent direct to the agent and that no special price concessions or priority on purchases of seed by

members could be given by the agent. The Directors appointed Messrs David Bell, Ltd., 15 Coburg Street, Leith, official agents of the Society for handling the Plant Breeding Station varieties Scotia Cocksfoot and Scotia Timothy.

*Certification Scheme for "Scotia" Strains of Cocksfoot
and Timothy*

The need has been evident for defining conditions which will govern the issue of the Society's certificate in respect of Scotia strains of grasses.

The Directors accordingly have decided that seed of Scotia strains of Cocksfoot and Timothy will be certified by the Scottish Plant Breeding Station, provided that :—

- (a) the crops have been grown from stock seed supplied by the Society or its agent ;

Note.—So long as a sward, established from stock seed, remains down a crop taken at any time during its life is eligible for certification.

- (b) the crops have been field-inspected and found satisfactory ;

Note.—Crops will be field-inspected by the National Institute of Agricultural Botany and the results of inspections will be notified to crop owners by the Scottish Plant Breeding Station.

- (c) the purity and germination of cleaned seed have been determined by an official Seed Testing Station, and samples are found to have a maximum total weed-seed content not exceeding 0.5 per cent.

Note.—Seed samples of not less than 2 oz. from each field-recommended crop may be sent to the Secretary, Scottish Plant Breeding Station, Craigs House, Corstorphine, Edinburgh 12, who will arrange to have them tested by the Seed Testing Station, Corstorphine, Edinburgh, the fees to be paid by the owner.

Pre-inspection of Fields.—The importance of isolation of fields and their freedom from weeds cannot be too strongly stressed. A seed field should not adjoin fields in which other

strains of the same species will be allowed to come into head ; at least 200 yards should separate the seed crops from such fields. At the latest, fields should be inspected before ploughing.

Pre-inspection of fields by the National Institute of Agricultural Botany can be arranged either through the Scottish Plant Breeding Station on request direct, or with the National Institute of Agricultural Botany, Cambridge.

Inspection of Growing Crops.—For the convenience of owners, forms of application for inspection of seed crops may be had from the Secretary, Scottish Plant Breeding Station, Craigs House, Corstorphine, Edinburgh 12, and completed forms should be returned as early in the season as possible, but, in any case, not later than 30th April.

Potatoes

In dealing with potatoes the Potatoes Research Committee were faced with different considerations.

Once placed on the market, new potato varieties cease to be under the control of the producer or agent, but it was agreed that the Society would maintain a virus-free nucleus of each variety which would be made available to agents for the purpose of producing virus-free stocks should that be necessary.

After careful consideration it was decided that :—

- (a) An agent should be a potato merchant.
- (b) Since it is the policy of the Society only to market varieties which have been registered by the Department of Agriculture for Scotland, agents would handle registered varieties only.
- (c) On registration a variety should be assigned to an agent and he should be supplied by the Society with the produce of half an acre, provided the crop had received a Stock-Seed Certificate.
- (d) On receiving a variety an agent might be permitted to multiply the stock for a further two years before distributing, but the terms of multiplication would be a matter of arrangement between an agent and the Committee. An agent would thus be a multiplier as well as a distributor.
- (e) The price of foundation stock handed over to an agent

should be settled by negotiation between the agent and the Committee.

- (f) An agent's selling price of a new variety on the market should be agreed between the agent and the Committee. It would be impracticable, however, for agents **to give price concessions to members of the Society, but priority in distribution could be given provided applications were received by the agent before 30th November.**

As two new productions only had yet to be marketed—namely, Pentland Ace and Craigs Alliance—the Directors decided to appoint the following as official agents:—

PENTLAND ACE	.	.	Messrs W. J. Campbell & Miller, 2 Charlotte Square, Edinburgh.
CRAIGS ALLIANCE	.	.	Sir James Denby Roberts, Bt., Strathallan Castle, Auchterarder.

V. RESEARCH PROGRAMME

Cereals

Oats

The projects of the oat breeding programme are for the most part of a long-term nature, and hybrid material from upwards of thirty different crosses, many of them made during the war years, was examined and selections continued with the object of combining earliness of ripening with high yield and resistance to lodging.

The problem of breeding an oat capable of being grown on alkaline soils has continued to receive attention, and unfixed material of a number of hybrids produced for this purpose has been sent to the County Organisers at three centres—Tiree, Uist, and Orkney—for trial and selection under alkaline soil conditions. The unfixed hybrid 0532 from the cross *A. byzantina* × Quality was tried at these centres in 1951 and gave a very satisfactory crop at the first centre. In Uist, where the soil is highly alkaline, pH 7.5-7.8, the crop failed in the early spring, but the variety is being tried again at this centre in 1952. No report has been received from Orkney.

