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Potatoes - Costs of prod. O.S.

NORTH OF SCOTLAND COLLEGE OF AGRICULTURE
School of Agriculture, Aberdeen
Agricultural Economics Department

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Some Economic Aspects of Potato Production in the North of Scotland, 1965 and 1966 Crops

by J. S. Bone, M.Sc. and Margaret A. Haughs, B.Sc.

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OF

OF SCOTLAND

With the Compliments of
The Provincial Advisory Agricultural Economist
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41½ UNION STREET,
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NORTH OF SCOTLAND COLLEGE OF AGRICULTURE

AGRICULTURAL ECONOMICS DEPARTMENT

SOME ECONOMIC ASPECTS OF POTATO PRODUCTION IN THE NORTH OF SCOTLAND 1965 AND 1966 CROPS

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POTATO COSTS 1965 AND 1966 CROPS

INTRODUCTION

During the period 1965 to 1967, a survey of potato production was carried out by the Agricultural Economics Department of the North of Scotland College of Agriculture, the investigation covering the production and marketing of the 1965 and 1966 crops. Similar studies were made by the two other Scottish Agricultural Colleges. An interim report was issued by the North of Scotland College of Agriculture (Economics Report No. 119) outlining the results for the 1965 crop.

Potato Marketing Board statistics* show that there has been a steady decline for some years now in the number of registered potato growers in Great Britain. In 1957, 81,685 growers were registered with the Board, but in 1966 this number had fallen to 54,700 - a drop of almost exactly one-third in ten years. All the available evidence indicates that many small-scale producers have given up the crop, while larger specialist growers are increasing their share of the market. For the past few seasons, the expanded acreages of large-scale growers have been sufficient to balance losses due to the disappearance of small potato enterprises. This situation is not likely to continue indefinitely and, for Great Britain as a whole, the acreage lost through farmers giving up the crop in 1966 was considerably in excess of any expansion taking place amongst large-scale producers. The 1966 acreage represents a reduction of about 10 per cent in plantings compared with the 1965 figure. Scottish farmers in particular appear to have cut back their 1966 potato acreage. The reduction, amounting to 19,000 acres, represented 14 per cent of the 1965 Scottish acreage, while the 44,000 acre decline in England and Wales was 8 per cent of the 1965 figure. The trend in registered potato acreage over the past ten years is outlined in Table 1.

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*Most of the statistical information in this report has been derived from the Handbook of Potato Statistics, prepared by the Potato Marketing Board, or from the Register of Potato Crops Certified, produced annually by the Department of Agriculture and Fisheries for Scotland.

TABLE 1

ACREAGE PLANTED BY REGISTERED PRODUCERS & BASIC ACREAGE (GREAT BRITAIN)

Crop Year	Scotland ('000 acres)	England & Wales ('000 acres)	Great Britain ('000 acres)	Basic Acreage Great Britain ('000 acres)
1957	136	524	660	748
1958	135	535	670	753
1959	135	536	671	760
1960	138	554	692	796
1961	125	467	592	810
1962	131	494	625	792
1963	139	514	653	758
1964	140	527	667	737
1965	133	516	649	739
1966	114	472	586	722

The response of Scottish seed potato producers following the marketing difficulties of the 1965 season is of interest. In 1966, plantings of Foundation Seed showed an increase of over 1,200 acres on the 1965 figure, and although the acreages of Virus Tested and Stock Seed were down, the total acreage of high grade certified seed from these three categories was 11,818, a net increase of just on 800 acres. In the same year, a very sharp decline occurred in the Grade A acreage certified, and the 1966 total of 41,972 acres was the lowest for ten years, equal to a drop of 22 per cent compared with the 1965 figure. Grade H, in the last year of its existence in 1966, accounted for only 3,153 acres - a decline of 59 per cent from the previous year's total.

The overall result of these changes has been to increase very substantially the share of the seed market occupied by the three highest grades (Table 2).

TABLE 2

POTATO ACREAGES CERTIFIED FOR SEED (SCOTLAND)

	1965	1966
Total Potato Acreage (Scotland)	141,668	122,368
(a) Virus tested	116	111
(b) Foundation Seed	7,302	8,513
(c) Stock Seed	3,594	3,194
Total (a + b + c)	11,012	11,818
Grade A	54,037	41,972
Grade H	7,758	3,153
Total (all grades certified)	72,807	56,943
Three highest grades as % of total certified	15	21

The total Scottish potato acreage is in excess of that planted by registered producers, since small-scale growers having less than one acre of potatoes for sale need not register with the Potato Marketing Board.

Certified seed crops account for roughly half of the total Scottish potato acreage, but within the North of Scotland College of Agriculture area seed crops are proportionally more important, since climatic conditions enable high quality seed to be grown. Of the 21,780 acres of potatoes planted in 1966 by registered producers in the N.O.S.C.A. mainland area, some 5,285 acres, or almost a quarter, were certified as Virus Tested, Foundation Seed or Stock Seed. For Scotland as a whole, the proportion of the total acreage occupied by these grades was only 10 per cent.

The most important varieties grown by registered producers in the areas covered by this Report are shown in Table 3. It is evident that early potatoes are of minor importance, but the production of maincrop potatoes is an important enterprise on many low-ground farms in the North East.

TABLE 3

POTATO ACREAGES BY VARIETY PLANTED BY REGISTERED PRODUCERS IN THE N.O.S.C.A. AREA

	Southern Area (Kincardine)		Northern Area *		Aberdeenshire		Other N.O.S.C.A. Counties**	
	1965	1966	1965	1966	1965	1966	1965	1966
First early	540	380	450	400	800	530	20	10
Second early	180	210	230	250	290	170	20	...
MAINCROP								
King Edward***	257	229	4,221	2,643	732	414	29	-
Golden Wonder	47	61	294	302	263	275	6	13
Kerr's Pink	807	707	2,123	2,178	2,852	2,447	163	143
Redskin	71	92	109	133	65	126	...	...
Majestic	3,784	2,539	2,162	1,344	3,069	2,013	46	23
Dr. McIntosh	125	127	18	3	76	30	-	-
Record	260	264	116	120	212	301	-	-
Pentland Crown	-	38	42	90	58	155	-	-
Pentland Dell	65	233	383	656	199	532	18	24
Others	344	450	262	301	734	747	48	77
Total Maincrop	5,760	4,740	9,730	7,770	8,260	7,040	310	840
Total all var.	6,480	5,330	10,410	8,420	9,350	7,740	350	290

* Ross, Inverness, Moray, Nairn and Banff.
** Caithness and Sutherland only (details not available for Orkney and Shetland)
*** Includes Red King.
... Less than 5 acres.

SOURCE: Statistics Section, Potato Marketing Board.

Most of the higher grade seed acreage is concentrated in the counties of Ross, Moray, Banff, Aberdeen, and Kincardine, while no certified seed of these grades is grown in Caithness or Shetland. The amounts produced in Inverness, Nairn, Orkney and Sutherland are relatively small. Tables 4 and 5 show the acreages of the main varieties certified in the three highest grades within the College area, for 1965 and 1966.

TABLE 4

CERTIFIED SEED POTATO ACREAGES BY VARIETY AND GRADE,
N.O.S.C.A. AREA - 1965 CROP

	V.T.	F.S.	S.S.
King Edward	-	151.75	593.00
King Edward (Paracrinkle-Free)	10.25	894.75	110.00
Kerr's Pink	-	48.50	124.50
Majestic	35.00	1,068.00	740.25
Pentland Dell	-	372.25	22.25
Record	-	73,75	20.50
Redskin	-	34.50	7.00
Others	4.00	323.00	358.75
Total Certified N.O.S.C.A. area	49.25	2,966.50	1,976.25
Total Certified Scotland	115.25	7,302.25	3,594.25
N.O.S.C.A. area as % of Scottish Total	42.7%	40.6%	55.0%

TABLE 5

CERTIFIED SEED POTATO ACREAGES BY VARIETY AND GRADE,
N.O.S.C.A. AREA - 1966 CROP

	V.T.	F.S.	S.S.
King Edward	-	9.00	160.50
King Edward (Paracrinkle-Free)	27.75	1,119.25	141.50
Kerr's Pink	-	101.75	153.00
Majestic	22.00	884.00	515.25
Pentland Dell	0.50	813.75	155.50
Record	-	174.75	9.00
Redskin	-	293.50	19.75
Others	18.00	383.00	312.00
Total Certified N.O.S.C.A. Area	68.25	3,779.00	1,466.50
Total Certified Scotland	110.75	8,513.25	3,194.00
N.O.S.C.A. Area as % of Scottish Total	61.6%	44.4%	45.9%

The most notable varieties grown for seed within the College area are Majestic and King Edward, but local preferences for particular varieties exist. Less emphasis is placed on the production of ware potatoes, which are grown mainly to satisfy local markets. Consumer preferences explain the popularity of varieties such as Golden Wonder and Kerr's Pink.