Some of the hybrid selections which have shown a high level of autumn dormancy under greenhouse conditions over a number of years were included with other new varieties in a replicated trial at the Plant Breeding Station in 1951. Statistical analyses of grain and straw yields, of height and maturity, and of grain size, shape, and other characteristics were carried out. Owing to the great differences in soil fertility occurring within the trial area, the experimental error was high, and, while significant differences were recorded in these characteristics, the difference required for significance was, in most cases, too high to permit of any comparison between oats of similar type. An interesting feature of the trial, however, was the high yield of grain obtained from the polyploid oat, *Aa A18*, produced at this Station by colchicine treatment in 1945. This variety, at 29.2 cwt. per acre, outyielded all the other varieties in the trial, including the control varieties Sun II. 28.8, Yelder 25.8, Onward 25.5, and Star 25.2. With a difference between the varieties of 4.7 cwt. required for significance at the 5 per cent level these differences are not

significant, but the results suggest that *Aa* A18, which ripens some four days earlier than Sun II., may be useful as a feeding oat, the grain being too large to be very popular for milling.

Stocks of the varieties which had completed a series of trials at the Plant Breeding Station and were considered worthy of extended regional trials were distributed to the Agricultural Colleges in Scotland and the National Institute of Agricultural Botany in England. As a result of the reports received and from observations at the Plant Breeding Station the selections *Aa* 704 and *Aa* 714 have been discarded.

The variety *Aa* 727, distributed for trial as a general-purpose oat, has been withdrawn from trials in this category on account of a very weak straw, but reports to date suggest that under low fertility conditions where no lodging is likely to occur, this variety may be capable of giving a relatively high yield of both grain and straw. Further trials are proposed to follow up these indications. The remainder of the varieties distributed are being continued for another year.

Of the varieties which have been in regional trials over a considerable period the variety *Aa* 676 was considered to have established itself as an early-ripening, short-strawed oat of the Potato type, giving a slightly higher yield of grain than Potato oat when tried against it in the Donside area of Aberdeenshire. The usefulness of this variety was considered to be limited, but in view of the demand for it from this area the variety was given the name "Albyn Donside" and is to be marketed under that name.

Attention has again been paid to the work on the experimental production of polyploids by means of colchicine and acenaphthene and to the synthesis of new types by inter-specific hybridisation. The method of acenaphthene treatment which has proved satisfactory for the duplication of the sterile hybrid 0582, *A. barbata* \times *A. strigosa*, is the subject of a separate note (see page 45). The following induced polyploids are now available: Tetraploid—*A. strigosa* (4x); Hexaploid—*A. barbata* \times *A. strigosa* (6x); Octoploid—*A. sativa* \times *A. strigosa* (8x); and Duodecaploid—*A. sativa* (12x).

Wheat and Barley

Four acres of the Station selection of winter wheat, Scottish Iron III., were grown, but there is no demand for seed of

this variety and the whole was sold for milling. No breeding work with wheat is now being carried out at the Station, though a museum collection of spring and winter wheat varieties is being maintained.

Stocks of Craigs Triumph barley and of an unnamed short, stiff-strawed selection (*Ac* 370) were grown, and in the case of Craigs Triumph the produce found a ready sale. *Ac* 370 has been distributed for regional trial.

Herbage Plants and Genecology

That different cultural environments change the competitive inter-relationships of the species components of mixed swards is well known, but the possible effects upon production of competition between strains of the same species is not so widely appreciated. The investigation conducted by the Society to explore the possibilities of the complementary use of intensively cultivated and natural herbage affords an example of how the potentialities of a specialised system of grassland farming may be affected by changes occasioned by intra-specific competition. One of the essential features of this system of herbage utilisation is the liberal application of nitrogen to the cultivated grass in order to produce a protein-rich diet during the period mid-April to early June. As no single strain was found to be capable of adequately satisfying this primary requirement throughout the whole period, mixed swards comprising early, second-early, and late strains of perennial ryegrass were next employed. But again the timing of production was unsatisfactory, for as the swards aged the yield of early herbage fell to a relatively low level. Since the cause was suspected to be due to changes in the strain representation in these mixed populations the competitive relationships between ryegrass strains of different maturity and plant-size type were examined.

In one of these tests a series of three swards of the following composition was sown: (1) a mixture of equal numbers of viable seeds of an early and a late strain of similar plant size; (2) and (3) pure cultures of the respective types. Sampling of the mixed sward at the end of the seeding year followed by growing-on tests revealed an establishment of 52 per cent early and 48 per cent late varieties. For the next four years

the three swards received the same treatment—very liberal nitrogen manuring in March, close grazing throughout April, followed by a second heavy manurial dressing, a rest during May, and the taking of a silage crop in early June. During the autumn of the fourth year of treatment all three swards were sampled, and it was found that in the mixture early variates represented only 6 per cent of the total population, though in pure culture the early strain had successfully maintained itself.

In another test of a similar kind a late strain of small plant size was substituted for the one of large size. Initial establishment in the mixed sward was 56 per cent early, and at the final sampling 74 per cent early and 26 per cent late; a reversal of the previous result. Again the pure cultures retained their respective characteristics.

Thus in the agronomic sense these mixed swards, in contrast to the pure cultures, had both deteriorated, as neither of them was in the end fulfilling the purpose for which it had been sown. It is possible that in many general-purpose swards, natural as well as cultivated, similar selective influences operate intra-specifically without so obviously affecting the efficiency of an agronomic practice. There is no doubt that strain defects which measurably impair production when treatment is intensive may well pass unnoticed when cultural conditions happen to be less exacting.

Under specialised systems of grassland farming the timing of production is of paramount importance, and it is in this connection that specialised grass strains are likely to be of greatest use; but in view of the foregoing results, not necessarily as components of mixed swards. In the breeding of special-purpose strains it is essential to know the merits and demerits of existing strains for particular cultural environments so that the programme can have definite objectives. For instance, in the case of the early strains employed in the complementary experiments referred to above, the shortness of the interval between the start of spring growth and the time of ear emergence, and the continuance of ear production over a long period were clearly defects of importance to the practical operation of this system of intense cultivation. Then again the potentialities of late ryegrass as a summer silage crop could not be fully realised on account of the dense growth-habit which makes cutting difficult under heavy nitrogen

treatments. In the current breeding work attempts are being made to remedy these defects.

The genecological investigations which were interrupted during the war were restarted at the time of Dr Earnshaw's appointment to the Herbage Section in 1949. Owing to Dr Earnshaw's much regretted death these studies have once again had to be curtailed pending the appointment of a successor. This work was not designed to answer any specific agronomic question, but had as its object the accumulation of data relating to the influence of environmental factors, and especially phytosocial factors, upon population dynamics, information so necessary to an understanding of the changes to which natural grazings are liable. Dr Earnshaw's approach was essentially exploratory and not restricted to any narrow field of investigation, and for that reason his results will be valuable as a guide to future work.

Hill grazings comprise a number of well-recognised floristic communities of differing economic value and, while each type of community is the resultant of a particular complex of environmental factors, it is by the assessment of the influences of given factors upon the individual components that an ultimate understanding can be obtained of how to change communities in a desired direction. These are practical matters which are being investigated in connection with other problems bearing upon the utilisation of natural vegetation, and which will be helped by the more academic approach outlined above.

Potatoes

The primary concern of the potato breeding work is the combination in commercially acceptable varieties of resistance to as many diseases as possible. In the past, particular attention has been directed towards the accumulation of qualities of resistance to blight, viruses A, X and Y, and the leaf-roll virus.

In connection with the problem of resistance to blight (*Phytophthora infestans*) in potatoes, isolates of the fungus obtained from Scotland, England, Belgium, Kenya, Southern Rhodesia, South Africa, and Peru were examined and found to contain three new biotypes. These, together with the

seven strains previously isolated, extended the scope of the work and made it possible to formulate a comprehensive scheme of inter-relationships between the genes controlling hypersensitivity in the host and the biotypes of the pathogen. This scheme, while including all the known biotypes, envisages several additional forms capable of differentiation by the host genotypes that have been produced. It illustrates the relationships between sixteen genetically different hosts and sixteen different strains of the parasite (ten known strains and six theoretical). By means of this classification it is possible to calculate the segregation-ratios to be expected from the mating of any pair of genotypes when infected with any strain or group of strains of the pathogen.

Each strain, being adapted to a particular *Solanum* genotype, which presumably is its natural host, is more prolific on it than on any other. The natural host of the common strain is *S. tuberosum* in relation to which it appears more virulent and causes more damage than any of the specialised strains so far examined. The evidence indicates that specialised strains with the widest host range are least virulent in relation to commercial varieties of *S. tuberosum* and would be unlikely to survive under natural conditions in competition with the more prolific common strain. It seems clear that these new strains would not have been found if hypersensitive varieties, against which the common strain is impotent, had not been bred. Thus new resistant varieties provide the means of isolation, multiplication, and identification of new biotypes which probably arise frequently in crops of *S. tuberosum*, but which would otherwise remain undiscovered.

In order to compare the strains of blight occurring in other countries and the genetic constitution of the breeding material employed, arrangements were made with Dr Mastenbroek in Holland and Professors Reddick and Peterson in U.S.A. to exchange differential host series and records of the reactions induced by local strains. The results show that no new genes were present in the Dutch or American hybrids and that specialisation in *Phytophthora* follows the same pattern in each of the three countries.