The importance of potatoes in the rotation has decreased over the period 1956-1966, but the rate of decrease has not been the same for all counties in the North College area. In Table 6, the acreage of potatoes per 1,000 acres of tillage crops - that is arable crops and fallow, excluding grass - is shown for 1956 and 1966.

TABLE 6

TOTAL POTATO ACREAGE PER 1,000 ACRES OF TILLAGE CROPS, BY COUNTIES, 1956 AND 1966

County	Per 1,000 acres tillage		Per Cent Reduction
	1956	1966	
	acres	acres	%
Shetland	175	157	10
Orkney	40	25	38
Caithness	25	16	36
Sutherland	79	71	10
Ross	107	82	23
Inverness	74	46	38
Moray	84	62	26
Nairn	58	33	43
Banff	37	31	16
Aberdeen	45	35	22
Kincardine	123	94	24
Average	77	59	23

SOURCE: Agricultural Statistics, Scotland. D.A.F.S. Edinburgh.

Overall, potatoes now occupy a smaller share of the tillage acreage in the North of Scotland, while the relative importance of barley has increased. The shift away from potatoes may be associated with the general tendency for yields to increase over the years, coupled with a fairly static demand for the crop. The requirement for ware potatoes is dependent on human consumption, which varies little from season to season, averaging about 200 lb. per head per year. The derived demand for Scottish seed potatoes is therefore unlikely to expand, and may indeed contract as other areas enter the seed potato market, and as English growers increasingly retain once-grown seed for their own use.

Because of climatic and soil conditions, and also transport costs, it is unlikely that large scale ware production will become important in the North of Scotland, so that the future for potatoes as a cash crop seems to lie with the production of high quality seed. Seed growers in the North have considerable experience of seasons of poor demand, when favourable growing conditions produce a surplus in excess of market requirements.

In years such as these, it is sometimes impossible to dispose of the ware fraction, while the seed itself may only be sold with difficulty. Seed of the higher grades, however, is more readily moved, and many of those producers retaining an interest in the crop now concentrate on the production of a higher grade of seed.

1965 AND 1966 POTATO CROPS - SURVEY RESULTS

The Sample

The investigation was part of a joint study of potato production carried out in conjunction with the Economics Departments of the two other Scottish Agricultural Colleges. The North of Scotland survey was confined to two districts, which were considered reasonably representative of the main potato growing areas. The counties chosen were:

a) Kincardineshire (Southern Area)
b) Easter Ross, Inverness, Moray, Nairn and Banff (Northern Area).

The sample was designed to include a proportion of growers in several acreage size groups, and was drawn on a random basis. The number of farms included at the outset of the investigation was 49, but for a variety of reasons, the number was reduced to 41 by the end of the first year, and to 32 in 1966. Accordingly some bias may have been introduced, since it was found that the representation of growers with over 50 acres of potatoes was lower than anticipated. The number of farms included in the sample each year, and their distribution within the acreage size groups used, are shown in Table 7.

TABLE 7

NUMBER OF FARMS SURVEYED

Potato acreage grown	Number of Farms					
	1965 Potato Crop			1966 Potato Crop		
	Southern area	Northern area	Total sample	Southern area	Northern area	Total sample
1 - 4.9	2	2	4	3	2	5
5 - 9.9	1	5	6	1	3	4
10 - 19.9	5	6	11	4	6	10
20 - 49.9	6	10	16	4	7	11
50 and over	4	-	4	2	-	2
Total	18	23	41	14	18	32

Farmers co-operating in the survey were asked to keep a note, on a field record sheet, of man and tractor hours attributed to the potato crop, while other costs, such as seed, fertilisers, casual and contract work were also recorded. At the end of each crop year, field visits were made to collect additional information

on management practices, and on crop disposal.

Most of the farms could be classed as mixed arable holdings, with an average of 35 per cent of their area under cereals (mainly barley). Potatoes occupied a larger proportion of the acreage of farms in the Southern area with an average of about 8 per cent overall. About 40 per cent of the acreage in both areas was under rotational grass, while rough grazing was somewhat more important in the Northern area.

Potatoes were taken after grass on most of the farms in Kincardineshire, but it was noticeable that farmers in the Northern area most frequently planted the crop after cereals. Probably as a consequence of this, few farmers applied dung to their potato land in Kincardineshire, whereas the majority of farmers in the North put dung on the stubble.

Compared with 1965, the average potato acreage per farm in 1966 declined somewhat in both areas. In Kincardine, the average acreage per farm was reduced from 33 to 26 acres, although in the Northern area an average reduction of only one acre occurred, from 18 to 17 acres per holding.

The North of Scotland is an important seed growing area, and the majority of farms surveyed were engaged in seed potato production. In the first year of the investigation, only 31.25 acres of uncertified potatoes were produced on the survey farms, but in 1966, 89 acres were harvested uncertified. Of this total, 79.5 acres were planted for ware production, and were therefore not inspected; the balance of 9.5 acres represented potential seed crops which failed to obtain a certificate.

Potato Acreage Costed and Varieties Planted

Each crop or field of potatoes was costed separately, so that different grades of the same variety, or separate fields of the same grade on one farm were considered as distinct crops. Table 8 shows how the potato crop acreage was distributed between areas and between seasons (acreages being to the nearest quarter acre).

TABLE 8

DISTRIBUTION OF TOTAL POTATO ACREAGE SAMPLED

Sample Data	1965 Potato Crop		1966 Potato Crop	
	Southern area	Northern area	Southern area	Northern area
Total potato acreage	549.00	401.75	359.75	312.50
No. of farms in sample	18	23	14	18
Average acreage per farm	30.50	17.50	25.50	17.50
No. of crops in sample	36	46	27	35
Average acreage per crop	15.25	8.75	13.25	9.00

Local preferences for certain varieties have already been noted, and an analysis of the 1966 sample crop acreage shows a pattern similar to that of 1965 (Economic Report 119). While Majestic and King Edward were again predominant in the Southern and Northern regions respectively, the acreage of ordinary King Edward grown on farms in the sample declined, although the paracrinkle-free acreage increased. Other changes within the sample included an increase in the Pentland Dell and Kerr's Pink acreages, but it would be unwise to base any conclusions on a sample of this size. Details of the varieties grown and acreages costed within the sample are given in Table 9.

TABLE 9

POTATO VARIETIES PLANTED 1966

Potato Variety	Southern Area			Northern Area			Total Sample		
	No. of Crops	Acreage	Per Cent of Total Acreage	No. of Crops	Acreage	Per Cent of Total Acreage	No. of Crops	Acreage	Per Cent of Total Acreage
King Edward									
Ordinary	1	19.50	5.4	2	14.00	4.5	3	33.50	5.0
Paracrinkle-free	-	-	-	11	154.50	49.4	11	154.50	23.0
Kerr's Pink	4	18.50	5.1	11	68.50	21.9	15	87.00	12.9
Majestic	13	243.75	67.8	1	16.00	5.1	14	259.75	38.6
Pentland Dell	2	24.50	6.8	6	50.50	16.2	8	75.00	11.2
Record	3	36.00	10.0	-	-	-	3	36.00	5.4
Golden Wonder	-	-	-	1	1.00	0.3	1	1.00	0.1
Redskin	2	8.00	2.2	1	4.00	1.3	3	12.00	1.8
Earlies	2	9.50	2.7	2	4.00	1.3	4	13.50	2.0
Total	27	359.75	100.0	35	312.50	100.0	62	672.25	100.0

In the Northern counties, a total of 198.5 acres or 64 per cent of the sample in that area was planted with Foundation Seed or Stock Seed, and 136.5 acres were granted F.S. or S.S. certificates. In Kincardineshire, 92.5 acres or 26 per cent of the sample in the Southern area was planted with the two higher grades; 83.0 acres gaining F.S. or S.S. certificates. The grades of seed planted and the grades ultimately obtained are shown in Table 10.

TABLE 10

GRADES OF SEED PLANTED AND GRADES CERTIFIED

Area		Grades					Total
		F.S.	S.S.	A	H	Uncertified	
Southern	Acres planted	73.0	19.5	261.25	-	6.0	359.75
	% of Total	20.3%	5.4%	72.6%	-	1.7%	100.0%
	Acres certified	63.5	19.5	249.75	10.0	17.0	359.75
	% of Total	17.7%	5.4%	69.4%	2.8%	4.7%	100.0%
Northern	Acres planted	177.0	21.5	91.5	-	22.5	312.5
	% of Total	56.5%	7.0%	29.5%	-	7.0%	100.0%
	Acres certified	116.0	20.5	104.0	-	72.0	312.5
	% of Total	37.0%	6.5%	33.5%	-	23.0%	100.0%
Total Sample	Acres planted	250.0	41.0	352.75	-	28.5	672.25
	% of Total	37.2%	6.1%	52.5%	-	4.2%	100.0%
	Acres certified	179.5	40.0	353.75	10.0	89.0	672.25
	% of Total	26.7%	6.0%	52.6%	1.5%	13.2%	100.0%

PRODUCTION COSTS PER ACRE

Average production costs per acre of seed and ware potatoes in the 1966 sample are shown in Table 11. Over the 672.25 acres covered by the whole sample, average costs amounted to £123.8 per acre. A distinction was made between seed and ware crops, and it was found that, on average, seed production costs were £10.5 greater per acre.

TABLE 11

AVERAGE PRODUCTION COSTS PER ACRE - SEED AND WARE CROPS 1966

	Seed Crops		Ware Crops		Total Sample	
	£	Per Cent of Total	£	Per Cent of Total	£	Per Cent of Total
Fertiliser	9.3	7.4	9.3	8.0	9.3	7.5
Seed	27.0	21.3	19.8	17.1	25.1	20.3
Operational Costs						
Regular Labour	23.5	18.6	17.9	15.4	22.1	17.9
Tractor Costs	5.5	4.3	6.4	5.5	5.7	4.6
Casual Labour	12.1	9.6	10.6	9.1	11.7	9.4
Contract Work	5.5	4.3	12.0	10.4	7.2	5.8
Sundries	6.4	5.1	4.4	3.8	5.9	4.8
Specialised Equipment	7.4	5.8	7.9	6.8	7.5	6.1
Rent	5.5	4.4	5.3	4.6	5.5	4.4
Overheads	24.3	19.2	22.4	19.3	23.8	19.2
Total Costs	126.5	100.0	116.0	100.0	123.8	100.0

Range in Total Costs

For the sample as a whole, there was a narrower range in total production costs per acre during the 1966 season, when compared with 1965. While 21 per cent of the sample acreage was produced at a cost of less than £100 per acre in the first year of the survey, only one crop, accounting for 0.3 per cent of the total sample acreage, was produced for under £100 per acre in 1966. This was a two acre crop of an early variety grown for ware, at an estimated cost of £99.3 per acre. The range of average costs encountered during the two years of the survey is shown in Table 12.

TABLE 12

RANGE AND AVERAGE TOTAL COSTS PER ACRE - 1965 AND 1966 CROPS

Total Costs per Acre	1965 Crop		1966 Crop	
	Acres	Per Cent of Total	Acres	Per Cent of Total
£70.00 - £79.99	27.00	3.0	-	-
£80.00 - £89.99	84.25	9.0	-	-
£90.00 - £99.99	85.00	9.0	2.00	0.5
£100.00 - £109.99	241.00	25.5	132.75	20.0
£110.00 - £119.99	157.50	16.5	273.00	40.5
£120.00 - £129.99	201.50	21.0	25.00	3.5
£130.00 - £139.99	58.75	6.0	105.00	15.5
£140.00 - £149.99	74.25	8.0	131.50	19.5
£150.00 - £159.99	21.50	2.0	3.00	0.5
Total	950.75	100.0	672.25	100.0
Average Cost	£114.7		£123.8	

Fertiliser

The average cost of fertiliser, amounting to 7.5 per cent of total costs in 1966, was £9.3 per acre. This represents a slight decrease of the order of two shillings per acre, compared with the previous year's figure of £9.4 per acre (8 per cent of total costs). The survey showed that the practice of applying dung to potato land was more common in the Northern area, and that farmers in Kincardine tended to use larger dressings of compound fertilisers per acre. In Table 13, details of fertiliser use for the two years are given for the sample as a whole.

TABLE 13

FERTILISERS AND F.Y.M. PER ACRE - 1965 AND 1966 CROPS

	1965 Crop	1966 Crop
Av. cost of fertilisers per acre Range in rate of application of fertiliser per acre - cwt Range in cost of fertiliser per acre	£9.4 5 - 12.5 £5.5 - £13.1	£9.3 5 - 10 £6.8 - £13.2
Av. number of units N.P.K. derived from fertiliser per acre	98:101:156	96:99:145
Total acres receiving F.Y.M. Total acres not receiving F.Y.M.	237.25 713.50	178.5 493.75
Av. rate of applications of fertiliser per acre on fields receiving F.Y.M. - cwt	7.6	7.1
Av. rate of application of fertiliser per acre on fields not receiving F.Y.M. - cwt	8.4	7.5

While the average cost per acre of fertiliser, and the average application per acre of N.P.K. differed little between years, there were indications that more concentrated materials were being used, since the quantities applied in cwt per acre showed some reduction in the second year. Again, there were signs that farmers applying dung tended to use a smaller quantity of 'artificial' fertilisers per acre.

The average fertiliser dressing in 1966 (excluding dung) supplied 96 units of nitrogen, 99 units of phosphate, and 145 units of potash, but, between farms, considerable differences were observed in the quantities applied. Although fertiliser recommendations are varied according to specific circumstances, the most recent general recommendations for potato manuring from the College Crop Husbandry Department reveal that such levels may be rather high, particularly for seed production.

Suggested rates per acre for seed crops following cereals or root crops, with dung, for example, are 58 - 63 units of nitrogen, 75 - 90 units of phosphate, and 35 - 45 units of potash. For seed crops following a three-year clover/grass ley without dung, suggested rates are in the range 35 - 45 units of nitrogen, 85 - 105 units

of phosphate, and 100 - 105 units of potash. Higher applications may be more appropriate for ware crops, but there is a growing body of evidence to show that excessive quantities of nutrients (particularly nitrogen) may reduce the quality and increase the risk of disease in seed tubers. On the other hand, low nitrogen dressings have been shown to increase the incidence of blackleg symptoms in potato crops - a factor which in the case of seed crops, could result in certification difficulties.

Seed

The cost of seed was again the largest single item in the average cost structure for potato production, amounting to £25.1 per acre for the sample as a whole, or 20.3 per cent of total costs. The average planting rate was 26.25 cwt per acre, but heavier rates were used for seed crops, while ware crops were, on average, planted with less than one ton of seed per acre. Tables 14 and 15 give details of average seed rates and costs per acre encountered during the 1966 survey for seed and ware crops respectively.