The continued appearance of new strains of blight suggests that permanent resistance, through hypersensitivity, may not be possible, at least in certain climatic areas. No definite conclusion can, however, be reached until the full range of

genotypes have been bred and adequately tested. While this aspect of the problem is being actively pursued, some attention is also being paid to field resistance which, although only partial, has the advantage of remaining unaffected by parasitic specialisation.

The prospect of breeding commercial varieties resistant to eelworm (*Heterodera rostochiensis*) has greatly improved by the discovery in certain lines in the Commonwealth Potato Collection of a high degree of resistance to this pest. On the initiative of the Agricultural Research Council material has been made available to the Society and an intensive breeding programme is planned for the coming season. An eelworm-infected plot of suitable size has been provided by the College of Agriculture for this work.

The Registration Trials in 1951 contained twenty of the Society's selections, two of which were included in the 3rd-Year, six in the 2nd-Year, and twelve in the 1st-Year Trials. All these seedlings were field immune from the common strain and from certain specialised strains of blight, and nine of them were field immune from virus X. The Registration Committee recommended that five of the selections in the 1st-Year Trials and one in the 2nd-Year Trials should proceed to the 2nd- and 3rd-Year Trials respectively in 1952, and that one of the selections in the 3rd-Year Trials—viz., 1253a(12), should be named and registered. This variety, now known as "Pentland Ace," was bred from the three species *S. Rybinii*, *S. demissum* and *S. tuberosum*, and was selected from a 4th-generation progeny. The official description of Pentland Ace is as follows:—

Maturity—Second early.

Tuber—Long oval, skin white, develops a pink coloration on exposure, flesh pale lemon, eyes shallow to medium, sprouts pink.

Foliage Type—Haulm of medium height, upright; stems thin, round, mottled bronze, branched, straggling towards maturity; wings small, straight or occasionally waved at top; leaf small, midrib tinged brown at bases of leaflet stalks; leaflets small to average size, rounded, thick, dark green, slightly glossy, slightly rough; secondary leaflets small and not numerous.

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Flower—Pink, small infrequent ; buds small, tinged pink, slightly hairy ; inflorescence stalks green, inconspicuous.

Remarks—Cropping good ; cooking quality good ; field immune from viruses X, A and B., and from blight strains A, B, and C. Registered in 1951.

In 1951, multiplication plots of approximately half an acre each of Craigs Royal, Craigs Alliance, 1085(6) and 1253a(12) (Pentland Ace) were grown on contract in Aberdeenshire. A similar quantity of a virus-tested stock of Craigs Alliance was also grown at Strathallan through the kindness of Sir James Denby Roberts, Bt. Arrangements have been made for the further multiplication in 1952 of Pentland Ace in Aberdeenshire and of Craigs Alliance at Strathallan.

Small virus-tested stocks of five of the Society's named varieties and eight unnamed selections were grown at West Loch in 1951, where it is expected to multiply and maintain them in virus-free condition. Arrangements have also been made for selections which have been raised in the greenhouse under insect-proof conditions to be grown at West Loch. The Society is indebted to the Department of Agriculture for Scotland for helpful co-operation in arranging these facilities.

As in previous years, samples of tubers and seeds were again sent to centres in many different countries overseas for experimental and trial purposes. In the tropics, where conditions tend to favour the spread of diseases such as *Phytophthora* blight, *Alternaria* blight, mosaic and leaf-roll, a number of hybrids have given encouraging results. A few are now grown commercially.

In continuation of investigations into the nature and inheritance of resistance to potato viruses, further studies have been made upon strains of virus X in relation to hypersensitive response and field immunity. Four strains of the virus have claimed particular attention, three strains of German origin because of their ability to kill potato varieties carrying one or both of the genes Nx and Nb, and one strain of American origin because of its failure to kill a number of varieties carrying both genes. These relationships between strains and genes are outwith those recorded for any strains hitherto examined, and it would seem that in evolutionary sequence the German strains are more primitive and the American strain is more

advanced than the strains of virus X which have so far been recovered from Scottish potatoes. For these reasons they are all of considerable academic interest. In addition, however, serious practical significance is attached to the American strain in view of its potentialities as a source of danger to established varieties which are field immune from the local strains of the virus.

None of these strains, nor indeed any strain yet tested, has overcome completely the immunity of U.S. seedling 41956. From an investigation into the nature of this immunity evidence has been obtained to suggest that it is due partially, if not entirely, to hypersensitive response. Macroscopic symptoms of this response were observed in small, discrete, necrotic spots on the leaves borne by the axillary shoots of young immune seedlings which had been grafted with X-infected scions. In no case did a full, systemic, necrotic disease develop on such plants, and tubers taken from them have been invariably free from the virus introduced.