TABLE 14

PLANTING RATES AND SEED COSTS PER ACRE - SEED CROPS 1966

Variety	No. of crops	cwt per acre	cost per acre £
Kind Edward ordinary	5	26.0	24.9
King Edward paracrinkle-free	9	24.6	23.3
Majestic	14	32.7	26.9
Pentland Dell	8	31.6	35.8
Record	3	31.3	24.4
Kerr's Pink	3	16.1	18.3
Redskin	2	27.5	27.4
Royal Kidney	1	28.6	40.0
Arran Pilot	1	30.0	22.5
Average	-	28.7	27.0

TABLE 15

PLANTING RATES AND SEED COSTS PER ACRE - WARE CROPS 1966

Variety	No. of crops	cwt per acre	cost per acre £
Kerr's Pink	12	20.2	17.3
Redskin	1	15.0	13.5
Golden Wonder	1	20.0	34.0
Earlies	2	20.0	30.8
Average	-	19.3	19.8

All crops submitted for inspection under the certification scheme of the Department of Agriculture and Fisheries for Scotland have been considered throughout this report as seed crops, although in certain cases the crops could be regarded as dual-purpose, providing both marketable seed and ware for local sale.

Wide variations were found in the quantity of seed planted per acre, ranging from 11 cwt per acre for a ware crop to 48 cwt per acre for a seed crop where closely spaced ware-sized tubers were used. Similarly, the range in seed costs per acre was considerable, from £8.8 in the case of home-saved seed for a ware crop, to £53.6 for home-saved Foundation Seed of an expensive variety (Pentland Dell).

Overall in 1966, 21 per cent of the sample was planted with purchased seed, with home-saved tubers being used for the remainder. In 1965, purchased seed was used to plant 15 per cent of the sample acreage. It was evident that ware growers used purchased seed to a greater extent than seed producers. In the second year of the survey, for example, almost half of the ware acreage was planted with purchased seed, compared with 17 per cent of the seed acreage.

Operational Costs

These consist of regular labour, tractor costs, casual labour and contract work, and amounted on average to some 38 per cent of total costs in 1966, compared with 40 per cent in 1965. Average regular labour and tractor costs of the various field operations are shown, in Table 16, for seed and ware crops, and for the sample as a whole.

TABLE 16

AVERAGE OPERATIONAL COSTS PER ACRE: REGULAR LABOUR AND TRACTOR COSTS 1966

Operation	Seed Crops			Ware Crops			Total Sample		
	Regular Labour	Tractor	Total	Regular Labour	Tractor	Total	Regular Labour	Tractor	Total
	£	£	£	£	£	£	£	£	£
Spring Cultivations	2.2	1.4	3.6	3.7	2.3	6.0	2.6	1.6	4.2
Planting	2.1	0.7	2.8	1.8	0.7	2.5	2.0	0.7	2.7
Summer Cultivations	2.0	0.9	2.9	2.1	1.0	3.1	2.0	0.9	2.9
Harvesting	6.0	2.3	8.3	5.0	2.3	7.3	5.7	2.3	8.0
Dressing	11.2	0.2	11.4	5.3	0.1	5.4	9.8	0.2	10.0
Total	23.5	5.5	29.0	17.9	6.4	24.3	22.1	5.7	27.8

Spring Cultivations

The cost of spring cultivations was greater for ware crops, but this was partly due to the relatively high proportion of ware growers applying dung. Of the 16 ware crops, 10 received dung, while only 14 of the 46 seed crops were dunged. No charge was made for the value of the dung, but labour and tractor hours for carting and spreading were included in the cost of spring cultivations. Farmers in the Northern area, where most of the ware crops were grown tended to plough slightly deeper and to cultivate rather more frequently than growers in Kincardineshire.

Planting

Most farmers planted the crop in 28 inch drills, the distance between tubers averaging about 10 inches. Considerable variations were found in planting distances, which ranged from a minimum of 7 inches for a seed crop to 16 inches in the case of a ware crop. In 1966, planting began in the first week of April, and in many cases farmers were able to complete the operation by about the middle of the month.

The majority of growers owned planters, but 11 out of the 62 crops in the 1966 sample were planted using machinery hired from contractors. The average charge for the hire of a planter was £2.2 per acre, but the cost could be expected to vary according to the acreage involved. While squads were employed to hand plant the crop on two occasions in 1965, the whole acreage covered by the 1966 survey was planted by automatic or semi-automatic machines. In some cases, one or two casual workers were hired to augment the regular farm staff where semi-automatic machines were used.

Although sprouting is now a recommended technique, few farmers in the survey had invested in the necessary boxes and lighting/heating equipment, so that only four crops were planted with chitted seed in 1966. In two cases a compromise was recorded where seed was sized and bagged off three to six weeks before the estimated planting date, in order to induce 'budding'. Chitting

is particularly valuable for the variety Pentland Dell, as a means of overcoming little potato disease.

Summer Cultivations

Chemical methods of weed control, while increasing in popularity, have by no means replaced traditional summer cultivations. Of the 62 crops surveyed in 1966, 9 received pre-emergence sprays, but in two of these cases, chemical treatment was limited to part of the acreage only. In total, 90 acres or 13 per cent of the sample, were treated chemically for weed control, compared with 74.5 acres, or 8 per cent of the sample in 1965. While there is as yet only limited acceptance of the chemical technique, general observation suggests that increasing numbers of farmers are conducting field-scale trials on their own holdings to determine its usefulness. As labour costs continue to rise, it may be anticipated that weed control on an increasing percentage of the potato acreage will be based on chemical methods.

Operations such as roguing, blight spraying, and haulm disposal have been included under the heading of summer cultivations. Roguing was frequently carried out by the farmer or his own staff in July prior to the inspection, but for the higher grades of seed, certificated roguers were employed annually on a contract basis. The charges varied according to the work involved, but customary rates for the single roguing for Grade A were from 20s. to 30s. per acre. Stock Seed and Foundation Seed crops are inspected twice, and are usually rogued before each inspection. For these grades, the rate varied between £2 - £4 per acre.

A number of crops were affected by blight in 1966, and conditions in some areas were such that repeated applications of sprays or dusts were necessary. Blight control measures were carried out very largely on a contract basis, although three farmers acquired sprayers and applied their own chemicals in 1966. The average cost of blight control on the 23 crops treated on contract was £3.5 per acre, compared with £2.3 per acre in 1965. The contractors'

charge per acre ranged from 20s. to 30s.

Blight was serious in some low-lying areas of Moray and Easter Ross in 1966, one farmer spraying seven times to protect the crop. In a few cases, haulm was cut down or burned off early to reduce the spread of infection, and a number of farmers reported that blight had noticeably reduced yields per acre in 1966.

Apart from disease considerations, efficient haulm distruction is important, particularly where complete harvesters are used, since it then becomes essential to reduce the amount of haulm to a minimum. The majority of farmers in the survey relied on mechanical methods of destruction, using P.T.O.-driven chains or flails to pulverise the haulm. In many cases this was supplemented by chemical treatment. Spraying alone with acid, sodium chlorate, or a proprietary compound, was confined to seven crops. Details of the methods adopted, and comparisons with the 1965 season, are shown in Table 17.

TABLE 17

METHODS OF HAULM DISPOSAL AND COSTS, 1965 AND 1966 CROPS

Method	1965 Crop			1966 Crop		
	No. of crops	Per Cent of total acreage	Av. cost per acre	No. of crops	Per Cent of total acreage	Av. cost per acre
			£			£
Mechanical	20	17	0.5	14	25	0.8
Chemical	17	29	2.7	7	12	2.7
Chemical/Mechanical	43	53	2.3	35	61	2.4
Died Down	2	1	-	6	2	-
Total	82	100	-	62	100	-

As in the previous year, the use of a chemical alone appeared to be more expensive than chemical and mechanical treatments used together. When a chemical only was applied, the material used was normally sulphuric acid, which required specialised equipment provided by a contractor. Of the seven crops burned down chemically in 1966, six were treated by contractors, while the seventh was sprayed with sodium chlorate using farm equipment.

Sulphuric acid was also used on some crops at half strength, to complete haulm destruction after pulverising or cutting, and

contractors were employed to apply this and other chemicals. The contractors' charge for applying these materials varied between 25s. and 84s. per acre, acid spraying being the most expensive. In most cases, haulm was pulverised by farmers using their own equipment, but contractors carried out this operation in four fields, at charges ranging from 10s. to 17s. per acre.

Harvesting

In 1966, 44 per cent of the sample was lifted by harvester, compared with 26 per cent in 1965. The increasing importance of harvesters in the second year of the survey is probably due to the reduction in the total number of growers which occurred between the two years, when several farmers with small to medium acreages gave up production. Growers in this category are less likely to own a harvester, or to have a high capital investment in specialised handling and storage equipment. Harvesting methods for the two seasons are indicated in Table 18.

TABLE 18

METHODS OF POTATO HARVESTING - 1965 AND 1966 CROPS

Method	1965 Crop			1966 Crop		
	No. of farms	Acres	Per Cent of total acreage	No. of farms	Acres	Per Cent of total acreage
Harvester	13	249.00	26	12	296.00	44
Elevator	20	614.25	65	17	328.75	49
Spinner	4	18.50	2	4	21.00	3
Contract	6	69.00	7	3	26.50	4
Total	43	950.75	100	36	672.25	100

NOTE: Some farms used more than one method.

Weather conditions at the time of lifting the 1966 potato crop were rather better than in the previous year, but one farmer in the group surveyed did not make use of his harvester because of difficult ground conditions. On another farm, the harvester was used for only one-quarter of the potato acreage, owing to the difficulty of separating clods from the tubers. As in 1965, some farmers were able to make use of school children during long week-ends to lift a proportion of the crop, while others relied on casual

squads hired at a contract rate of £18 - £20 per acre. These squads were sometimes poorly organised, and on more than one occasion, labour disputes on the field brought harvesting to a standstill. There is little doubt that hand labour for potato lifting will become more difficult to find - another factor which underlies the tendency for the crop to be concentrated in large units, where full mechanisation becomes justifiable.

The use of spinner diggers was confined to small acreages, but elevator diggers were in widespread use, and one farmer owned two, as a safeguard against mechanical failure. Owing to the lower initial cost, the elevator digger is cheaper per acre to operate where small acreages are concerned. Where larger acreages are involved, the complete harvester becomes competitive, since the labour cost per acre is reduced, while depreciation and interest charges are spread over a greater acreage.

Storage

Relatively few of the potatoes harvested from the sample acreages were pitted outside, the majority being stored in converted buildings. These were frequently redundant stables or byres, having walls lined with straw bales. In such cases, direct storage costs were limited to the cost of straw, and even this was recouped if the straw was used again for bedding.

Approximately three-quarters of the crop was stored in converted or specialised buildings, the remainder being pitted, or in the case of one or two ware crops, sold off the field.

Dressing

Careful dressing is most important in the production of an attractive seed sample, and growers generally take precautions to reduce damage at this stage to a minimum. Where seed is sent south, a further inducement to good dressing is provided by the possibility of complaint and return of the seed to the grower.

Crops included in the 1966 sample were mainly stored indoors and dressed by farm staff in the slack winter period. In several instances, casual labour was employed to assist the

regular staff in dressing out the crop to meet large orders, and when this is taken into account, the total cost of the dressing operation averaged £13.7 per acre, compared with £10.5 in the previous year. At an average yield of 8.5 tons per acre, the cost per ton was therefore 32s. This represents an increase of 9s. per ton over the previous year.

Sundries

Miscellaneous costs such as the annual £3 per acre Potato Marketing Board levy, sprays, straw for potato pits and sheds, fuel for the dresser, and inspection fees in the case of seed crops, are included under this heading. These costs amounted on average to £5.7 per acre in 1965 and £5.9 per acre in 1966.

Specialised Equipment

Depreciation of planters, diggers and harvesters and of specialised storage buildings was included here at rates shown in Appendix B. In 1965 these charges were £5.6 per acre, while in 1966 the figure had risen to £7.5 per acre.

Rent and Overhead charges

On tenanted farms in the group surveyed, actual rents were taken, while on owner-occupied holdings an estimated rental value was used. In 1965, the average value was £5.3 per acre, but due to unavoidable changes in the composition of the sample, the average increased to £5.5 per acre in 1966.

Overhead costs were allocated at standard rates per acre; on total labour costs per acre; and on the number of tractor hours per acre. These charges are estimated to cover items such as rates, insurance, depreciation of general implements, and other non-specific costs (see Appendix B).

OUTPUT PER ACRE

Slight yield differences were observed between the Northern and Southern areas of the survey in 1965, with crops in the North yielding on average 4 cwt per acre more than those in Kincardineshire. In the second year, average yields from the Northern area were

12 cwt per acre below those from Kincardineshire, where yields remained on average virtually stable (Table 19). The 17 cwt per acre reduction in average yields which occurred between seasons in the North could be associated with the widespread incidence of blight, which affected many crops in 1966. Farmers were forced to destroy the haulm at an earlier stage than usual, particularly in the Moray Firth area, and this resulted in yield reductions in a number of cases.

TABLE 19

AVERAGE YIELDS PER ACRE - 1965 AND 1966 CROPS

Year	Southern Area		Northern Area		Total Sample	
	tons	cwt	tons	cwt	tons	cwt
1965	8	19	9	3	9	1
1966	8	18	8	6	8	10

An analysis of the 1966 seed and ware crops shows that, within these broad categories, there was little difference in average yields, seed crops averaging 8 tons 12 cwt per acre, and ware crops 8 tons 10 cwt per acre.

Returns per acre were dependent on the quantity of saleable tubers produced, and on the price per ton, which varied according to variety and grade. In general, it is clear that the 1966 crop met a more favourable market, and returns per acre were considerably improved over the previous year. Average figures for the two main areas sampled are shown in Table 20.

TABLE 20

AVERAGE RETURNS PER ACRE - 1965 AND 1966 CROPS

Year	Southern Area	Northern Area	Total Sample
	£ per acre	£ per acre	£ per acre
1965	123.9	144.6	134.2
1966	192.4	179.3	185.0

Seed crops produced a greater average return than ware crops, with a cash output of £189.5 per acre, compared with £172.0 per acre for ware crops in 1966. Large differences in returns per acre were again evident in the second year of the investigation, and Table 21 summarises the range in returns over the sample as a whole for 1965 and 1966.

TABLE 21

RANGE OF RETURNS PER ACRE - 1965 AND 1966 CROPS

Returns £ per Acre	1965 Crop		1966 Crop	
	Acres	Per Cent of Total Acreage	Acres	Per Cent of Total Acreage
25 - 49.99	17.50	2.0	-	-
50 - 74.99	96.00	10.0	-	-
75 - 99.99	150.75	16.0	23.50	3.5
100 - 124.99	265.50	28.0	11.50	1.5
125 - 149.99	170.50	18.0	92.50	13.5
150 - 174.99	72.50	7.5	152.00	22.5
175 - 199.99	97.00	10.0	161.00	24.0
200 - 224.99	48.50	5.0	102.25	15.5
225 - 249.99	27.00	3.0	10.00	1.5
250 and over	5.50	0.5	119.50	18.0
Total	950.75	100.0	672.25	100.0

If a figure of £125 per acre be taken to represent the lowest level of cash output necessary to cover costs of production, then 50 per cent of the potato acreage failed to meet the target in 1965. In the second season, only 5 per cent of the sample acreage yielded a cash output of less than £125, while 35 per cent produced returns in excess of £200 per acre.

Results for seed and ware growers, analysed in the same way in Table 22, indicate that a greater proportion of seed producers achieved returns in the higher range, but the small size of the ware sample makes it difficult to draw any firm conclusions from this observation. Because of lower production costs (Table 11) differences in profitability between seed and ware crops might be narrower than the returns per acre suggest.