Following upon reports that immunity from virus X had been recognised within the species *Solanum acaule*, tests by sap inoculation and grafting were carried out on fourteen lines of this species and on two lines of the related species *S. depexum* made available from the Commonwealth Potato Collection. Immune responses were found in two lines of *S. acaule*—C.P.C. 379.1 and 2106.1—the parents of the former being apparently homozygous and the latter heterozygous for the character. In other lines necrotic reactions similar to those conditioned in some species by the gene Nx were observed. They occurred in all seedlings derived from C.P.C. 2060.2, 2112.3, 2113.2 and 2114.3, but in only a proportion of the progenies C.P.C. 2104, 2108.3, 2109.3, and 2111.1. The remaining six lines—C.P.C. 1167.1.1, 1168.2, 2105.3, 2107.2, 2110.2, and 2118.3—contained seedlings which responded to infection with mosaic reactions only.

Studies on the inheritance of necrotic responses to virus Y were continued in an examination of tetraploid material derived from *S. demissum*, C.P.C. 2167, *S. simplicifolium*, C.P.C. 51a, and cultivated varieties. Throughout the material similarities in response to infection and in segregations have led to the view that in all three sources similar, if not identical, genes are in control of reaction to virus Y. It is considered, therefore, that the two exotic species have no special value

in breeding for resistance to virus Y. On the other hand, the relationship between necrotic reaction and resistance to virus Y in the species of *S. Rybinii* and the family *Longipedicellata* has been found to persist in seedling progenies. It now seems clear that this resistance has its basis in hypersensitive response of a type which closely resembles that recorded above in relation to immunity from virus X.

Several field trials laid down from 1948 to 1950 to assess field resistance to leaf-roll and virus Y were completed during the year. From the material concerned eleven seedlings were selected as being of potential value in further breeding: four on account of their high level of resistance to leaf-roll and seven for their resistance to virus Y. A further thirty seedlings were selected from preliminary trials for extended tests under intensive conditions of infection.

In the laboratory, tests for the detection of hypersensitive responses to viruses X and Y were applied to over 1200 plants and upwards of 10,000 plants were examined for the presence of A, X, and Y viruses.

An investigation was initiated into the spread of virus X in a number of commercial stocks of Majestic, all of which have been derived from a common parental stock. Tests made during the year confirmed the initial similarity of the stocks with regard to content of virus X, and indication was obtained that environmental factors affect markedly the expression of disease symptoms and probably the rate of spread of the virus also.

Studies on a stunting disease of potato found in a commercial seed crop of Majestic have lead to a tentative diagnosis of unmottled curly dwarf, a virus disease of which there is apparently no previous record in Scotland.

A disease which, in 1949, appeared late in the season and spread rapidly in experimental plots of the varieties Arran Victory and Kerr's Pink has been identified as the virus disease Witches' Broom. No further spread of this disease was observed during 1950 or 1951, and although transmission of the disease by graft transfer has been made, no insect vector has yet been found.

Root Crops and Other Brassicas

In the past the work of this section has been concerned with the breeding of swedes and to a lesser degree with intercrossing and selection among kales. It has now been decided that the Station shall undertake a more extensive investigation of the genus *Brassica* with a view to exploring more fully its agronomic potentialities. Before he left the Station Dr Haigh had collected seed of some Asiatic species of *Brassica* which have been developed as vegetables, and steps are being taken to collect more material. Meanwhile seed of a number of forms has been sown out for preliminary observation.

Swedes

Yield Trials.—Attention may be drawn to some paradoxical results obtained in two yield trials and apparently due to an unusual autumnal drought. The trials occupied adjacent areas and were sown on 9th and 10th May, but trial 51/1 was tested and harvested in October; while trial 51/2 was kept until December. The prolonged drought in September and October apparently caused the roots of trial 51/1 to have very high dry-matter percentages although they were quite well grown. Subsequent increase in the water content had increased the yield but lowered the dry-matter percentage when trial 51/2 was tested. The point may be illustrated by comparing the three control varieties which were used in both trials:—

Estimate	Dry-matter per acre in cwt.		Dry-matter percentage		Root yield per acre in tons	
	51/1	51/2	51/1	51/2	51/1	51/2
Victory .	65	69	12.1	11.0	28	32
Champion .	58	67	12.3	11.3	23	39
Aberdeen .	58	62	13.4	12.2	21	26
MEAN .	60	66	12.6	11.5	24	29

The early variety Victory usually gives 10 per cent or less dry matter in Station trials.

Strain AFT.—The work was continued on strain AFT or Ds 32, which is under consideration as a winter-hardy, purple-top of good yielding capacity. In a trial harvested in November AFT yielded best of ten strains and showed slightly more dry matter per acre than Victory. A good quantity of seed was obtained from over 100 plants in an isolation plot.