TABLE 22

RANGE OF RETURNS PER ACRE - SEED AND WARE - 1966 CROP

Returns £ per acre	Seed Crops		Ware Crops	
	Acres	Per Cent of Total Acreage	Acres	Per Cent of Total Acreage
75 - 99.9	23.50	4.0	-	-
100 - 124.99	-	-	11.50	14.5
125 - 149.99	82.00	14.0	10.50	13.0
150 - 174.99	149.00	25.0	3.00	4.0
175 - 199.99	114.50	19.5	46.50	58.5
200 - 224.99	96.25	16.0	6.00	7.5
225 - 249.99	10.00	1.5	-	-
250 and over	117.50	20.0	2.00	2.5
Total	592.75	100.0	79.50	100.0

When the relationship between yield and total returns per acre is examined, it becomes evident that, in general, high yielding crops provide the greatest returns per acre. Thus for seed crops in the 1966 season, two crops with yields averaging 4.5 tons per acre realised under £100 per acre, while four crops averaging 12.6 tons grossed an average of £285 per acre. Similar trends were apparent in ware crops (Table 23).

TABLE 23

RELATIONSHIP BETWEEN YIELD PER ACRE AND TOTAL RETURNS PER ACRE, SEED AND WARE CROPS

Yield per acre	Seed Crops			Ware Crops		
	No. of crops	Mean Yield	Av. Return per acre	No. of crops	Mean Yield	Av. Return per acre
		tons	£		tons	£
Under 5 ton	2	4.5	91.5	-	-	-
5 - 5.9	-	-	-	1	5.1	101.0
6 - 6.9	7	6.4	147.1	5	6.5	165.0
7 - 7.9	9	7.5	155.3	1	7.3	133.3
8 - 8.9	8	8.4	179.9	1	8.1	175.0
9 - 9.9	12	9.3	191.5	4	9.5	175.4
10 - 10.9	1	10.4	242.3	2	10.6	204.5
11 - 11.9	3	11.3	329.1	1	11.7	210.0
12 ton and over	4	12.6	285.4	1	12.1	192.0

The relationship between the price received per ton of seed or ware sold and total returns per acre follows a similar trend, high prices per ton being associated with good returns per acre. In seven instances, no seed was sold off the farm, since an outlet for the crop was found on the ware market, and seed was retained for home use.

The choice of variety, and the grade obtained, each play a part in determining the price per ton. In 1966, for example, the variety Arran Pilot, which had fared badly the previous year fetched a high price, and Foundation Seed was sold for over £40 per ton. Within the sample of ware crops, the best result was obtained from a crop of the early variety Duke of York. Table 24 gives details of the distribution of seed and ware crops in 1966, according to price received per ton sold.

TABLE 24

RELATIONSHIP BETWEEN PRICE PER TON AND TOTAL RETURNS PER ACRE

SEED AND WARE CROPS 1966

Price per ton sold	Seed Crops			Ware Crops		
	No. of crops*	Mean Price per ton	Av. Return per acre	No. of crops	Mean Price per ton	Av. Return per acre
		£	£		£	£
£15 - 19.9	3	18.4	232.7	5	18.0	167.0
20 - 24.9	16	22.5	170.0	9	20.5	163.3
25 - 29.9	14	26.4	187.7	-	-	-
30 - 34.9	3	31.9	223.5	1	30.0	193.5
35 - 39.9	2	35.9	321.9	1	37.2	250.8
40 - 44.9	1	43.1	400.0	-	-	-

*No seed was sold in 7 cases.

GROSS MARGIN AND PROFIT PER ACRE

Production costs can be divided into two categories - a) variable costs, which are readily allocated to the enterprise, and which vary according to the size of the enterprise, and b) fixed costs, which cannot easily be allocated to a specific enterprise, and which do not alter in the short term if small changes are made in the size of the enterprise.

The gross margin is the surplus remaining after deducting variable costs from the total value of the crop sold plus value of crop retained (gross output). The gross margin does not therefore represent the level of profitability, but it is the fund available to cover fixed costs, any balance being profit.

Included amongst the variable costs of potato growing are seed, fertiliser, casual labour, contract work and sundry costs, while fixed costs are made up of regular labour and tractor costs, depreciation of specialised equipment, rent and overhead charges. These costs are summarised for the 1965 and 1966 seasons in Table 25 below, which shows the overall gross margins and profits per acre for the whole sample acreage each year.

TABLE 25

AVERAGE GROSS MARGINS AND PROFITS PER ACRE - 1965 AND 1966 CROPS

	1965 Crop	1966 Crop
	£	£
GROSS OUTPUT	134.2	185.0
Variable Costs		
Seed	22.3	25.1
Fertiliser	9.4	9.3
Casual Labour	11.1	11.7
Contract Work	7.6	7.2
Sundries	5.7	5.9
TOTAL VARIABLE COSTS	56.1	59.2
GROSS MARGIN	78.1	125.8
Fixed Costs		
Regular Labour	20.1	22.1
Tractor Costs	6.3	5.7
Specialised Equipment	5.6	7.5
Rent	5.3	5.5
Overheads	21.3	23.8
TOTAL FIXED COSTS	58.6	64.6
PROFIT	19.5	61.2

This Table illustrates that, while slight changes in the level of variable and fixed costs occurred between seasons, the large difference in the value of gross output had the effect of increasing average profit per acre three-fold.

In Table 26, the 1966 results for seed and ware crops are compared on a gross margin basis. Both variable and fixed costs tended to be higher for seed crops, but the increased value of the gross output from such crops resulted in a greater profit per acre from seed production. However, the sample of ware crops was relatively small, and it would be imprudent to suggest that seed growing is necessarily more profitable than ware production.

TABLE 26

AVERAGE GROSS MARGINS AND PROFITS PER ACRE - SEED AND WARE CROPS 1966

	Seed Crops	Ware Crops
	£	£
GROSS OUTPUT	189.5	172.0
Variable Costs		
Seed	27.0	19.8
Fertilisers	9.3	9.3
Casual Labour	12.1	10.6
Contract Work	5.5	12.0
Sundries	6.4	4.4
TOTAL VARIABLE COSTS	60.3	56.1
GROSS MARGIN	129.2	115.9
Fixed Costs		
Regular Labour	23.5	17.9
Tractor Costs	5.5	6.4
Specialised Equipment	7.4	7.9
Rent	5.5	5.3
Overheads	24.3	22.4
TOTAL FIXED COSTS	66.2	59.9
PROFIT	63.0	56.0

All crops surveyed in 1966 provided a return sufficient to cover variable costs, although in the previous season, the output from two crops was insufficient to meet these charges. In 1966, the average gross margin for the whole sample was £125.6 per acre, whereas in 1965, the average was £78.2 per acre. The range of gross margins provided by seed and ware crops, and by the sample as a whole in 1966, is shown in Table 27.

TABLE 27

DISTRIBUTION OF ACREAGE ACCORDING TO GROSS MARGIN PER ACRE, 1966 CROP

GROSS MARGIN £ per Acre	Seed Crops		Ware Crops		Total Sample	
	Acres	Per Cent of Total Acreage	Acres	Per Cent of Total Acreage	Acres	Per Cent of Total Acreage
20 - 39.99	3.50	0.5	-	-	3.50	0.5
40 - 59.99	20.00	3.5	12.00	15.0	32.00	5.0
60 - 79.99	44.00	7.5	8.50	10.5	52.50	8.0
80 - 99.99	162.50	27.5	1.50	2.0	164.00	24.5
100 - 119.99	25.00	4.0	5.00	6.5	30.00	4.5
120 - 139.99	126.50	21.5	5.50	7.0	132.00	19.5
140 - 159.99	66.75	11.5	10.00	12.5	78.75	11.5
160 - 179.99	15.00	2.5	35.00	44.0	50.00	7.5
180 and over	127.50	21.5	2.00	2.5	129.50	19.0
TOTAL	592.75	100.0	79.50	100.0	672.25	100.0
Average Gross Margin per Acre	£129.2		£115.9		£125.6	

A comparison of the results from the ten most profitable and the ten least profitable seed crops produced from farms in the 1966 sample (Table 28) underlines the importance of yield in achieving a satisfactory profit per acre. On the expenditure side, both fixed and variable costs were broadly similar for the two groups of farms, with the 'worst' farms having only slightly greater production costs per acre. Lower costs on the 'best' units may be a consequence of economies of scale, since these units tended to grow larger acreages, with an average size more than double that of the 'worst' units.