Early and Late Selection.—A point of interest was the behaviour in yield trials of two groups of material which were being selected respectively for earliness and lateness of type. A parent generation of each group had been tested in 1949, when conditions were very different from those affecting the succeeding generation. The group selected for earliness was derived from crossings between two old Station strains—viz., ACF \times ABJ—and in 1949 bacterial soft-rot severely attacked a trial in which nineteen lines were being tested.

Although "root" tissue that was apparently sound was tested, the dry matters averaged only 8 per cent, and a sample of Champion, the maincrop control, only showed 9.3 per cent. As there were marked differences in yield between the reciprocal matings, one was discarded and the other, AMN, was extensively selected and propagated. Trial 51/1 contained eight units of AMN: five of which were progenies of one of the best lines of the 1949 trial, AMNaAb. These five occupied good positions in order of merit, and were about equal to the Victory control in yield of dry matter. Their percentages of dry-matter ranged from 12.2 to 13.6, in contrast with the 8.1 per cent of AMNaAb, the parent generation. Without checking against the controls, the results of either year would be most misleading.

Selection for lateness, or rather for hard types of "root" with high percentage of dry matter, was carried out on group ANM, derived from a cross between Excelsior \times Stirling Castle, and this selection failed in its object. In 1949 five lines of ANM were included in a trial which was tested and weighed late in the season. There were fewer signs of soft-rot in this trial, but the dry-matter percentage averaged only 9.9. Four of the ANM lines were about average, and one was relatively high with 11.2 per cent. In 1951 ten units which were not actual descendants of the above were tested, and nine of them were above average in yield of dry matter but below average in percentage, while the tenth yielded poorly. So far selection in this group has tended to isolate larger and softer types.

Clubroot Resistance.—The search for resistance among the Station material was continued, and in one test a line of the above-mentioned cross, ANM, showed remarkable resistance, which was not fully confirmed by a trial later in the summer. Boxes of plants of this line, ANMdmxV, were wintered out-of-doors, and there was a high proportion of survivals, many

of which will be seeded, as also will the survivors of the original clubroot test. That more efficient resistance might be introduced into swede or rape, by gene exchange, is still a possibility, and with this in view numerous attempts were made to cross tetraploid races of kale and The Bruce turnip, but with no success so far.

Kales

The kale material for testing in 1951 comprised a new strain called "Hybrid Kale" from New Zealand, some leafy marrow-stem kales and crosses, the inbred lines of thousand-headed kale \times broccoli and perpetual \times curly kale, and various back-crossings and other hybrid progenies. A small trial was sown out and left in unthinned rows, while various samples with few seed were sown in seed-beds and later transplanted into trials.

Unthinned Sowings.—The progenies of several pairs of plants which had been seeded in isolation plots were examined. Most of the plants were definite crosses, and selections were taken from those progenies which appeared to yield better than the parent lines. Six lines were sown out in a latin square, and the average yields are given in the accompanying table:—

Form and Strain	Ratio Lf : St.	Yield per acre in cwt.		
		Gross	Leaf	Stem
Thousand-headed Kale—				
Inbred Line, T5	3.30 : 1	369	283	86
Variety	2.32 : 1	372	259	113
N.Z. "Hybrid Kale"	1.72 : 1	410	259	151
Marrow-stem Kale—				
Variety	0.92 : 1	416	197	218
Leafy \times Normal, M32	0.98 : 1	407	201	205
Leafy Strain, M34	1.35 : 1	402	231	171

The New Zealand "Hybrid Kale" appeared to be a leafy form of marrow-stem. Its gross yield was similar to those of the marrow-stem strains, but, as the proportion of leaf to stem was higher, the leafage, which was somewhat un-uniform in character, was as great as in the case of thousand-headed kale. The stems were fully as tall but more slender than those of typical marrow-stem, but quite unlike the leafy strain M 34, which has a short, stout stem. The F_2 generation (M 32) of a cross between a plant of M 34 and a normal, showed a low ratio, and this had also been found when the F_1 was examined

in a previous trial. The inbred line of thousand-headed kale, T5, had very little stem and a good yield of leaf.

The weighing of this trial was extended over twelve weeks, half-plots of one replication being cut each week for the first six weeks and then the remaining halves. All the strains except T5 increased in gross weight between the first cutting, 11th September to 9th October, and the second period, 16th October to 19th November, but only the New Zealand strain developed more leafage, for the others increased in stem length but actually diminished in yield of leaf, probably due to leaf-fall.