TABLE 28

AVERAGE RESULTS PER ACRE - SEED CROPS 1966

	Best 10 Crops		Worst 10 Crops	
	£	£	£	£
Output				
Seed sold	167.5		52.3	
retained	59.5	227.0	32.3	84.6
Ware sold	55.7		42.1	
retained	0.8	56.5	3.2	45.3
Brock		2.4		1.7
Total Output		285.9		131.6
Variable Costs				
Seed		32.3		27.5
Fertilisers		8.8		9.2
Casual Labour		12.9		15.9
Contract Work		4.0		4.2
Sundry Costs		8.2		5.5
Total Variable Costs		66.2		62.3
GROSS MARGIN		219.7		69.3
Fixed Costs				
Regular Labour		20.0		20.4
Tractor Costs		5.2		5.3
Specialised Equipment		6.5		9.5
Rent		4.9		5.8
Overheads		22.3		24.7
Total Fixed Costs		58.9		65.7
Total Costs		125.1		128.0
ESTIMATED PROFIT		160.8		3.6
Average Yields - seed	8.0 tons		3.3 tons	
- ware	2.9 "		2.7 "	
- brock	0.6 "		0.4 "	
TOTAL	11.5		6.4	
Av. seed price per ton	£28.1		£25.4	
Av. ware price per ton	19.3		19.2	
Av. seed rate per acre	35.0 cwt		26.1 cwt	
Av. seed cost per ton	£18.5		£21.3	
Av. fertiliser rate	7.4 cwt		7.4 cwt	
Units N	93		88	
P	99		100	
K	144		131	
Av. acreage	15.7		6.2	

When cash output per acre for the two groups was compared, the average value of the crop from the worst farms was less than half that of the best group. Although seed prices were £2.7 per ton greater for crops sold off the better farms, this could account for only part of the difference, and it is evident that the explanation is to be found in the yield figures. Low average yields were not necessarily due to poorer management, but could be traced in two cases to flooding. Blight also affected yields on several farms, but it could be argued that timely dusting or spraying might have reduced these losses.

A summary of the distribution of output, costs and profits from seed crops in the 1966 sample emphasises the importance of a high cash output per acre in achieving a satisfactory return. Table 29 indicates that average costs of production increased gradually, but the increase was only of the order of £17 per acre over a range of outputs varying from less than £100 to over £300 per acre. As a consequence, high profits were associated with high output crops, while the lowest levels of output were insufficient to cover production costs.

TABLE 29

DISTRIBUTION OF OUTPUT, COSTS AND PROFITS PER ACRE - SEED CROPS 1966

Range of Output	No. of results	Average Output per Acre	Average Cost	Average Profit
£		£	£	£
50 - 99.9	2	91.5	109.3	-17.9
100 - 149.9	17	133.8	119.1	13.5
150 - 199.9	24	175.6	121.8	48.1
200 - 249.9	11	214.3	123.1	91.3
250 and over	8	304.4	126.5	178.0

Fixed costs amounted on average to £64.7 in 1966, and only 55 acres, or some 8 per cent of the sample showed gross margins below this figure. Of the seed crops, 40.5 acres gave inadequate gross margins, while the corresponding figure for ware crops was 14.5 acres. Although some producers suffered losses due to factors such as flooding, blight, or downgrading of seed crops (blackleg was troublesome in some crops) the general results in 1966 were much more satisfactory for growers as a whole. In 1965, owing mainly to the poor market for potatoes, almost one-third of the crops did not provide a gross margin sufficient to cover fixed costs.

The resulting distribution of acreages according to profit per acre - gross margin less fixed costs - is given in Table 30 for the 1965 and 1966 crops included in the sample.

TABLE 30

DISTRIBUTION OF ACREAGE ACCORDING TO AVERAGE PROFIT PER ACRE - 1965 AND 1966 CROPS

Profit or Loss £ per Acre	1965 Crop		1966 Crop	
	Acres	Per Cent of Total Acreage	Acres	Per Cent of Total Acreage
		%		%
(-) 60 - (-) 40.01	123.75	13.0	-	-
(-) 40 - (-) 20.01	145.25	15.5	3.50	0.5
(-) 20 - (-) 0.01	111.50	11.5	31.00	4.5
0 - 19.99	133.25	14.0	38.50	5.5
20 - 39.99	188.50	20.0	116.00	17.5
40 - 59.99	87.00	9.0	150.50	22.5
60 - 79.99	99.50	10.5	116.00	17.5
80 - 99.99	10.00	1.0	40.00	6.0
100 and over	52.00	5.5	176.75	26.0
TOTAL	950.75	100.0	672.25	100.0
Av. Profit per Acre	£19.5		£61.2	

In 1966, three seed crops and two ware crops, accounting for five per cent of the total sample acreage, were estimated to have made losses. In the previous year, losses were incurred on 40 per cent of the sample acreage.

Some evidence was again available to indicate that producers of Foundation Seed, the highest commercial grade, achieved better returns than those producing Stock Seed, A or H grades. Although only 16 F.S. crops were included in the 1966 sample, their average profitability was £84.8 per acre, compared with an average of £51.3 per acre for other grades. Ware growers included in the survey did rather better, with profits per acre averaging £56.0.

Individual returns were influenced a great deal by market conditions and the 1965 and 1966 seasons provided good examples of the large price fluctuations which can occur between seasons for the same variety. This is illustrated in Table 31, which compares average costs, outputs and profits for six selected varieties grown by producers included in the survey.

TABLE 31

AVERAGE COSTS AND RETURNS FOR SELECTED POTATO VARIETIES PER ACRE - 1965 AND 1966 CROPS

	No. of Crops		Av. Acreage per Crop		Av. Cost		Av. Output		Av. Profit	
	1965	1966	1965	1966	1965	1966	1965	1966	1965	1966
			acres	acres	£	£	£	£	£	£
K. Edward	12	3	12.0	33.5	116.2	125.4	112.0	155.3	-4.2	29.9
K. Edward Pc. Free	15	11	9.9	15.5	124.0	133.4	154.7	180.6	30.7	47.2
Majestic	24	14	20.1	18.6	116.9	118.3	127.6	174.3	10.7	56.0
Kerr's Pink	14	15	4.1	5.8	113.1	117.3	137.6	161.3	24.5	43.9
Record	4	3	10.2	12.0	110.1	111.6	137.3	225.1	27.2	113.5
Pentland Dell	5	8	7.5	9.4	126.8	139.0	162.9	232.6	36.1	93.6

Although not an identical sample, since some growers gave up production after the first year while others changed to different varieties, Table 31 indicates the extent to which profitability can vary between seasons for the same variety. The figures themselves are of little value in forecasting future financial results, however, as changes in the pattern of supply and demand exert an over-riding influence on market price. For example, Pentland Dell, which provided good returns during the years surveyed, has now been superseded by later Pentland varieties, and the price per ton for Pentland Dell was consequently much lower in 1967.

Good grades of Majestic and Paracrinkle-Free King Edward - the two main varieties grown in the North East - tend to show less spectacular price fluctuations, and may be expected to remain popular, particularly amongst those growers who have established outlets for the crop.

SUMMARY AND CONCLUSIONS

This study of potato production in the North of Scotland has indicated the extent to which profits can vary between years, depending very largely on market conditions outwith the farmer's control. In 1966, despite a slight decrease in average yield per acre on the farms included in the survey, gross outputs markedly improved, since supply was more closely in line with demand. Changes in the level of both fixed and variable costs per acre were relatively small and, as a result, the profitability of the enterprise was governed by yield and market price. The average cost of growing an acre of potatoes in 1966 was £123.8 per acre, or about £10 per acre more than in 1965. Improved returns, however, outweighed the increase in costs, with an average value of £185.0 per acre in 1966, compared with £134.2 per acre for the 1965 season. Whereas losses were incurred on just over one-third of the sample acreage in 1965, the corresponding proportion in 1966 was only 5 per cent.

As far as most growers are concerned, there is only limited scope for cost saving. Efforts to economise in preparatory cultivations, or by planting poor quality or damaged seed can jeapordise the success of the resulting crop. Nevertheless, the survey has shown that some growers are using quantities of plant nutrients in excess of current recommendations, and in such cases, a reduction in fertiliser levels might be of benefit by reducing costs and by improving quality. Opportunities may exist for some saving by better methods of harvesting or dressing, but the problem of finding suitable labour must accelerate the trend towards mechanisation. The expense of changing to a system with complete harvester and bulk handling machinery is sufficient to deter many small growers, and the alternative of unreliable squads of casual workers has already caused a number to abandon potato production altogether. This at least avoids the dilemma facing some growers who, having invested in equipment, decide to cut back production at a later date. A factor responsible for high costs on one or two farms in this survey was under-utilisation of existing machinery where, for example, a complete harvester was used to lift only three or four acres in a season.

As far as organisation is concerned, two points emerge. Firstly, each producer should consider his experience of the potato trade over the past five or six seasons. It seems fairly reasonable to assume that a firm demand will continue for the better grades of seed, as more English growers take higher-grade stock with the intention of producing once-grown seed. This will have the effect of shifting demand gradually away from the 'A' grade, so that future prospects seem brightest for growers prepared to make the extra effort to obtain F.S or S.S. certificates. At the same time, the production of ware varieties for local sale offers a useful opportunity for growers on better land, when yields justify the outlay involved.

Marketing is the great and so far unresolved problem of the potato crop, since yield fluctuations from season to season are such as to make forward planning unreliable in the extreme. Although the Potato Marketing Board has underlined the problem, little has been done to utilise surplus potatoes in glut years, with the result that producers' prices in more remote areas are severely reduced in a season of high yields. The market support operations of the Board have assisted in the past by cushioning the worst effects, but heavy demands on the Market Support Fund in recent years have almost exhausted the Board's reserves. A poll of registered producers taken in June 1967 to seek approval for an increase in the acreage contribution from £3 to a maximum of £5 per acre proved unsuccessful, so that the Board's support operations in the event of future surpluses may be severely curtailed. Returns of Planting Intentions to the Board indicate that producers intend to increase their acreages in the 1968 season, and if the increase materialises, it is inevitable that another heavy surplus will result.

Human consumption cannot be expected to rise significantly, since demand has remained static at about 200 lb per head per year for a decade or more. Indeed, as consumers' purchasing power increases, it is likely that preference will be shown for commodities such as fruit and livestock products. As a result, the demand for more bulky foods, including potatoes, is likely to decline over the long term. The rate of this decline may be modified by an increase in the total population, and by aggressive selling

of processed potatoes in the form of crisps, etc., but expansion of the potato acreage on a nation-wide scale cannot be to the advantage of producers.

In the short run, the individual farmer may take steps to maintain his income by making a regular contract with a reputable merchant or grower. An extension of this is seen in the co-operation now developing between seed and ware producing groups, in order to establish a more stable range of prices.

Having assessed the market possibilities, it is necessary for the grower to make a decision on his likely long-term commitment to the potato crop. This may be based on the continuing availability of good casual workers or contract services, since such factors affect the level of machinery investment. If potatoes are to form a major enterprise on the farm, adequate provision must also be made for storage and dressing facilities. In these respects, the balance of advantage is likely to lie with the larger specialist grower, who can reap the benefits to be derived from his scale of operation. It is probable that, in the future, potato growing will develop along lines not unlike those already evident in the egg industry, with an increasing share of the output being derived from large units. If this is so, then in potatoes, as in eggs, the medium-sized unit will find the going difficult, leaving the field to be divided between the small local supplier - a specialist in his own right - and the large-scale operator.

APPENDIX A

Standard Appendix

The figures shown in this Appendix are derived from 82 records covering 950.75 acres in the 1965 crop year, and from 62 records covering 672.25 acres in 1966. Less than 5 per cent of the sample was grown for ware each year.

TABLE A I

SUMMARY OF AVERAGE COSTS PER ACRE

	1965 Crop	1966 Crop	1965 Crop	1966 Crop
	Hours	Hours	£	£
Regular labour	67.9	66.6	20.1	22.1
Casual labour	52.1	52.7	11.2	11.7
Tractor costs	27.8	25.5	6.3	5.7
Machinery depreciation and repairs			5.6	7.5
Contract services			7.5	7.2
Materials - seed			22.3	25.1
fertiliser			9.4	9.3
sundry (incl. fuel)			2.7	2.9
P.M.B. levy			3.0	3.0
Rent			5.3	5.5
Share of General Farm Expenses			21.3	23.8
Cost of Production per Acre			114.7	123.8

TABLE A II

SUMMARY OF AVERAGE YIELDS AND RETURNS PER ACRE, 1965 AND 1966 CROPS

Yield per Acre	1965 Crop			1966 Crop		
	9.1 tons			8.5 tons		
	Total tons	Returns		Total tons	Returns	
		£ per ton	£ per acre		£ per ton	£ per acre
Sales - seed	3.2	17.1	54.7	3.1	25.2	78.2
ware	3.8	15.2	57.8	3.5	20.8	72.8
Retained - seed	0.9	18.1	16.3	1.1	26.1	28.7
ware	0.2	12.0	2.4	0.2	18.0	3.6
brock, etc.	1.0	3.0	3.0	0.6	2.8	1.7
Total or average	9.1	-	134.2	8.5	-	185.0
Cost			114.7			123.8
Margin			19.5			61.2

TABLE A III

SUMMARY OF AVERAGE YIELDS AND RETURNS PER ACRE, SEED AND WARE CROPS 1966

Yield per Acre	Seed Crops			Ware Crops		
	8.6 tons			8.5 tons		
	Total tons	Returns		Total tons	Returns	
		£ per ton	£ per ton		£ per ton	£ per ton
Sales - seed	4.0	25.5	102.1	0.4	24.0	9.6
ware	2.5	19.7	49.3	6.5	21.6	140.2
Retained - seed	1.3	25.8	33.5	0.7	21.4	15.0
ware	0.2	14.0	2.8	0.3	19.7	5.9
brock, etc.	0.6	3.0	1.8	0.6	2.2	1.3
Total or average	8.6	-	189.5	8.5	-	172.0
Cost			126.5			116.0
Margin			63.0			56.0

TABLE A IV

SUMMARY OF AVERAGE QUANTITIES PER ACRE

					1965 Crops	1966 Crops
					cwt	cwt
Seed - Home grown					22.2	18.6
Purchased					3.8	7.6
Total					26.0	26.2
Manures and Fertilisers						
	Area Dressed Only					
	1965 Crop		1966 Crop			
	acres	cwt per acre	acres	cwt per acre		
F.Y.M.	237.25	310	178.50	288	77.0	76.5
Compounds	950.75	7.8	672.25	7.4	7.8	7.4

APPENDIX B

Costings Method

Seed

Purchased seed has been charged at cost. Home grown seed has been charged at market value.

Fertilisers

Fertilisers have been charged at net cost (subsidy deducted). No allowance has been made for manurial residues. No charge has been made for dung applied, but the costs of carting and spreading the dung are included.

Casual Labour and Contract Work

Charged at the rates paid. Hand planting, roguing, lifting and dressing on a 'contract' basis have been included as casual labour.

Regular Labour

Regular labour has been charged at the rates operating on the individual farms, including insurance and allowance for perquisites, holidays etc. Manual work of the farmer has been charged at the farm rate. Where no regular labour was employed, a charge of 6s. per hour was made for the farmer's manual work.

Tractor

Tractor work has been charged at 4s. 6d. per hour for wheeled tractors, and 13s. 6d. per hour for crawlers. These rates are estimated to cover fuel, depreciation and repairs.

Depreciation and Repairs

Charges to cover specialised equipment used for the potato crop have been made as follows:-

Implements	20 per cent of purchase price
Electrical equipment	15 per cent of purchase price
Potato storage sheds or conversions	5 per cent of purchase price

Rent

Rent has been charged at the rate paid by the tenant, or at an agreed notional figure in the case of the owner-occupier.

Overheads (Share of General Farm Expenses)

Overheads have been charged at the following rates:-

	1965		1966	
	s.	d.	s.	d.
Per Acre	10	6	13	3
Per £ Labour	7	3	8	3
Per tractor hour	6	9	6	6