Transplanted Kale Trials.—Fifteen strains were planted out in randomised blocks, but each plot contained only sixteen plants spaced at 24 in. \times 24 in. Plants from each plot were weighed individually in November-December. At that period, and with fully developed plants, the ratios of leaf:stem remained at 2.3 : 1 and 0.9 : 1 respectively for thousand-headed and marrow-stem kales, but the New Zealand hybrid showed an increase and was now 2.1 : 1. Its gross weight was equal to that of marrow-stem, but its leaf weight was greater than in either control. The thousand-headed line T5 again had a wide ratio, 3.2 leaf : 1 stem, but its gross yield was relatively poor. Hybrids of which T5 had been a parent were noted as yielding well.

The other strains in the transplanted kale trial were inbred lines and the progenies of intercrossings. The inbred line derived from thousand-headed kale \times broccoli gave a mediocre performance, but when crossed with T5 the offspring had one of the highest yields of leaf in the trial.

Sugar Beet

The immediate problem in connection with the production of sugar beet strains suited to Scottish requirements is to obtain freedom from bolting. Not only would this permit earlier sowings to be made when weather conditions are favourable, but absence of bolters would also be very desirable in the mechanical harvesting of crops. In 1951, early sowing was not practicable because of a late spring, but even so many crops in Scotland produced undesirable numbers of bolters. There are other improvements to the beet or to its

seed that might be effected, but these are problems of a long-term nature.

Work was continued with the sugar beet research programme undertaken at the request of the Sugar Beet Research and Education Committee of Great Britain. A second generation was propagated from the first group of material to be selected by the Station, and progeny trials were carried out on the offspring of the second group. Testing, selection, and propagation were carried out on non-bolting, sugar beet material bred by the Cambridge Plant Breeding Institute.

Trials, 1951.—Some Cambridge material was sown out in a trial to test resistance to bolting and yield. The control, an ordinary sugar beet variety, bolted to the extent of 11.5 per cent when sown on 6th-9th April, and 2.7 per cent in a later sowing made on the 24th of that month. When sown on the earlier dates, a Cambridge experimental strain had 0.4, and three families had 0.2, 0.8, and 1.3 per cent of bolters respectively. The sixty-four plots of the trial were tested for sugar content and yield of root and top, giving information as to the relative merits of the families. Tetraploid sugar beet produced at Cambridge was also included in this trial. Three other trials were sown out on 13th, 14th, and 19th April to test sixty-three progenies of plants selected by the Station. These had been chosen for a good yield of leaf combined with a well-shaped crown. The shaw types in the progenies were found to be extremely mixed, but a main type could be discerned in some, and when this seemed reasonably good, plants were selected for propagation. The sowing dates of the trials were not early, but bolting did occur, and the control varieties ranged from 4 to 10 per cent. Most of the progenies showed little or no bolting.

Trials, 1952.—The land was in good condition for sowing during much of March and April this year, and consequently it has been possible to make some early sowings of sugar beet on good tilths, and in particular to lay out a trial for the comparison of a Cambridge non-bolting strain with a sample of a commercial variety. In this trial, sowings were made in replicated plots on three dates—11th March, 3rd April, and 16th April—and good stands of plants were obtained after singling in each case. The March sowing was slow to braird, and till June the plants were only slightly larger than those sown on 3rd April, but there was a considerable difference

between these and the plants of the last sowing, which were much smaller. A trial of twenty-five sugar beet samples was sown in two parts, on 19th March and 11th April respectively, but another trial testing smaller samples of seed was sown on 20th March only. The plant stands were more irregular in these trials, probably due to the poor condition of some of the locally grown seed. Some losses were sustained after singling, due to blackleg disease, but very little damage by strangles had been noted by mid-June. Various hybrid lines derived from sugar beet \times garden beet were sown out in trial and observation plots, and also some progenies of American male-sterile sugar beet plants which had been pollinated by non-bolting and other beet.

J. W. GREGOR, *Director*.

R. J. L. GALLIE, *Secretary*.

VI. APPENDIX

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Publications

- BLACK, W. "Inheritance of Resistance to Blight (*Phytophthora infestans*) in Potatoes: Inter-Relationships of Genes and Strains." *Proc. Roy. Soc.*, Edinburgh, B. LXIV., pp. 312-352, 1952.

The common strain and six specialised strains of *Phytophthora infestans* have been employed in testing potato varieties and seedling progenies bred from the wild species *S. demissum* for resistance to the disease. Resistance, due to the hypersensitive condition of the protoplasm, is manifested in the presence of major genes, and four such genes have been identified—viz., R_1 , R_2 , R_3 , and R_4 . Each gene induces in the plant a hypersensitive response to infection with the common strain

and with a particular group of specialised strains of the parasite. The genes are inherited independently in simple Mendelian fashion, but in the segregations three different types of deviations from standard disomic ratios occur due to (a) unpaired chromosomes, (b) incompatibility factors, and (c) partial auto-synthesis. A series of minor genes modify the phenotypic expression of the major gene system and so differentiate grades of hypersensitivity or of susceptibility as the case may be.

The common strain of *P. infestans* appears to be a population persisting at an equilibrium determined by host range and environmental conditions. Mutations frequently occur, but new forms survive only when host genotypes, to which they are specially adapted, are available.

DAVEY, V. MCM. "Fodder Beet in Denmark and Sweden." *Scottish Agriculture*, Vol. XXI., pp. 91-93, 1951.

New forms of fodder beet have largely replaced the mangold in Danish cultivation, and to a considerable extent also in Sweden. Higher concentration of dry matter in the root is desired for stock feeding in Denmark, and importance is also attached to the value of the "top," which is assessed after due allowances have been made for losses in ensilage. Despite reduction in the gross yield of roots, due to diminished water content, the new forms outyield true mangolds in feeding value. The first innovations were simply strains of large-rooted sugar beet, called *sugar-beet-for-fodder*, which are still used to a small extent, for feeding pigs and horses, and for silage of the tops. The *fodder-sugar-beet*, which now occupies two-thirds of the Danish fodder beet acreage, has been bred from hybridisations of mangold \times sugar beet, and includes a range of types intermediate between these parents. The most popular type in Denmark has a shapely root growing rather deep in the soil and containing 17-18 per cent of dry matter. In Sweden a softer type of *half-sugar-beet*, as it is described there, seems to be preferred; the root is long and grows well out of the soil, but has only about 14 per cent of dry matter. In both countries strains of mangold have recently been bred with roots in which the dry matter has been raised to 14-15 per cent, and these are attracting considerable interest.

——— "Methods of Sampling Root Crops." *Edinburgh School of Agriculture*, Bulletin No. 32, 1951.

A contribution to a symposium on methods of sampling and the establishment of experiments.

VII. OCCASIONAL PAPERS

Acenaphthene as an Agent for the Production of Polyploidy in Oats

In a report to 'Nature' (1938), Kostoff described two methods by which plants may be treated with acenaphthene for the production of polyploidy: one being the immersion of the material in a saturated aqueous solution of acenaphthene with excess of crystals, and the other the enclosure of the parts to be treated in a glass tube lined with the crystals; in the latter case the crystals being evaporated from an ether solution on to the walls of the tube.

From this and from other references in the literature it is evident that where acenaphthene had been used successfully, the desired effect was obtained by the presence of vapour from sublimating crystals in the immediate vicinity of the dividing cells of the plant (Navashin, 1938. Kostoff, 1938. Badenhuizen, 1941). In those cases where successful treatment of graminaceous material was reported, treatment had been applied to the germinating seed or early seedling stage of the plants (Gavaudan, Gavaudan and Durand, 1938. Jaretzky and Schenk, 1940).

For the material with which the note is concerned, the triploid hybrid *Avena barbata* × *A. strigosa* (21 chromosomes), treatment at such an early stage was inappropriate, in that only one seed of the cross was obtained, and a method was required which could be applied at a later stage in the development of the plant.

The original hybrid plant was divided by the separation and re-potting of rooted tillers until a number of separate "plants" was established, each beginning to tiller.

The lined tube method of acenaphthene treatment appeared to be the most appropriate for this material, and at the same time the easiest to apply, but instead of enclosing each branch in a separate tube it was found more convenient to treat each "plant" as a whole.

For this purpose a number of clear glass, one-pint bottles were obtained and the bottoms removed by means of a loop of heated wire. The upper portion was then filmed with acenaphthene crystals by depositing them on the inner walls of the bottles from chloroform solution.

On 21st June 1949 a filmed bottle was placed over each of ten "plants" growing in pots in the greenhouse, remaining in position until the end of September. During this period the shoots as they developed grew through the necks of the bottles and out of the influence of the acenaphthene, succeeding new tillers being subject to the vapour as they appeared. When the treatment was discontinued the "plants" were divided and re-potted.

No seed was obtained from the treated "plants" during 1949, but tillers coming to maturity in 1950, and a few as late as 1951, bore seed. A similar series of treatments commenced on 6th October 1950 and discontinued on 13th January 1951 also resulted in the production of seed. Except for seed obtained from acenaphthene-treated "plants" the hybrid had otherwise proved sterile.

In all, forty-two seeds were obtained in 1950 and twenty-five in 1951. Except in one case of a panicle which had six fertile spikelets, these seeds were borne singly or at most two per panicle. Of the forty-two seeds obtained in 1950, twenty-six germinated and developed into fertile plants, of which those examined to date have proved to be amphidiploid (42 chromosomes).

D. CAMERON.

H. D. GARVIN.

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